ATTACHMENT 3- QUALITY ASSURANCE PROJECT PLAN

ACRONYMS

ASTM	American Society for Testing and Materials
TEADS-EDS	Tooele Army Depot South Explosive Destruction System
DOT	Department of Transportation
DQO	data quality objective
ECBC	Edgewood Chemical Biological Center
EDS	Explosive Destruction System
EPA	Environmental Protection Agency
GC/MS	gas chromatograph/mass spectrometer
LMQAP	Laboratory and Monitoring Quality Assurance Plan
MDL	method detection limit
NIOSH	National Institute for Occupational Safety and Health
PQL	practical quantitation limit
QA	quality assurance
QA/QC	quality assurance/quality control
QAPjP	Quality Assurance Project Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
SAP	Sampling and Analysis Plan
TIC	total ion chromatogram
UDEQ	Utah Department of Environmental Quality
VOC	volatile organic compound

3. 1 Introduction

The procedures and methodologies used to characterize Explosive Destruction System (EDS) operation wastes will ensure proper treatment of wastes; safe handling and storage of treatment residues; and safe handling, treatment, or disposal of wastes shipped offsite. This Quality Assurance Project Plan (QAPjP) describes the quality assurance/quality control (QA/QC) measures that will be in place to ensure adequate sampling and analysis of waste streams are conducted, confirm that required treatment levels and vapor screening levels (as applicable) are met, and allow for proper characterization of the wastes for final disposition.

Liquid and solid waste sample analysis for chemical agent shall be performed by Edgewood Chemical Biological Center (ECBC) personnel using an onsite mobile laboratory. At a minimum, air monitoring systems and operations will meet the certification and validation requirements outlined in this Quality Assurance Project Plan (QAPjP) Attachment 3, and the *Chemical Materials Agency Laboratory and Monitoring Quality Assurance Plan (LMQAP).*

A contracted Utah-certified laboratory will analyze liquid and solid waste samples for Resource Conservation and Recovery Act (RCRA) hazardous waste constituents and characteristics in accordance with *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846, current edition for the method certified to report. The laboratory selected will follow the requirement in this Quality Assurance Project Plan and the Utah certification program for QA/QC for sample analyses as identified in Utah Rule R444-14, Rule for the Certification of Environmental Laboratories.

This QAPjP addresses the QA/QC requirements for RCRA waste sampling and analysis and chemical agent monitoring and sampling analysis for treatment/waste samples. Also, any item not addressed in this QAPjP is discussed in the CMA programmatic LMQAP. The procedures and requirements in the LMQAP are incorporated into the permit by this reference and are enforceable documents for the purpose of compliance with this Permit. The Permittee shall provide the LMQAP to the Director for approval at least 60 days before operations commence. During operations the Permittee shall use the version of the LMQAP approved by the Director.

Detailed information on waste characteristics, waste analysis, and waste characterization methodologies for EDS operations are in the waste analysis plan.

3.2 Purpose

The primary purpose of the quality assurance and quality control parameters is to ensure that wastes are properly characterized in compliance with RCRA requirements for general waste analysis [Utah Administrative Code R315-8-2.4]. Waste characterization also is performed to ensure the safe management of wastes being stored or treated, proper disposition of treatment

residues, and proper characterization of waste for shipment to a permitted hazardous waste treatment, storage, and disposal facility.

The plan also addresses requirements for the verification of treatment and characterization of chemical agent munitions, components, and wastes.

This plan establishes the requirements that will be followed to ensure data quality objectives are met, that all data obtained are technically sound, statistically valid, and properly documented. This plan also identifies the tools that will be used to measure the degree of certainty that all objectives have been met.

3.3 QA/QC Objectives

Quality Assurance (QA) is a systematic approach to ensure that processes and activities meet quality, safety, technical, and management requirements, and that the data and results compiled for waste analysis and waste monitoring are valid and properly documented. QA for the EDS project operations will ensure that waste sampling, waste monitoring, and laboratory analysis operations are performed in accordance with approved plans and procedures. Quality Control (QC) is the mechanism through which QA achieves its goals. The primary objective of this plan is to control and characterize any errors associated with the collected data. QA activities, such as using standard procedures for locating sample sites and collecting samples, are intended to limit the introduction of errors. QC activities, such as collecting duplicate samples and including blanks in sample sets, are intended to provide the information required to characterize any errors in the data. Other QC activities, such as planning the QC program and auditing ongoing and completed activities, ensure that the specified procedures are followed and that the QA information needed for characterizing errors is obtained.

The second QA/QC objective is to confirm that waste sampling and analysis has been conducted according to the specifications of the EDS Waste Analysis Plan and requirements of this Quality Assurance Project Plan. QA/QC activities will include:

- Field inspections and assessments – performed by the QA Manager or designee, depending on the activity. These inspections and assessments will be primarily visual examinations but may include measurements of materials and equipment used, techniques employed, and the final products. The purpose is to verify that a specific guideline, specification, or procedure for the activity is successfully completed. These checks shall include those to determine that limiting conditions of operations related to the laboratory and monitoring are met. In addition, assessments shall be performed to evaluate monitoring and laboratory

procedures. These assessments shall verify that the IOPs have been followed. Assessments shall validate the data included in data packages. This shall be accomplished by reviews that will include but not be limited to the following components of the data packages: 1. Completeness of the data package. 2. Calibration verification/challenge. 3. Completeness and correctness of daily performance charts and QC charts. 4. Tune verifications. 5. Adherence to QC requirements (blanks, QPs, QLs, surrogates, etc.) 6. Accuracy of flowrates. 7. Completeness of extraction logs and standard records forms. 8. Equipment serial numbers. Checklists shall be completed to document results. Checklists may include site-specific requirements to ensure compliance with this Permit. Assessments shall include completion of checklists that are included in daily data packages. These inspections shall be conducted daily while in operation. This means every lab related procedure covered in the WAP or QAPP shall be evaluated at least once on the day that that particular procedure is being performed. An example of a checklist has been incorporated into this Permit as Figure 18.

- Field testing – performed on the site by the QA Manager or designee according to IOP procedures provided by the Permittee. This shall include spikes for MINICAMS. These spikes shall be challenges to the calibration of MINICAMS. These shall be done with solutions other than what was used for calibration. These spikes shall be done by a person other than who did the calibration. At least once per month this challenge shall be done while the EDS is operating. All MINICAMS shall be placed on a rotating schedule for this challenge such that all MINICAMS shall be challenged before the first one challenged is due again. The acceptance range for this challenge shall be equal to the acceptance range of the calibration.
- Laboratory analyses – performed by the contract Utah-certified laboratory on samples of waste. The purpose of laboratory analyses is to determine constituents or characteristics present and their concentration level.
- Perform Laboratory audits.
- Verifying contract laboratory maintains instruments and performs calibrations.

3.4 Responsibilities and Authority

External audits and surveillances, either announced or unannounced, will be conducted as required in this QAPjP. Additional external audits or surveillances may be conducted by other qualified organizations as requested by the RCMD. All documents and data produced by the audits, onsite mobile laboratory and offsite Utah-certified contract laboratory will be placed in the operating record. The environmental regulatory agencies may review these data to ensure that the EDS operations personnel are complying with permit requirements as they pertain to waste characterization, monitoring, and treatment operations.
Sampling and analysis to determine that treatment and vapor screening levels (as applicable) are met will be performed by ECBC personnel. Sampling for RCRA waste characterization purposes will be performed by ECBC personnel or the RCMD hazardous waste contractor.

The following is a list of site personnel directly involved in QA and their responsibilities pertaining to quality data:

The QA Manager is an independent entity provided by ECBC who reports directly to the RCMD Site Manager. ECBC generally refers to this person as a QA Coordinator. All data produced on-site, both analytical and monitoring, will be reviewed by the QA Manager and personnel reporting the results. All data will be approved by the QA Manager. All treatment liquid neutralent quality control data will be approved by the QA Manager prior to emptying the treatment neutralent from the EDS. The QA Manager is responsible for verifying compliance with the quality assurance plan and site-specific monitoring plan; reviews and certifies data prior to submitting data to Data Management System (DMS)/INACCMO; monitors site to ensure proper procedures are followed prior to operation; assists in review of near real-time (NRT) CHROM-NET™ data. RCMD or their qualified designee is responsible for reviewing the QA reports produced by the off-site lab and shall verify their compliance with the stated QA requirements.

The RCMD Site Manager will be responsible for ensuring that appropriate data are provided to the state and federal regulatory agencies as stipulated by this Permit.

The TEADS Manager may substitute for the QA coordinator.

TEADS – EDS Crew Chief is responsible for quality assurance of the EDS unit.

The off-site lab used for RCRA characterization shall be responsible for QA of their data.

3.5 Health and Safety Protocols

During all sampling and analysis activities, strict compliance with industrial hygiene and safety standards will be mandatory. All personnel involved in sampling and analysis activities shall be trained in the applicable safety procedures; the use of all cleaning, decontamination, and sampling equipment and proper cleaning and decontamination techniques per Standard Operating Procedures. Sampling and analysis personnel will have received Occupational Safety and Health Administration health and safety training for hazardous waste operations, per 49 CFR 1910.120 prior to their participation in EDS operations at TEADS. Sampling personnel will be required to wear eye, skin, and respiratory protection gear, as dictated by the Site Safety and Health Officer. If personnel accidentally contact waste material, decontamination procedures will be performed as directed by safety personnel.

3.6 Data Quality Objectives

Data quality objectives (DQOs) are qualitative and quantitative statements developed by data users to specify the quality of data needed from a particular activity. The Environmental Protection Agency (EPA) provides the basis for developing the DQOs (EPA/240/B-06/001, February 2006).

The DQOs for waste sampling and analysis include, but are not limited to, the following.

3.7 Sampling and Analysis Objectives

DQOs for waste sampling and associated data analyses are:

- Determine if waste samples are representative of the wastes at the time the samples were taken
- Demonstrate that treatment level and agent screening (as applicable) values are met for EDS process wastes
- Ensure waste characterization is adequate for waste acceptance at a permitted hazardous waste treatment, storage, and disposal facility
- Ensure laboratory and monitoring analytical results can be validated.

3.8 Data Assessment Objectives

Collected data must be scientifically sound, of known quality, and thoroughly documented. The DQOs for the data assessment are:

- Accuracy[1] – The accuracy of an analytical method is represented as the percent recovery of the target analyte from a given matrix. The quality of the data can be assured through the comparison of individual data values, expressed as percent recovery, to established QC limits. Accuracy QC limits for each specified matrix are located in Table 15.
- Precision[2] – The precision will be the agreement between the collected samples (duplicates) for the same parameters, at the same location, and from the same collection device. Both field duplicates and matrix spike/matrix spike duplicates will be collected.
- Representativeness – The representativeness will address the degree to which the data accurately and precisely represent a real characterization of the population, parameter variation at a sampling point, sampling conditions, and the environmental condition at the time of sampling. The issue of representativeness shall be addressed for the following points:

  - Based on the waste stream and its volume, an adequate number of samples are collected
  - The representativeness of selected media has been accurately defined
  - The sampling and analytical methodologies are appropriate
  - The environmental conditions at the time of sampling are documented.

- Completeness – The completeness shall be defined as the ability of the sampling and analytical methodologies to accurately measure the constituents of concern present in the waste. The goal for completeness shall be 95 percent.

- Comparability – The comparability of the data generated shall be defined as the data that are gathered using standardized sampling methods, standardized analysis methods, and quality-controlled data reduction and validation methods.

[1] When measuring accuracy, the Utah-certified contract laboratory will prepare and analyze matrix spike duplicate samples.

[2] When measuring precision, the Utah-certified contract laboratory will prepare and analyze matrix spike duplicate samples.

- Sensitivity – Reflects the ability of the analytical method to detect analytes of interest below the level of concern. This goal is achieved by identifying the level of concern, choosing a method with appropriate detection limit, and ensuring the laboratory analyses calibration standards are at or below the level of concern.

3.9 Sampling QA/QC

The selected sampling methods for agent monitoring and waste characterization are summarized in Table 13 and will be consistent with: *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, *Annual Book of ASTM Standards*, American Society for Testing and Materials (ASTM), current edition; EDS permit SOPs, or other EPA-recognized methods.

Table 13 - Sample Type, Sampling Equipment, Methods, and Frequency

Media & Waste Stream	Sample Type[a]	Method and Equipment[b]	Frequency[c]	Field QC Samples
Neutralent	Grab	For chemical agent samples, collect liquid sample in a stainless steel or glass bottle from vessel sample valve per EDS SOP	Sample each treatment batch.	One field duplicate on every fifth treatment batch.
	Grab	For pH analysis (FS and FM smoke neutralent), collect sample from Valve 28 of the Containment Vessel effluent discharge line per EDS SOP.	Sample each treatment batch.	

Media & Waste Stream	Sample Type[a]	Method and Equipment[b]	Frequency[c]	Field QC Samples
	Composite	For RCRA waste characterization sampling, collect sample from waste container using a COLIWASA or drum thief per EDS SOP or ASTM D5495-03.	Composite all drums associated with each treatment batch. Composite sample may not be more than 5 individual drums.	One field duplicate on every fifth treatment batch.
Rinsewater	Grab	For chemical agent samples, collect liquid sample in a stainless steel bottle per SOP	Sample each batch of rinsate from the vessel for agent analysis.	One field duplicate on every fifth treatment batch.
	Composite	For RCRA waste characterization sampling, collect sample from waste container using a COLIWASA or drum thief per EDS SOP or ASTM D5495-03.	For RCRA waste characterization, composite all drums associated with each treatment batch. Composite sample may not be more than 5 individual drums.	One field duplicate on every fifth treatment batch.

Media & Waste Stream	Sample Type[a]	Method and Equipment[b]	Frequency[c]	Field QC Samples
Spent Decontamination Solutions and Containment Pan/Sump Liquids/PDS Liquid Waste (for Agent Analysis and RCRA Waste Characterization)	Grab	Collect liquid samples from waste container using a COLIWASA ASTM D5495-03 or per EDS SOP	For Chemical Agent and RCRA waste characterization, collect one sample from each container (drum) generated.	One field duplicate on every fifth treatment batch.
Spent Carbon (from EDS Drum Filter, Environmental Enclosure Carbon Filtration System) & Pre-Filters	No samples	N/A	Spent carbon filters are declared listed hazardous waste F999 and also carry any other waste codes applicable from wastes treated.	N/A
Potentially Contaminated PPE[d]	Grab	ECBC IOP	Every container shall be headspaced monitored (Bagged 4 hours >70°F) for minimum of 2 complete consecutive MINICAMS cycles or 2, 1-hour DAAMS tubes to meet the 0.5 VSL in accordance with the SAP and IOP.	When monitoring waste with DAAMS, 1 QP sample is analyzed per batch and a batch is no more than 10 samples. When monitoring waste with MINICAMS, each batch of no more than 10 samples is bracketed by passing challenges. There shall be at least 1 QP sample per operating day.

Media & Waste Stream	Sample Type[a]	Method and Equipment[b]	Frequency[c]	Field QC Samples
Unexploded Energetic or Propellant Compounds (if generated)	Grab	ECBC IOP	Every container shall be headspaced monitored (Bagged, 4 hours >70°F) for minimum of 2 complete consecutive MINICAMS cycles or 2, 1-hour DAAMS tubes to meet the 0.5 VSL in accordance with the SAP and IOP.	
Solid Wastes (Including Lab Ware, Sampling Equipment, Plastic Bags, Stainless Steel Sample Bottle Assemblies, Grayloc seals and Overpacks	Grab	ECBC IOP	Every container shall be headspaced monitored (Bagged, 4 hours >70°F) for minimum of 2 complete consecutive MINICAMS cycles or 2, 1-hour DAAMS tubes to meet the 0.5 VSL in accordance with the SAP and IOP.	
Air monitoring for GA/GB, H/HD/HT and HN-3	Grab	Collect headspace sample in a sample bag from containment vessel per EDS SOP and analyze before opening containment door	Each chemical agent treatment operation	

Notes:

[a] For each waste stream sampled, appropriate QA/QC samples per the QAPjP in Attachment 3 will be collected as shown in Table 13.

[b] As applicable, equipment used to sample waste materials will be disposable or designed for easy decontamination. Contaminated disposable equipment will be managed as hazardous waste, as appropriate. Cleanable equipment will be thoroughly decontaminated prior to reuse. Spent decontamination solutions will be managed as hazardous waste as appropriate.

[c] A neutralent batch is defined as the volume of treatment reagent and chemical fill contained in the EDS Containment Vessel after the chemical fill from an explosively opened munition or other container (for example, a cylinder) has been treated. A rinsewater batch is the volume of liquid contained in the EDS Containment Vessel that is used to rinse the vessel after the neutralent has been drained.

[d] Potentially contaminated PPE is PPE that has been in contact with liquid agent or worn in an area where vapor agent was confirmed above the 15 minute STEL for the chemical agent being processed at the time.

ASTM	=	American Society for Testing and Materials
COLIWASA	=	composite liquid waste sampler
H	=	Levinstein Mustard
HD	=	distilled sulfur mustard
DAAMS	=	Depot Area Air Monitoring System
HN-3	=	nitrogen mustard
EDS	=	Explosive Destruction System
HT	=	mustard-T mixture
FM smoke	=	titanium tetrachloride
PDS	=	Personnel Decontamination Station
FS smoke	=	sulfur trioxide and chlorosulfonic acid
RCRA	=	Resource Conservation and Recovery Act

GA = tabun

SOP = Standing Operating Procedure

GB = sarin

3.10 Sample Containers, Preservation, Handling, and Management

Sample container selection, preservation, handling, and management are critical to sample quality. Considering waste compatibility, durability, volume, and analytical sensitivities, the containers permitted to be used are listed in this QAPjP**.** The contract laboratory will provide sample containers, labels, and preservatives for RCRA analysis.

All sample containers will be labeled with at least the following information:

- A unique alphanumeric identifier
- Date and time of collection
- Sample collector's name
- Preservatives used-listed including thermal 4-6°C
- Parameters and requested Methods.

An example of a sample container label is provided in Figure 20. Immediately after collection, filled sample containers will be placed on ice or Blue-ice® packs, if necessary, in durable coolers or comparable receptacles for transport to the laboratory or samples may immediately be placed in a refrigerator pending shipment to a laboratory for analysis. RCRA analyses will be conducted at an Utah-certified laboratory within the allowable holding times for sample analysis. Coolers or comparable receptacles will be tightly sealed before sample shipment occurs. Samples will be screened for chemical agent prior to being released off-site. If the samples show the presence of agent in excess of the permitted screening levels in this Permit, they shall not be sent offsite for analysis. Samples then will be transported to ensure delivery within the allowable holding times for sample preparation and analysis. All sample collection, preparation, packaging, transportation, and analysis will conform to the requirements of SW-846, current edition.

Sampling procedures that will be used at the EDS are designed to ensure that each sample is accounted for at all times. The primary objectives of the sample control procedures are as follows:

- Important and necessary sample constituents are preserved (e.g., refrigerated, capped).
- Each sample collected for analysis is uniquely identified.
- Samples are protected from loss, damage, or tampering.
- Any alteration of samples during collection or shipping (e.g., preservation, breakage) is documented.
- A record of sample custody and integrity is established.

- The correct samples are analyzed and are traceable to the applicable data records (e.g., chain-of-custody, field records, request for analysis, laboratory ledgers).

As part of sample management procedures, personnel collecting the samples will maintain a record of sampling activities. This record will include: the purpose of sampling; date and time of collection; sample number; sampling location, sampling methodology, container description, waste description (metal fragments, rinsewater, etc.); description of process originating the waste; name and address of field contact; number and volume of samples; field observations; destination and transporter; and signature of collector. This record shall become part of the operating record.

Samples will be transported in accordance with DOT, EPA, and Army requirements. Hazardous waste samples will be properly packaged, marked, and labeled. Shipping papers will be prepared as required by DOT regulations, EPA requirements, and Army regulations and guidelines.

All equipment used to sample waste materials will be disposable or designed for decontamination. Contaminated disposable equipment will be managed as hazardous waste, unless sampling proves otherwise. Cleanable equipment will be thoroughly decontaminated prior to reuse. Decontamination solutions will be managed as hazardous waste, unless sampling proves otherwise.

Sampling requirements are specified in the WAP.

3.11 Field QC Samples for RCRA Waste Sampling Analysis and Agent Monitoring.

The goal of the RCRA waste sampling and analysis effort is to collect and analyze representative samples of wastes generated during EDS operations. The laboratory chosen for this RCRA analysis shall be Utah-certified, have significant capacity and quality to meet analytical demand, provide timely and complete data packages, and provide technical support in the form of sample kits and shipping supplies. Laboratory blanks and supplies for field blanks shall be prepared by the laboratory. For each waste stream sampled, appropriate QA/QC samples will be collected, as shown in the WAP.

Field QC samples may include trip blanks, rinse blanks, and/or duplicate samples. Trip blanks are used to verify that field procedures do not contaminate containers or samplers. They are prepared using analyte-free water when samples are to be analyzed for volatile organic compounds (VOCs). At least one trip blank will be prepared and analyzed for each cooler used for storing and transporting VOC samples.

Rinse blanks shall be used to detect cross-contamination resulting from the use of non-dedicated (re-used) sampling equipment. It is anticipated that disposable, one-time use sampling equipment will be used. However, if sampling equipment is re-used, at least one rinse blank

shall be collected for every 20 samples per parameter group and matrix. This blank shall be prepared in the field by rinsing the cleaned sampling equipment with analyte-free water and collecting the rinsate. There shall be a minimum of one rinse blank per lab set. There shall be a minimum of one rinse blank per 20 samples.

Duplicates are samples collected at the same time from the same source and are used to measure sample homogeneity and analytical precision. Duplicates shall be collected as described in Table 13 and/or at the request of the waste generator or a representative of the UDEQ. There shall be a minimum of one duplicate collected per sampling event. A field duplicate sample will be analyzed for every fifth treatment batch.

All agent monitoring will have a minimum of two complete consecutive MINICAMS cycles or two DAAMS tubes. A field QP DAAMS, (spiked in lab and then aspirated in the field) for each DAAMS method will be analyzed daily.

3.12 Sampling Handling and Chain-of-Custody

A chain-of-custody record will accompany samples at all times. An example of a chain-of-custody form is included as Figure 19. The personnel performing the sampling shall be responsible for initiating the chain-of-custody procedures at the time samples are collected. A chain-of-custody record form shall be used to document sample collection activities, including sampling site, sample identification, number of samples, and date and time of collection. The form also shall document the names of responsible individuals and dates and times of custody transfers.

Samples will be screened for agent prior to being shipped off-site. An agent screen release document for samples shall be provided with the chain of custody form to the off-site laboratory.

Samples will be received at the laboratory by a designated sample custodian. This individual will carefully review received samples and documentation for compliance with applicable sampling and documentation requirements such as type and condition of container, sample preservation, collection date, and chain-of-custody records. After verifying that all samples submitted are listed and that the required information is listed on the form, the sample custodian will sign and date the chain-of-custody form. The sample custodian will then store and secure the samples appropriately (e.g., in locked refrigerator).

Chain-of-custody documentation for samples will continue throughout the analytical process. After logging in and storing the samples, the sample custodian will distribute sample-receiving logs, which will list sample numbers and analyses to be performed, to designated laboratory personnel. Upon completion of analyses, results will be submitted to the laboratory data management section along with QA/QC information. Much of the analytical results will be used to characterize wastes prior to the wastes being sent to a permitted hazardous waste treatment,

storage, and disposal facility. All data sheets and laboratory records will be retained as part of the permanent record. All DAAMS samples transferred to the onsite mobile analytical platform will be accompanied by a scratch log. An example of a scratch log is included as Figure 21.

3.13 Laboratory QA/QC

The RCRA analytical laboratory and ECBC mobile laboratory shall conduct its operations in such a way as to provide reliable analytical results. The QA/QC of data generated by the analytical laboratory shall follow the minimum requirements of this Quality Assurance Project Plan. At a minimum, the laboratories shall follow the guidelines presented in this section. The laboratory QA/QC plan will document the following:

- Sample custody and management practices
- Sample preparation and analytical procedures
- Instrument maintenance and calibration procedures
- Sample Holding Times
- Internal QA/QC measures including the use of method blanks, spiked samples, and duplicates.

3.14 Preventive Maintenance

Preventive maintenance procedures are intended to prevent instrument malfunctions and to detect as early as possible any potential problems with the analytical equipment that might result in inaccurate analyses. Analytical instruments or instrument systems in use at the laboratory shall undergo routine preventive maintenance as recommended by the vendor or manufacturer, or if such maintenance is warranted based on equipment operating experience. All maintenance procedures shall be documented.

Each item of equipment, including reference standards, shall, when appropriate, be labeled, marked, or otherwise identified to indicate its calibration status.

The laboratory shall have documented instructions on the use and operation of all relevant equipment, on the handling and preparation of items, and for calibrating equipment. All instructions, standards, manuals, and reference data relevant to the laboratory's operation shall be maintained up to date and will be readily available to the staff.

Where computers or automated equipment are used for the capture, processing, manipulation, recording, reporting, storage, or retrieval of calibration or test data, the laboratory shall ensure the following: (1) the computer software is documented and adequate for use; (2) computer and automated equipment is maintained to ensure proper functioning and provided with the

environmental and operating conditions necessary to maintain its integrity; and (3) establish and implement procedures for protecting the integrity of the data.

Maintenance and repair records shall be maintained on all instruments and instrument systems and will become part of the operating record.

3.15 Analytical Instruments and Equipment

Analysis of RCRA samples is performed on various types of analytical instruments, including gas chromatographs, inductively coupled plasma, mercury analyzers, spectrometers, spectrophotometers, and pH meters. The ECBC mobile laboratory will use IOPs and SOPs to analyze for chemical agents in neutralents and rinsewaters and provide support for the MINICAMS monitoring by analysis of historical and conformational DAAMS tubes samples.

3.16 Analytical Instrument Equipment Maintenance, Testing, Inspection and Calibration/Challenge Criteria

Analytical instrumentation shall be maintained, tested, and inspected in accordance with laboratory and manufacturer specifications and the LMQAP. MINICAMS shall be calibrated/challenged daily prior to operations and then every four to five hours of operations with an acceptance range of 75-125% except for distal end challenges (required at least once per campaign and no later than every 2 months) with an acceptance range of 60-140%. DAAMS instruments used for historical (Class 1) and confirmation (Class 3) analysis shall be calibrated or challenged daily and then after every 20 samples that same day. Any response in the retention time window for a Class 3 DAAMS will indicate the presence of agent. All other analytical instruments shall be challenged (ICV) daily prior to analyzing samples with a minimum acceptance range of 80-120%. Continuing calibration shall occur at a minimum of every 20 samples or at least once per operational day whichever comes first with minimum acceptance range of 80-120%.

Table 14 lists the required maintenance procedures for laboratory equipment.

3.17 Routine Assessment of Precision, Accuracy, Comparability of Analytical Data

QA for analytical data from collected samples will include evaluation of precision, accuracy, and comparability, which are discussed below and in Table 15.

<u>Precision</u>

Precision in reference to laboratory analysis is a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is

assessed by means of laboratory duplicate/field replicate sample analysis. The laboratory objective for precision is located in Table 15.

Table 14–Required Maintenance Procedures for Laboratory Equipment

Equipment	Procedure/Frequency	Spare Parts
Analytical Balance	Daily: Calibrate with Class S standard weights, clean up spills. Sensitivity check daily. Annually: Service by TMDE/Manufacturer	
Gas Chromatograph/ Mass Spectrometer	Daily: Verify gas supply is above 200 psi, check column flow acceptance range, check detector temperature acceptance range. As Needed: Check level of oil in mechanical pumps and diffusion pump, replace electron multiplier, clean source, repair/replace jet separator, replace filaments, perform column maintenance. Semi-Annually: Check oil in mechanical rough pump and change, if necessary. Annually: Vendor supported preventive maintenance	Columns, ferrules, chemical traps
Gas Chromatograph/Flame Photometric Detector	Daily: Verify gas supply is above 200 psi, check column flow acceptance range, check detector temperature acceptance range. As Needed: Perform column maintenance. Annually: Vendor supported preventive maintenance	Columns, ferrules, chemical traps
DAAMS System	Daily: Verify flow rates, critical orifices, fittings, and ferrules. Change NOx Filters weekly, minimum for Mustard. As Needed: Perform vacuum pump and sequencer maintenance.	Ferrules, extra pumps
MINICAMS®	Daily: Verify gas supply, check temperatures, flow rates, alarm action level, and operating parameters. As Needed: Replace PCT, reactor tubes, analytical columns, clean sample lines, check pump oil level. Semi-Annually: Vendor supported preventive maintenance	PCT, reactor tubes

Notes:

DAAMS = Depot Area Air Monitoring System

PCT = preconcentrator tube

TMDE = Test Measurement and Diagnostic Equipment

Precision of the chemical laboratory data will be measured through the use of matrix spike duplicate samples and calculated as the percent relative standard deviation (%RSD). The standard deviation, s, is calculated from the variance, s^2, as follows:

$$s^2 = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}$$

where $\bar{x}$ is the mean value of a variable, x_i is the value of an individual measurement of a variable, n is the number of data points, and s is obtained from:

$$s = \left(s^2\right)^{1/2}$$

The %RSD is then:

$$\%RSD = s / \bar{x}$$

The standard deviation and %RSD are calculated for every constituent measured.

Accuracy

Accuracy means the nearness of a result, or the mean of a set of results, to the true value. Accuracy is assessed by means of reference samples and percent recoveries. The laboratory objective for accuracy is to be within the control limits for the analytical methods as specified in Table 15.

Accuracy of laboratory data shall be measured through the use of matrix spike duplicate samples and will be assessed through the calculation of percent recovery from any certified standard that the laboratory analyzes as part of its ongoing QA/QC program. The percent recovery is calculated as follows:

$$\%\text{Recovery} = \frac{SSR - SR}{SA} \times 100\%$$

where SSR is the spiked sample result, SR is the sample result, and SA is the spike added. The laboratory also will be required to run a sufficient number or type of blanks to detect laboratory contamination.

Comparability

Comparability is the degree to which one data set can be compared with another. Comparability is achieved by using consistent methods and standards that are traceable to a reliable source. All data will be reported in units consistent with the conventions used for the given analyte and methods employed. Comparability can be enhanced by using:

- EPA SW-846 or EPA 600/4-88-039 methods of analysis
- ASTM methods
- National Institute for Occupational Safety and Health (NIOSH).

3.18 Method Detection Limit (MDL) and Matrix Validation

Method detections limits for all analytes shall be performed at least one time during an EDS campaign. MDL studies shall be performed using neutralent and rinsewater spiked with analytes of concern. The MDL is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyzed concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. The MDL is calculated as follows:

$$MDL = t_{(n-1,1-\alpha=0.99)} \times S$$

where

$t_{(n-1,1-\alpha=0.99)}$ = student's t value for a one-sided, 99-percent confidence level and a standard deviation estimate with n-1 degrees of freedom.

S = standard deviation of the replicate analysis.

Analytical data will be reported between the MDL and Laboratory Reporting Limit. The Laboratory reporting limit will be below the regulatory/project specific limits.

A method/matrix validation shall be performed for each sample matrix at the reportable limit. A set of 7 spiked matrices e.g., Neutralent at the action level must be demonstrated.

3.19 Laboratory QC Samples

Internal QA/QC checks are established by submitting QA and QC samples to the analytical laboratory. The frequency of laboratory QC samples is per batch (20 or fewer samples) unless a shorter frequency is specified in section 3.19 and is defined by the laboratory's QA/QC plan and procedures and this QAPjP. The types of laboratory QC samples are:

- *Method Blank.* Defined as laboratory grade water taken through the entire analytical procedure to determine if samples are accidentally contaminated by chemicals in the laboratory.
- *Laboratory Control Samples.* Defined as known clean matrix, similar to samples (solid/liquid), spiked with compound(s) representative of the target analytes and is used to document laboratory performance.

- *Matrix Spike.* Defined as an aliquot of a sample matrix, spiked with a known concentration of the analytes of interest. The matrix spike is subjected to the entire analytical procedure to indicate the appropriateness of the method for the matrix by measuring recovery.
- *Matrix Spike Duplicate.* Defined as an aliquot of a duplicate sample matrix, spiked with a known concentration of the analytes of interest. The matrix spike duplicate is subjected to the entire analytical procedure to indicate the representativeness of the sampling for the matrix by measuring precision.
- *Duplicate.* Defined as a second aliquot taken from the original sample container and analyzed separately to test repeatability of an analysis.

For the Neutralent grab sample for chemical agent analysis, there shall be one lab duplicate of the sample analyzed for every 5th treatment batch as listed in Table 13.

For the Nuetralent composite sample for RCRA characterization there shall be one Matrix Spike sample and one Matrix Spike Duplicate sample analyzed for each treatment batch.

For the Rinsewater composite for RCRA characterization there shall be one Matrix Spike sample and one Matrix Spike Duplicate sample analyzed for each treatment batch.

For the Spent Decontamination Solutions and Containment Pan/Sump Liquids/PDS Liquid Waste (for Agent Analysis and RCRA Waste Characterization) grab sample there shall be one Matrix Spike and one Matrix Spike Duplicate sample analyzed per container.

3.20 Analytical QC Limits

Analytical QC limits are outlined in Table 15.

Table 15 - Analytical QC Limits[a]

Analytical Parameter	Surrogate Recovery Limits	MS/MSD Recovery Limits	LCS/LCSD Recovery Limits	RPD Limits
Volatiles, 8260B	±20%	±20% rinsewater, decon solutions (etc) ±30% neutralent	±20%	± 20% rinsewater, decon solutions (etc) ±30% neutralent
Semi-volatiles-8270D	±30%	±20% rinsewater, decon solutions (etc) ±30% neutralent	±20%	±20%
Metals-6010C or 6020A	N/A	±20%	±20%	±20%
pH	N/A	N/A	N/A	0.05 pH units
Ignitibility	N/A	N/A	N/A	N/A
Cyanide	N/A	±30% (every 10 samples)	N/A	±20%

Notes:

[a] Procedures should be in place for establishing and updating control limits for analysis. Control limits are established to evaluate laboratory precision and bias based on the analysis of control samples. Typically, control limits for bias are based on the historical mean recovery plus or minus three standard deviation units, and control limits for precision range from zero (no difference between duplicate control samples) to the historical mean relative percent difference plus three standard deviation units. At a minimum, the laboratory shall meet these limits.

LCS = laboratory control sample

LCSD = laboratory control sample duplicate

MS = matrix spike

MSD = matrix spike duplicate

N/A = not applicable

RPD = relative percent difference

3.21 Data Quality and Data Deliverables

To ensure hazardous waste characterization data are reliable, the off-site Utah-certified contract laboratory shall operate and conduct analyses according to the performance quality requirements identified in this section. Data quality validation and assessment for agent treatment and monitoring will be reviewed by the chemist, monitoring technician and reviewed and approved by the EDS QA Manager.

Data Quality Assessment. Data quality assessments will evaluate whether the data generated by the laboratories is consistent with the established DQOs.

For the RCRA waste characterization, the off-site laboratory will furnish a QA Manual (or QA Program Plan) to the EDS QA Manager that defines the quality procedures and policies specific to that facility. In addition, the off-site laboratories will be provided a copy of this quality assurance project plan by the Permittee to incorporate project specific requirements. RCMD or an assignee will be responsible for reviewing the reports from that off-site facility to ensure consistency with RCRA limits and with the project specific requirements. An audit of the analytical laboratory may be performed by RCMD or an assignee at any time during the EDS operations.

For Agent characterization and monitoring the EDS QA Manager will ensure procedures and policies and data reporting is consistent with this plan. All data will be approved by the EDS QA Manager.

Data Quality RCRA Characterization Deliverables. For the RCRA analysis, data packages will consist of complete Level III data packages with raw data unless a Level IV is specifically requested by the DWMRC. A request for electronic deliverables may be made as appropriate. Summary reports for the RCRA characterization will include but not be limited to:

- Chain-of-custody, Field Sampling Logs, any associated correspondence
- Name and address of laboratory (on letterhead)
- EPA or other approved method used (with title and method number)
- Client delivery order (or job) number
- Sample identification, client, and laboratory number
- Date and time sampled
- Date and time sample received by laboratory
- Date and time sample was extracted/digested
- Dilution factor
- Sample matrix
- Date and time sample was analyzed

- Parameters tested
- Units reported
- Concentration of each parameter found
- Reporting limit or other similar limit for each parameter [practical quantitation limit (PQL)]
- Report date
- Case narrative for each sample batch and any anomalies encountered with samples
- Signature of laboratory supervisor or director (or assignee).

Quality Control Deliverables for RCRA Characterization and Chemical Agent. The contract laboratory will provide the following type of information in the case narratives and other written text.

Metals – Toxicity Characteristic Leaching Procedure extraction logs (EPA 1311), method blank results, lab control sample and lab control sample duplicate [% recoveries with calculated relative percent difference (RPD)], matrix spike and matrix spike duplicate (% recoveries with calculated RPD), original sample (OS), and original sample duplicate (OSD) with calculated RPD.

Organics – extraction logs, method blank results, lab control sample, (% recovery), and matrix spikes (% recoveries with calculated RPD), and surrogates (% recovery).

Wet Chem – extraction preparation logs, method blank results, lab control sample and lab control sample duplicate (% recoveries with calculated RPD), matrix spike and matrix spike duplicate (% recoveries with calculated RPD), OS, and OSD with calculated RPD.

Other – For methods in which no spikes can be performed (for example, specific gravity) an original sample and sample duplicate analysis must be performed and reported (OS/OSD with calculated RPD %).

Chemical Agent analysis will follow the procedures specific in this QAPjP. Full data package deliverables will be provided with each treatment batch.

Data Qualifiers. In cases where results are out-of-control and the laboratory supervisor and the QA Coordinator determine that re-preparation and re-analysis is not possible, then the results for that sample or analytical batch shall be qualified. The qualifiers used for waste analysis results shall be consistent with EPA Contract Laboratory Program data qualifiers that are listed and defined below. Additional notes and explanations may accompany the reports to further describe

the occurrence. All non-detectable results will be identified with a less than sign with the detection limit value, when applicable.

ND: This flag indicates the compound was not detected at or above the MDL.

U: This flag indicates the compound was detected above the MDL but below the PQL.

J: This flag indicates an estimated value. An example is this flag is used (1) when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed and (2) when the mass spectral and retention gas chromatograph/mass spectrometer (GC/MS) identification criteria and the result is less than the PQL but greater than zero.

N: This flag indicates presumptive evidence of a compound. This flag occurs only on a mass spectral library search. It is applied to all total ion chromatogram (TIC) results.

B: This flag is used when the analyte is found in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user to take appropriate action. This flag is used for TICs as well as positively identified target compounds.

E: This flag indicates compounds with concentrations exceeding the upper level of the calibration range of the instrument for that analysis. If one or more of the compounds have a response greater than the upper level of the calibration range, the sample or extract shall be diluted and re-analyzed. If the dilution of the extract causes any compounds identified in the first analysis to be below the calibration range in the second analysis, both results are delivered with the flag "DL" attached to the second analysis.

D: This flag is used for all compounds identified in an analysis at a secondary dilution factor.

X: Other specific flags may be required to properly define the results. If used, the flags shall be fully described with the description attached to the sample summary package. Use Y and Z if more than one flag is needed.

R: This flag is used to indicate that the analytical result is rejected. A reason for the data rejection is required.

3.22 Corrective Action

Corrective action will be initiated by the laboratory QA/QC Officer when required to ensure data quality meets the criteria established in the laboratory QA plan and this QAPjP. Corrective action will be initiated in response to performance audits, system audits, comparison studies, QA program audits or exceedance of any QAPjP limit specified in this plan.

Standard laboratory-initiated corrective actions consist of checking instruments, apparatus, obtaining new reagents and/or standards, and calibration verification or recalibration. If standard laboratory-initiated corrective actions do not identify and correct the problem, then instrument custodians, instrument system specialists, method authors, or chemists will troubleshoot and repair or correct the system performance.

3.23 General Approach to Corrective Action

For either immediate or long-term corrective actions, steps comprising a closed loop corrective action system are as follows: (1) define the problem; (2) assign responsibility for investigating the problem; (3) investigate and determine the cause of the problem; (4) determine a corrective action to eliminate the problem; (5) assign and accept responsibility for implementing the corrective action; (6) implement the correction and determine its effectiveness; and (7) verify that the corrective action has eliminated the problem.

Undesirable performance or analytical errors will be identified as a problem in precision or bias. Either the results of replicate measurements were not in close agreement or the results were not in agreement with the expected (target) or reference values. Also, there is a possibility that both situations will occur concurrently. Rules for finding and resolving the causes of these deficiencies are not well established. However, the approach that the analyst takes must be systematic and based on common knowledge and experience of the laboratory personnel. A team effort from the analysts, the immediate supervisor, and the Laboratory Manager will be required. The most obvious causes are to be eliminated first. If the initial investigation does not resolve the problem, the attention is to be directed to the more complex possibilities.

Obvious simple errors such as the transposition and transcription errors of data, the use of incorrect calculations or calculation errors, incorrect readings and recording of instruments readouts, the use of the wrong analytical procedures, and the lack of attentiveness to details in the laboratory will lead to imprecision or bias. A review and internal audit of the data and a detailed discussion with the analysts concerning how and when they performed specific steps in the laboratory procedures may indicate the cause of, and a corrective action for, the deficiency.

Bias

Inexperience of the analyst, instrument instability, variable contamination in the samples, variability of the method blanks, poor reagent quality and control, or fluctuations of the laboratory environment are possible causes of bias. Approaches to resolving these causes are the following: (1) check for obvious and simple errors first; (2) repeat the analysis at the point where sample is first introduced into the analytical procedure; (3) repeat the analysis on a different instrument or use another gas chromatograph column; and (4) have another analyst repeat the analysis.

Accuracy

Incorrect calibrations, losses of analyte during sample preparation or analysis, incorrect calibration standards, stock solutions, innate bias of the analyst, matrix effects on the analyte, instrumental shifts, instrument not calibrated, and contaminations in the sample or standards are possible causes of inaccuracy. Approaches to resolving these causes are the following: (1) check for the obvious and simple errors first; (2) repeat the analysis at the point where sample is first introduced into the analytical procedure; (3) repeat the analysis with new calibration standards; (4) recalibrate the analytical instrument; (5) repeat the analysis on another instrument that is calibrated; (6) have another analyst repeat the analysis; (7) repeat the analysis with fresh or new samples, if possible; and (8) check analytical instrument and detector.

3.24 QA Reports to Management

QA reports will be generated by the laboratory to document the analytical results and organizational performance. These reports will contain, at a minimum, reports of system or performance audits; reports of required corrective actions implemented; assessment of the generated data precision, accuracy, and comparability; and resolution of previously reported problems. A Level III data package (unless a Level IV is specifically requested by the DWMRC) will be submitted with each sample batch with a minimum of the following items:

Case Narrative

QC summary sheet

Preparation sheets

Analytical preparation logs

Analytical results

Raw Data

Dilution logs if applicable

Corrective action report if applicable.

3.25 Recordkeeping

Both the onsite mobile chemical agent laboratory/monitoring and offsite contract laboratory performing RCRA analyses will maintain a record system that will include the documentation of all samples received, analyzed, analyses conducted, preparations, QC challenges, maintenance of laboratory equipment, and reports prepared. The TEADS-EDS site operations will maintain documentation on samples collected, chain-of-custody, results, and reports received. All

information will become part of the operating record and will be kept until closure has been completed.