WASTE TREATMENT AND IMMOBILIZATION PLANT
APPENDIX 3B
QUALITY ASSURANCE PROJECT PLAN FOR THE WASTE ANALYSIS PLAN

CHANGE CONTROL LOG

Change Control Logs ensure that changes to this unit are performed in a methodical, controlled, coordinated, and transparent manner. Each unit addendum will have its own change control log with a modification history table. The "**Modification Number**" represents Ecology's method for tracking the different versions of the permit. This log will serve as an up to date record of modifications and version history of the unit.

Modification History Table

Modification Date	Modification Number
03/2007	

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APPENDIX 3B
QUALITY ASSURANCE PROJECT PLAN FOR WASTE ANALYSIS PLAN

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APPENDIX 3B
QUALITY ASSURANCE PROJECT PLAN FOR WASTE ANALYSIS PLAN

TABLE OF CONTENTS

TABLES

FIGURE

1

ACRONYMS

ALARAASTM	as low as reasonably achievableAmerican Society for Testing and Materials
BNIDFLAW	Bechtel National, Inc.direct feed low-activity waste
DOE	United States Department of Energy
DST	double-shell tank
EPAEMF	United States Environmental Protection AgencyEffluent Management Facility
EQL	estimated quantitation limit
HLW	high-level wasteHigh-Level Waste (Facility)
Lab	Analytical Laboratory
LAW	low-activity wasteLow-Activity Waste (Facility)
LDRLCS	Land Disposal Restrictionslaboratory control sample
LIMS	laboratory information management system
MDL	method detection limit
PCB	Ppolychlorinated Bbiphenyl
PT	Pretreatment (Facility)
QA	quality assurance
QAM	*Quality Assurance Manual*
QAPjPQAPP	*Quality Assurance Project Plan for the Waste Analysis Plan*
QC	quality control
RPD	relative percentage difference
WTPTSAP	River Protection Project – Waste Treatment and Immobilization Planttank sampling and analysis plan
WAC	Washington Administrative Code
WAP	Waste Analysis Plan
WTP	Waste Treatment and Immobilization Plant

2

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3B.1 INTRODUCTION

This Quality Assurance Project Plan (~~QAPjP) was prepared~~herein referred to ~~support~~as "this QAPP") supports the sampling and analysis to be implemented by the ~~River Protection Project –~~Hanford Tank Waste Treatment and Immobilization Plant (WTP), particularly in support of the ~~verification and~~ characterization of the waste feed and the characterization of secondary waste streams. This ~~QAPjP~~QAPP will ensure that the quality and quantity of data resulting from these sampling and analysis activities can support the decision-making process for the management of WTP wastes. This ~~document~~ QAPP was prepared using guidance provided in the following references:

- ~~*EPA*~~ *Guidance for Quality Assurance Project Plans* (EPA ~~1998).~~ 2002)
- *Test Methods for Evaluating Solid Waste* ~~-~~: *Physical/Chemical Methods*, SW-846 (EPA ~~1997).~~ 2014)
- 24590-WTP-QAM-QA-06-001, *Quality Assurance Manual* (~~QA Manual).~~herein referred to as "QAM")

Quality assurance (QA) and quality control (QC) ensure that an activity or project meets a required quality standard. QA is associated with record~~-~~ keeping, tracking, audits, and assessments, and it involves determining the desired level of quality and setting limits in advance. QC is associated with the controls ~~that are~~ implemented while an activity is being performed. This ~~QAPjP will comply~~QAPP complies with the applicable requirements of the ~~QA Manual~~QAM and ~~will~~ becomes effective at the commencement of laboratory operations.

Controlled copies of this ~~QAPjP~~QAPP will be kept at the WTP ~~facility~~. The Project Document Control ~~M~~manager, or equivalent ~~title~~, will be responsible for ensuring that controlled copies of the QAP~~j~~P are kept current when revisions to this QAP~~j~~P are made.

3B.2 PROJECT DESCRIPTION

The ~~United States~~US Department of Energy ~~(DOE)~~ has contracted Bechtel National, Inc. ~~(BNI)~~ to design, construct, and commission the WTP. ~~DOE~~The US Department of Energy will select an alternate contractor to operate the WTP. The WTP will store and treat mixed waste currently stored in the Hanford double-shell tank (DST) system unit~~. The~~, operated by the Tank Operations Contractor. The WTP has been designed to operate under two operating configurations. In the baseline configuration, DST waste ~~feed~~ will first be ~~divided into two streams~~ processed through the WTP Pretreatment (PT) Facility, and then sent on for vitrification at the Low-Activity Waste (LAW) Facility and the High-Level Waste (HLW) Facility. Alternately, if the waste meets acceptance criteria for the LAW Facility (e.g., the waste is pretreated or conditioned before transfer to WTP), the waste may be transferred directly to the LAW Facility under a direct feed operating scenario.

The WTP will commence initial operations by processing ~~and disposal purposes: high-level waste (HLW) stream, which is composed of the higher radionuclide and solids content of the waste feed,~~waste pretreated by the Tank Operations Contractor and ~~low-activity waste (LAW) stream, which has a lower radionuclide~~fed directly to the LAW Facility. This configuration is referred to as "Direct Feed Low-Activity Waste" (DFLAW) configuration. In this configuration, the LAW Facility and ~~solids content. The LAW stream is generally the supernatant~~ Analytical Laboratory (Lab) will be commissioned to operate while the PT Facility and HLW Facility construction is completed. Upon the completion of construction and successful commissioning of the PT and HLW facilities, the WTP will switch to the baseline configuration. The portion of ~~the tank waste. The treatment processes are being designed to pretreat the~~DST waste ~~feed to separate the waste feed into the HLW and LAW streams, immobilize the waste streams~~ not subject to direct feed processing (e.g., not pretreated or conditioned before transfer to WTP) will be treated in ~~a glass matrix through vitrification, and treat the off-gas to a level that protects human health and the environment.~~the baseline configuration with the PT, LAW, and HLW facilities.

~~BNI and t~~The Tank ~~o~~Operations ~~c~~Contractor will conduct sampling and facilitate shipment for analysis ~~to characterize incoming waste feed and to assess the effectiveness of the treatment processes~~ and will provide results to the WTP for assessment against the waste acceptance criteria prior to waste receipt at the WTP. The WTP's ~~S~~secondary waste will also be sampled and analyzed if process knowledge is insufficient to properly designate the secondary waste. ~~Figure B2-1 presents a simplified flow diagram showing the locations where samples will be collected for analytical testing to support regulatory decisions.~~Analysis of samples for regulatory compliance purposes will be performed by a qualified outsourced analytical laboratory subject to the provisions of this QAPP.

3B.3 ~~CONSTITUENTS~~ CHARACTERIZATION OF ~~CONCERN~~THE WASTE FEED

~~The *River Protection Project –*~~Appendix 3A, *Waste Treatment and Immobilization Plant Waste Analysis Plan* (~~WAP) (Appendix 3A)~~24590-WTP-RPT-ENV-01-003, herein referred to as "WAP"), identifies the sampling locations and associated constituents ~~of concern for verification of the waste feed and~~ for characterization of the waste feed.

~~3B.3.1 Waste Acceptance Criteria~~

~~Verification analysis determines whether the waste feed can be accepted into the WTP for processing. The verification w~~Waste acceptance criteria for regulatory characterization are to be met prior to waste processing by the WTP. The waste characterization parameters are as follows:

- Total organic carbon
- Polychlorinated biphenyls (PCB~~s~~)
- pH
- Compatibility
- Selected metals
- Selected organic compounds
- Selected anions
- Ammonia
- Cyanide

The waste acceptance criteria for regulatory characterization of the waste feed ~~verification is~~are described in ~~the~~ 24590-WTP-RPT-MGT-04-001, Rev 0, *Regulatory Data Quality Objectives Optimization Report* ~~(~~[1] (herein referred to as "RDQO Optimization~~) (24590-WTP-RPT-MGT-04-001)~~ Report"). This report describes the constituents of regulatory concern and analytical methods appropriate for the characterization of the waste feed. The RDQO Optimization Report is designed to address the regulatory needs of the WTP and will be re-evaluated as a result of the environmental risk assessment, which is currently under development. The environmental risk assessment is scheduled for completion prior to the commencement of cold operation of the WTP. The RDQO Optimization Report's process is subject to periodic evaluation and may affect the list of analytes, selection of analytical methods, and associated QA/QC requirements.

~~3B.4.0 Characterization of the Waste Feed~~

~~The Regulatory DQO (Wiemers and others, 1998) process will determine the constituents of concern and analytical methods appropriate for the characterization of the waste feed. The Regulatory DQO (Wiemers and others, 1998) process is progressing according to the *Regulatory DQO Test Plan for Determining*~~

[1] The RDQO Optimization Report, Section 9.6, Quality Assurance, specifies compliance with ASME NQA-1-1989; however, the QAM updates this requirement and requires compliance with ASME NQA-1-2000, *Quality Assurance Requirements for Nuclear Facility Applications.*

Method Detection Limits, Estimated Quantitation Limits, and Quality Assurance Criteria for Specified Analytes (Patello and others, 2001) and is projected to be completed prior to commissioning of the WTP. The DQO process is an ongoing activity and may periodically change the constituents of concern and the selection of analytical methods.

3B.63B.4 PROJECT MANAGEMENT

This section of the QAPjP addresses the following requirements:

- Project organization and responsibility
- Special training requirements
- Documentation and records
- Standard operating procedures

3B.6.13B.4.1 Project Organization and Responsibility

An example of the WTP management structure supporting sampling and analysis activities is depicted in Figure 3B-1. These organizational structures and functions may change over the life of the facility. Project.

The WTP QA Manager of Functions and QA (or designee) reports directly to the WTP Project ManagerDirector. The WTP Manager of Functions and QA Manager will provide independent QA oversight to ensure that onsite and subcontracted sampling and analytical laboratory activities are performed in accordance with this QAPjP.

The facility managers (or designees) for pretreatment, balance of facility,the PT Facility, Effluent Management Facility (EMF), HLW vitrificationFacility, and LAW vitrificationFacility, supported by the Lab TechnicalAnalytical Laboratory Manager, will coordinate the execution of sampling and analysis activities in their respective facilities and ensure compliance with this QAPjP.

The shift facility operations managers (or designees) for pretreatment, balance of facility, the PT Facility, EMF, HLW vitrificationFacility, and LAW vitrification Facility will be responsible for the activities associated with sampling in their respective facilities.

The WTP Analytical Laboratory Lab Technical Manager (or designee) will coordinate with the Tank Operations Contractor to arrange for any required collection of tank waste samples, their packaging, and shipment to the analytical facility, including ensuring the requirements of this QAPP, as they apply, are implemented by the Tank Operations Contractor. The WTP Lab Technical Manager (or designee) will ensure that analysis is conducted in accordance with this QAPjP. This manager will oversee the WTP onsite laboratory, will be responsible for the coordination and technical oversight of any subcontracted analytical laboratory laboratories, and will conduct periodic assessments to verify that onsite laboratory activities are being performed in accordance with this QAPjP.

Subcontracted analytical laboratory managers will be responsible for ensuring that this QAPjP is implemented in their respective laboratories.

3B.6.2 Special Training Requirements

Individuals involved in sampling, analysis, or data review will be trained and qualified to safely implement the activities addressed in the WAP and this QAPjP. Training will conform to the training requirements specified in the *Washington Administrative Code, Personnel Training* (WAC 173-303-330), the QA Manual, and the *River Protection Project – Waste Treatment Plant Dangerous Waste Training Plan* (Chapter 8.0).

Only individuals familiar with and trained in the requirements for waste acceptance criteria will approve waste shipments into the WTP. Evaluations will be performed by process engineers or chemists who are qualified to evaluate the waste for compatibility and acceptability for processing.

~~Training records will be maintained in accordance with Section 4.3 of this document.~~

~~3B.6.6~~3B.4.2 Documentation and Records

This section presents the requirements associated with the development, management, and distribution of waste characterization data and documents.

3B.4.~~3~~2.1 ~~Document~~Documentation and Records Procedures

Documents and records developed as part of the waste analysis program will be generated, reviewed, approved, distributed, used, controlled, and revised in accordance with approved procedures. These procedures will comply with applicable requirements of the ~~QA Manual~~QAM.

Organizations that generate or use data in an electronic format are responsible for complying with applicable software quality requirements specified in the ~~QA Manual~~QAM to ensure that data input (and changes to data input) is complete and accurate, and that security and integrity of the data is maintained.

3B.4.~~3~~2.2 Document and Records Storage

Documents and records will be stored and maintained according to approved procedures consistent with applicable requirements of the ~~QA Manual~~QAM. These documents and records will include, but will not be limited to, the following:

- Training ~~(see Section 4.2).~~
- Data report packages
  - Chain-of-custody forms
  - Sampling methods
  - Sampling conditions
  - Sample descriptions
  - Sample management records
  - Analytical methods
  - Data summary reports
  - QA~~ and ~~/QC reports
- Assessment reports (including non-conformance and deficiency reports)
- ~~Instrument~~Analytical instrument inspection, maintenance, and calibration logs
- Records and results of waste analysis, specifically the following:
  - Waste profiles
  - ~~Waste verification.~~
  - ~~Waste confirmation.~~
  - ~~LDR~~Land Disposal Restrictions evaluation
  - ~~Waste~~Notification of waste acceptance~~Waste non-conformance.~~
  - Notification of waste nonconformance
  - Corrective actions
  - ~~DST w~~Waste feed characterization
  - Secondary waste characterization

~~3B.6.7~~3B.4.3 Standard Operating Procedures

Standard operating procedures for waste sampling and analysis will be developed after the system design has been completed and before waste is received for processing. Standard operating procedures will be developed, implemented, and controlled in accordance with applicable requirements of the ~~QA Manual~~QAM.

~~3B.7~~3B.5 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

~~3B.7.1~~3B.5.1 Data Quality Objectives

The data quality objectives for the WTP and for the characterization of the Hanford tank waste are addressed in the following subsections.

3B.5.1.1 Data Quality Objectives for the WTP

~~A DQO process [such as the seven-step procedure provided in *Guidance for the Data Quality Objectives Process* (EPA 1994)] may be implemented to support the decision-making process, particularly when complex decisions need to be made using analytical data. Using the DQO~~Using the data quality objectives process ensures that the data collected are of adequate quality and quantity to support the decision-making process. The seven steps of this process are identified in Table 3B-1, along with a summary of the key activities that are performed under each step.

3B.5.1.2 ~~RDQO~~Regulatory Data Quality Objectives Optimization for Hanford Tank Waste Characterization

Characterization of the Hanford waste feed will be performed in conformance with the process in the RDQO Optimization Report (24590-WTP-RPT-MGT-04-001) ~~process~~. This process establishes sample preparation and analytical methods suitable for determining the concentration of selected constituents of concern at method detection limits (MDL) sufficient for regulatory requirements. The RDQO Optimization Report's process is an ongoing activity and may affect the set of analytes and analytical methods, and associated QA/QC requirements.

~~3B.7.2~~3B.5.2 Data Quality Indicators

This section discusses the following data quality indicators:

- Analytical measurement accuracy
- Analytical precision
- Representativeness

~~3B.7.2.1~~3B.5.2.1 Analytical Measurement Accuracy

Accuracy can be estimated by calculating the percentage recovery of laboratory matrix spike samples using the following equation, described in *Preparation Aids for the Development of Category II Quality Assurance Project Plans* (EPA 1991):

$$\%R = \left(\frac{s - u}{C_{sa}}\right)100$$

Where

%R	= percentage recovery
s	= measured concentration in spiked laboratory aliquot
u	= measured concentration in un-spiked laboratory aliquot
C_{sa}	= actual concentration of spike added

Accuracy can also be estimated by calculating percentage recovery for the use of standard reference materials or surrogates using the following equation, as outlined in *Preparation Aids for the Development of Category II Quality Assurance Project Plans* (EPA 1991):

$$\%R = \left(\frac{C_m}{C_{srm}}\right)100$$

Where

C_m	= measured concentration of standard reference material or surrogate
C_{srm}	= actual concentration of standard reference material or surrogate

Table 3B-2 lists the parameters for which accuracy will be estimated.

~~3B.7.2.2~~3B.5.2.2 Analytical Precision

Precision can be estimated by analyzing matrix spikes and matrix spike duplicates. The relative percentage difference (RPD) between the analytical results for the matrix spike samples and the matrix spike duplicate samples will be calculated as outlined in *Preparation Aids for the Development of Category II Quality Assurance Project Plans* (EPA 1991):

$$RPD = \frac{|S_{ms} - S_{msd}|}{\left(\frac{S_{ms} + S_{msd}}{2}\right)} \times 100$$

Where

RPD	= relative percentage difference
S_{ms}	= matrix spike sample
S_{msd}	= matrix spike duplicate sample

Precision can also be estimated by analyzing duplicate samples. ~~The~~The RPD ~~relative percentage difference~~ between the analyte levels measured in these samples will be calculated using the following equation, provided in *Preparation Aids for the Development of Category II Quality Assurance Project Plans* (EPA 1991):

$$RPD = \frac{(C_1 - C_2)}{\left(\frac{C_1 + C_2}{2}\right)} \times 100$$

Where

RPD	= relative percentage difference
C_1	= larger of the two observed values
C_2	= smaller of the two observed values

Table 3B-2 lists the parameters for which precision will be estimated.

~~3B.7.2.3~~3B.5.2.3 Representativeness

Representativeness is a qualitative QA objective that determines the degree to which a sample or group of samples is indicative of the subject being studied. It takes into account the size and volume of the sample, as well as the times and locations of sampling. The number of samples collected for the characterization of waste feed and secondary waste streams will be evaluated during the development of standard operating procedures to ensure that sampling is representative of the total waste being sampled.

Liquid samples taken within the WTP will be obtained from agitated vessels or piping systems to ensure that the sample taken represents the vessel contents.

~~3B.7.3~~3B.5.3 Method Detection Limits and Estimated Quantitation Limits

~~Method detection limits (~~The MDLs~~)~~ and the estimated quantitation limits (EQL~~s~~) supporting waste characterization analysis have been established in the ~~RQDO~~RDQO Optimization Report (24590-WTP-RPT-MGT-04-001) ~~report~~. For other analyses supporting environmental decision-making, the laboratory will establish the MDLs and EQLs in conformance with SW-846 (EPA ~~1997~~2014) or other guidance.

The MDL is defined as the minimum concentration of a substance that can be measured and reported with 99~~-~~% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix type containing the analyte.

The EQLs are defined as the lowest concentration that can reliably be achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The EQL is generally 5 to 10 times the MDL. For many analytes, the EQL analyte concentration is selected as the lowest non-zero standard in the calibration curve. Sample EQLs are highly matrix-dependent.

~~The MDLs and EQLs will be determined as defined by Chapter 1 of SW-846 (EPA 1997).~~ The MDLs will include sample preparation methods, and will be determined by spiking uncontaminated water and solid (typically sand) with known concentrations.

The EQL is affected by the following:

- Sample matrix
- Sample volume or mass used
- Final concentrate volume or final digestate volume from sample preparation
- Amount introduced into the instrument for quantitation
- Use of dry or wet weight for reporting solids

~~Each EPA method in SW-846 (EPA 1997) lists target EQLs in water, soil, or both matrices. Water EQLs are lower than those in soil or waste. For various waste types, the methods list EQL multipliers relative to water or soil.~~ The SW-846 methods stress that the EQL will differ by matrix and should be evaluated by matrix (EPA 2014).

Certain samples may be reduced in sample size or diluted for waste minimization and to comply with the as low as reasonably achievable ~~(ALARA)~~ philosophy~~.~~, referred to as "ALARA." The SW-846 ~~(EPA 1997a)~~ "method hotline" indicates that sample size is not a method modification unless detection limits are not sufficient for making decisions. Additional guidelines and acceptable minor modifications for radioactive samples have been established and agreed to as documented in the RDQO Optimization Report (24590-WTP-RPT-MGT-04-001), Section 9.8.4

Section 3B.6.3, and Table 3B-2 present the ~~p~~Project-specific analytical performance requirements.

~~3B.7.4~~3B.5.4 Reporting Requirements

Data generated from laboratory analyses will be reported to ~~BNI~~Bechtel National, Inc. or the ~~operations contractor~~ Tank Operations Contractor in an organized format that contains the supporting information required in the data report package for the appropriate level of data ~~verification or validation.~~evaluation and assessment. Refer to Section 3B.8.0 for a discussion of the data report package and to Section 3B.9.0 for a discussion of data ~~verification~~evaluation and ~~validation.~~assessment.

The reported data will identify the concentration units (~~such as~~e.g., milligrams per liter) and appropriate laboratory qualifiers. Data reported as non-detected will be referenced against a stated MDL or instrument detection limit value. Values between the MDL and the EQL will be qualified and documented. If selected reporting limits are used instead of EQLs or detection limits, the reporting limits will be consistent with the specific data reporting requirements presented throughout the WAP. Target minimum reportable quantity (MRQ) ranges have been established in the RDQO Optimization Report. The MDL will be compared to the minimum reportable quantity to ensure data (non-detection results in particular) are meaningful for regulatory purposes.

~~3B.9~~3B.6 DATA ACQUISITION AND MEASUREMENT

The following section addresses the QA requirements for data acquisition and measurement.

~~3B.9.1~~3B.6.1 Sampling Procedures and Management

Subsections 3B.6.1.1 through 3B.6.1.4 provide direction on the types of sampling procedures to be implemented and the types of equipment that may be used to support the sampling, as well as guidance on how to manage and document field activities.

~~3B.9.1.1~~3B.6.1.1 Sampling Procedures and Design

The sampling procedures to be implemented for analyzing waste feed from the DST system unit to support characterization of the waste feed and the characterization of secondary waste streams are described in the following sections. Proposed sampling methods are shown in Table ~~B2-2. For samples taken at the~~3B-4. For each feed staged for transfer to the WTP, a description of the regulatory compliance sampling activities and analytical requirements will be provided in Tank Sampling and Analysis Plans (TSAP). For samples taken at WTP, standard operating procedures for sample collection will be developed after the system design is complete and before waste is received for processing.

~~3B.9.1.2~~3B.6.1.2 Selected Sampling Equipment

Equipment selected to support waste sampling activities will meet the requirements of the specific SW-846 method (EPA ~~1997~~2014) or other applicable performance based analytical methods. If modifications of the procedure are needed, they will be requested in accordance with WAC 173-303-110~~.~~, *Dangerous Waste Regulations – Sampling, Testing Methods, and Analytes*.

When feasible, disposable equipment will be used to collect samples to obviate the need to decontaminate equipment after use. The process for decontamination of sampling equipment, when necessary, is presented in Section 3B.6.1.3.3.

~~3B.9.1.3~~3B.6.1.3 Sample Handling and Shipping

Personnel involved in sampling will be required to ~~have~~ read and ~~understood~~ understand the operating procedures for sampling before implementing sampling activities. The sample preservation, containers, and holding times for each of the types of analyses to be performed are specified in Table 3B-5.

Storage conditions will be evaluated to ensure that the samples remain representative. Samples collected for waste feed characterization will ~~normally~~ be ~~transported~~ collected, packaged, and shipped by the Tank Operations Contractor to ~~the analytical~~a WTP contracted laboratory ~~pneumatically~~. Collection methods, packaging, and shipping instructions will be addressed in the TSAP and will be governed by Tank Operations Contractor procedures consistent with SW-846 (EPA 2014), where applicable, with allowances for sample size reduction to maintain personnel dose rates as low as reasonably achievable.

The specific description of sample collection activities will be included in the TSAPs for each WTP feed compliance sampling event.

The samples will not be chemical or ~~manually~~thermally preserved during transfer or shipment to the (these preservation techniques react with the tank waste). Care will be taken during sampling to avoid the temporary storage of samples in excessively high or low temperatures. The samples shall be shipped on the same day as sampled whenever possible to meet analytical holding time requirements.

A unique identification number generated by the laboratory information management system (LIMS) will be marked on sample containers before collecting the sample. This number will be recorded on the chain-of-custody form. The sample labeling and chain-of-custody documentation will be checked to ensure the traceability of each of the samples.

~~3B.9.1.3.1~~3B.6.1.3.1 Chain-of-Custody

The ability to demonstrate that samples were obtained from the locations specified in the applicable WAP and that they reached the laboratory without alteration are key considerations for data resulting from laboratory analysis. Evidence of collection, shipment, ~~reception~~receipt at the laboratory, and laboratory custody until disposal will be documented using a chain-of-custody form. The chain-of-custody form will, as a minimum, supply the following information:

- Sample identification number
- Sample volume
- Number of sample bottles/type
- Method of sampling
- Sampling date and time
- Sampling location
- Name of the contact person
- Shipping date
- Analyses to be performed
- Preservation method
- Sample characteristics~~,~~ (if any)

A sample will be considered to be in custody when it is under any of the following conditions:

- In a person's possession.
- In view, after having been in a person's physical possession.
- Locked so that it cannot be tampered with, after having been in a person's physical custody.
- Sealed with tamper-proof seal.
- In a secured area, restricted to authorized personnel only.

Chain-of-custody forms will be included in the final data report package. Electronic chain-of-custody forms and electronic signatures may be used.

The chain-of-custody practices and procedures for the WTP will address the following general requirements for custody records:

- Sample management planning and procedures will identify responsibilities, including interfaces between organizations for documenting possession of a sample from collection and identification through handling, preservation, shipment, transfer, analysis, storage, and final disposition.
- Sample traceability will ensure that it can be tracked from its collection through final disposition.

- Sample identification will be documented and checked before the sample is released.
- If individual samples have specific custody requirements, as required by documents such as the WAP, TSAP, test plans, study plans or job packages, these requirements will be implemented.
- For samples with limited use or storage life, methods will be established that preclude using an out-of-date sample.

Implementing documents will identify those representative samples that need to be archived.

~~3B.9.1.3.2~~3B.6.1.3.2 Sample Preservation, Containers, and Holding Time

Table 3B-5 lists the sample container, preservation method, and holding time requirements for different types of analyses.

~~3B.9.1.3.3~~3B.6.1.3.3 Maintaining and Decontaminating Field Equipment

Field equipment used to support waste monitoring and sampling activities will be maintained in accordance with manufacturer guidelines, and will be decontaminated prior to use. Disposable sampling equipment will be used whenever possible due to the high concentrations of radionuclides in the waste materials to be sampled.

Equipment decontamination will be performed according to approved procedures and consistent with guidance provided in the following references or by the manufacturer:

- SW-846, *Test Methods for Evaluating Solid Waste~~—~~: Physical/Chemical Methods*~~, SW-846~~ (EPA ~~1997~~2014)
- *A Compendium of Superfund Field Operations Methods* (EPA 1987)

~~3B.9.1.4~~3B.6.1.4 Sampling Quality Assurance and Quality Control Procedures

The WTP sampling procedures for characterization of waste feed and secondary waste streams ~~shall~~ will be developed in accordance with the requirements of this QAP~~j~~P. The QA audits and surveillances of sampling activities will be conducted by the WTP ~~QA~~ Manager of Functions and QA (or designee) to verify the implementation of QAP~~j~~P requirements. Management assessments will also be performed by the WTP ~~Analytical Laboratory~~Lab Technical Manager (or designee) to ensure that the waste sampling program is adequate and effective. Revisions to established sampling procedures will be reviewed to determine their possible impacts on data quality and approved by authorized personnel prior to issuance and implementation. Field records and documentation, including field measurements, will be handled and preserved in a manner consistent with Section 3B.4.~~3~~2 of this QAP~~j~~P. ~~Quality assurance~~The QA surveillances and audits, management assessments, corrective actions, and root cause analyses will be implemented as described in Section 3B.7.~~1~~0 of this QAP~~j~~P.

Sampling ~~quality control (~~QC~~)~~ procedures may involve the collection of blanks and duplicate samples. The purpose and frequency of collection for each of these samples are presented in Table 3B-7~~Table B2-4,~~ together with sampling QC objectives.

~~3B.9.2~~3B.6.2 Instrument and Equipment Calibration, Testing, Inspection, and Maintenance

The following sections address instrument calibration, testing, inspection, and maintenance requirements for waste ~~anaylsis.~~analysis.

~~3B.9.2.1~~3B.6.2.1 Instrument Calibration Frequency

~~Laboratory~~Analytical laboratory personnel will be responsible to ensure that instruments are calibrated in accordance with approved procedures. Instrument calibration will comply with applicable QA/QC requirements of the applicable analytical method. Instrument calibration records will be managed in accordance with Section 3B.4.~~3~~2 of ~~the~~ this QAP~~j~~P.

~~3B.9.2.2~~3B.6.2.2 Instrument and Equipment Testing, Inspection, and Preventive Maintenance Requirements

~~The Laboratory Manager~~The analytical laboratory management (or designee) will ensure that laboratory instruments are routinely tested and inspected to confirm that they are in proper working order. Preventive maintenance schedules recommended by the equipment manufacturer will be implemented and documented. Instrument maintenance records will be managed in accordance with Section 3B.4.2 of this QAPP.

~~3B.9.3~~3B.6.3 Sample Preparation Methods, Analytical Methods, and Analytical Performance Requirements

The sample preparation methods, analytical methods, and performance requirements (~~such as~~e.g., EQL, precision, and accuracy) for analyses are summarized in Table 3B-3 and Table 3B-2, and are consistent with the requirements specified in SW-846 (EPA ~~1997) or as negotiated~~ 2014) and in conformance with the regulatory data quality objectives identified in the RDQO Optimization Report (24590-WTP-RPT-MGT-04-~~004, Rev 0~~001). Any applicable analytical method provided in WAC 173-303-110 may be used for analysis. If an analytical method used for regulatory purposes other than the methods provided in WAC 173-303-110 are proposed, approval of the method will be requested from Ecology according to WAC 173-303-910(2). The proposed analytical method will not be used for regulatory purposes until Ecology authorizes the method. If modifications to a procedure are needed, they will be requested in accordance with WAC 173-303-110(4). The SW-846 ~~(EPA 1997a)~~ "method hotline" indicates that sample size is not a method modification unless detection limits are not sufficient for making decisions.

~~3B.9.4~~3B.6.4 Analytical Laboratory Information Management

The ~~laboratory information management system (~~LIMS~~)~~ is part of the ~~p~~Plant ~~i~~Information ~~n~~Network (PIN) system. Sample and QC data generated by the analytical laboratory will be stored in the LIMS database. At a minimum, this database will hold the sample number, sample collection date, analysis date, analytical methods employed, analytical results, and ~~validation~~ qualifiers. In the event of a LIMS system failure, this information will be recorded in paper form and entered into LIMS ~~once~~ when the system is operating. For a more complete description of these software systems, refer to Section 3A.7.0 of the WAP.

~~3B.9.5~~3B.6.5 Analytical Laboratory Quality Control

~~Laboratory~~The analytical laboratory QC procedures will involve the analysis of duplicates, method blanks, and matrix spike samples. The purpose and frequency for each of these samples ~~is~~ are presented in Table 3B-7.

~~3B.10~~3B.7 PERFORMANCE ASSESSMENTS, CORRECTIVE ACTIONS, AND EVALUATIONS

The following subsections address assessment and oversight requirements.

~~3B.10.1~~3B.7.1 Routine Analytical Laboratory Assessment and Corrective Actions

The WTP Lab Technical Manager (or designee) will conduct periodic assessments to verify that laboratory procedures meet the requirements of this QAP~~j~~P. The QA surveillances and audits will be conducted by the WTP ~~QA~~ Manager of Functions and QA (or designee) to ensure that laboratory activities comply with applicable QA requirements. Management assessments will also be performed by the WTP ~~Analytical Laboratory~~Lab Technical Manager (or designee) to ensure that the laboratory program is adequate and effective.

Management assessments, QA surveillances and audits, corrective action, and root cause analyses will be conducted according to approved procedures.

~~3B.10.2~~3B.7.2 Data Reduction and ~~Validation~~Review

Data reduction and ~~validation~~ review procedures will be developed for data generated for environmental compliance according to the requirements of the current version of SW-846 (EPA ~~1997~~2014) or other applicable guidance, prior to the operation of the analytical laboratory. ~~Validation~~ Evaluation and ~~verification~~assessment of analytical data is discussed in Section 3B.9.0.

~~3B.10.3~~3B.7.3 Reports to Management

Conditions identified as having an adverse effect on quality, the significance of such conditions, and corrective actions will be documented, reported to the appropriate level of management, and resolved according to approved procedures.

The assessment reports may include the following items, as appropriate:

- Deviations from the requirements specified in this QAP~~j~~P.
- Limitations or constraints on the applicability of the resulting analytical data.
- Results of QA surveillances and audits of the waste analysis program.
- Management assessments of data quality in terms of MDLs, precision, accuracy, and representativeness. The quantitative performance indicators for precision and accuracy are given in ~~Table B2-5~~Table 3B-2.

~~3B.11~~3B.8 DATA REPORT PACKAGES

The data reports received from the laboratory will serve as documentation of an analytical project. The primary data reporting will be by electronic systems. The following are examples of the information contained in data reports documenting environmental support activities:

- Sample identifications
- Holding times, including the following:
  - Sampling date
  - Date the laboratory received the sample
  - Extraction or preparation date
  - Analysis date
  - Re-extraction or re-analysis dates
- Analytical parameters
- QC, including the following:
  - Laboratory control sample (LCS) / standard including percent recovery
  - Preparation blanks, including identity and concentration of each constituent identified
  - Sample, duplicate (including RPD) and replicate results
  - Recovery results of matrix spikes, matrix spike duplicates, or post digestion spikes (if matrix spike not performed)
  - Detection limits
  - Report uncertainty/counting error for radiochemical analysis
  - Additional data reporting (that is, the percent of moisture/solid or correction for equivalent dry weight)
- QA, including the following:
  - Descriptions of procedures and methods used to generate the results
  - Deviations from procedures

- o Analytical anomalies for raw data results, spikes, surrogates, and method blanks
- o Analytical qualifiers
- o Calibration and instrument tuning
- o Corrective actions implemented

- Raw analytical data~~, as appropriate~~
- Chain-of-custody~~, as appropriate~~

~~3B.12~~3B.9 VERIFICATION AND ~~VALIDATION~~ASSESSMENT OF ANALYTICAL DATA

~~The~~A graded approach to data verification and ~~validation~~assessment processes will ensure that the data resulting from the selected analytical method are consistent with the requirements specified in this ~~QAPjP. Persons performing data verification or~~ QAPP. Data validation will be ~~trained according to Section 4.2~~performed when necessary.

~~3B.12.1~~3B.9.1 Data Verification

The primary data reporting will be ~~by~~ via electronic data systems. Data verification will be performed on laboratory data packages that support environmental compliance to ensure that their content is complete and in order. ~~A page by page~~A review of the data package will be performed to ensure ~~that~~the following:

- The data package contains the required technical information.
- Deficiencies are identified and documented.
- Identified deficiencies are corrected by the laboratory and the appropriate revisions are made.
- Deficient pages are replaced with the laboratory corrections.
- Data package revisions are tracked.
- A copy of the completed verification report is placed in the data file.

~~3B.12.2~~3B.9.2 Data ~~Validation~~Evaluation and Assessment

Data ~~validation ensures~~will be evaluated to ensure that the data resulting from analytical measurements meet the quality requirements specified in ~~this QAPjP. Data validation~~ the applicable data quality objectives. A data review will be performed on data packages that support environmental compliance~~.~~ to ensure the following parameters are met:

- Precision
- Accuracy
- Representativeness
- Comparability
- Completeness
- Sensitivity (detection limits)

A ~~validation~~ plan for assessing the data will be developed and implemented prior to the operation of the laboratory~~, according to guidance found in SW-846, Chapter 4 (EPA 1997), or other appropriate guidance~~.

~~3B.13 DATA QUALITY ASSESSMENT~~

Data obtained will be evaluated to determine whether they are of the appropriate type, quality, and quantity to support their intended use. Such data quality assessment will be performed, in accordance with *Guidance for Data Quality Assessment* (EPA 1996), on data packages ~~used to ensure environmental compliance~~ as necessary to determine acceptability and process ability of the waste, for assessment of secondary waste characteristics, to ensure environmental compliance in accordance with applicable data quality objectives.

~~3B.14~~3B.10 REFERENCES

~~3B.14.1~~3B.10.1 Project Documents

~~24590-WTP-PL-ENV-01-002, *River Protection Project – Waste Treatment Plant Dangerous Waste Training Plan.*~~

24590-WTP-QAM-QA-~~01~~06-001, *Quality Assurance Manual~~.~~ (QAM).*

~~24590-WTP-RPT-ENV-01-003, *River Protection Project – Waste Treatment Plant Waste Analysis Plan.*~~

24590-WTP-RPT-MGT-04-001, Rev. 0, *Regulatory Data Quality Objectives Optimization Report* (RDQO Optimization Report).

~~3B.14.2~~3B.10.2 Codes and Standards

~~ASTM. 2001. *Standard Test*~~ASME NQA-1-2000. *Quality Assurance Requirements for Nuclear Facility Applications*. The American Society of Mechanical Engineers, New York, NY.

WAC 173-303-110. *Dangerous Waste Regulations – Sampling, Testing Methods, and Analytes.* Washington Administrative Code

WAC 173-303-910. *Dangerous Waste Regulations – Petitions*. Washington Administrative Code.

3B.10.3 Other Documents

ASTM D5058-12. 2012. *Standard Practices for Compatibility of Screening Analysis of Waste*~~, Method D5058-90~~. American Society for Testing and Materials, West Conshohocken, ~~Pennsylvania~~PA.

ASTM D3987-85. 2004. *Standard Test Method for Shake Extraction of Solid Waste with Water.* American Society for Testing and Materials, West Conshohocken, PA.

EPA. ~~1987.~~1974. *Nitrogen, Ammonia (Potentiometric, Ion Selective Electrode)*, Method 350.3. US Environmental Protection Agency, Washington, DC.

EPA. Method 350.3. *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87/001b~~.~~, August 1987. US Environmental Protection Agency, Washington, ~~D.C~~DC.

EPA.~~-~~ 1991. *Preparation Aids for the Development of Category II Quality Assurance Project Plans*, EPA/600/8-91/004. US Environmental Protection Agency, Washington, ~~D.C~~DC.

EPA. ~~1994.~~ 1993. *Determination of Inorganic Anions by Ion Chromatography*, Method 300.0. US Environmental Protection Agency, Office of Research and Development, Cincinnati, OH.

EPA. 2002. *Guidance for Quality Assurance Project Plans*, EPA QA/G-5, EPA/240/R-02/009. US Environmental Protection Agency, Office of Environmental Information, Washington, DC.

EPA. 2006. *Guidance for the Data Quality Objectives Process*, EPA QA/G-4, ~~September 1994.~~EPA/240/B-06/001. US Environmental Protection Agency, Office of Environmental Information, Washington, ~~D.C~~DC.

~~EPA. 1996. *Guidance for Data Quality Assessment*, EPA QA/G-9. US Environmental Protection Agency, Washington, D.C.~~

~~EPA. 1997.~~EPA. 2014. *Test Methods for Evaluating Solid Waste~~,~~: Physical~~-~~/Chemical Methods*, SW-846, ~~Third Edition~~ Update V, as amended. US Environmental Protection Agency, Washington, ~~D.C.~~DC. https://www.epa.gov/hw-sw846/sw-846-compendium (accessed May 2, 2016).

~~EPA. 1998. *EPA Guidance for Quality Assurance Project Plans*, EPA QA/G-5, February 1998. US Environmental Protection Agency, Washington, D.C.~~

~~WAC 173-303. *Dangerous Waste Regulations*, Washington Administrative Code.~~

Table B23B-1 Data Quality Objective 7-Step Process [a]

	Key Activities
Step 1: State the problem	• Identify the constituents of concern • Develop a conceptual site model • Formulate a concise problem statement
Step 2: Identify the decisions	• Identify the principleprincipal study questions that the study will attempt to resolve • Identify the alternative actions that may result once each of the principal study questions has been resolved • Integrate the principal study questions and alternative actions to form decision statements
Step 3: Identify required inputs	• Identify the information needed to resolve each decision statement • Define the source and level of quality for the information needed • Determine whether data of adequate quality already exist
Step 4: Define study boundaries	• Define the population of interest and the geographic area or volume to which each decision statement applies • Divide the population into statistically-based strata with relatively homogeneous characteristics • Define the temporal boundaries of the problem • Define the time frame to which each decision applies • Determine when to collect the data
Step 5: Develop a decision rule	• Define the statistical parameters (such ase.g., mean, upper confidence limit-) • Determine the final action • Develop "if… then…" statements that incorporate the parameter of interest, scale of decision-making, action level, and actions that would result from the decision
Step 6: Specify tolerable limits on decision errors	• Define the expected concentration range for the analyte of interest • Identify the decision error • Define the null hypothesis • Select a statistical vs. non-statistical sampling design • For statistical designs, define the boundaries of the gray region and set tolerable limits for decision error

Step 7: Optimize the design	Non-statistical design • Summarize applicable screening method alternatives • Summarize applicable sampling method alternatives • Develop an integrated screening or sampling design Statistical design • Identify statistical sampling design alternatives (such ase.g., simple random, stratified random) and select the preferred option • Select the statistical hypothesis test for testing the null hypothesis • Evaluate various design options by varying the decision error criteria and width of the gray region • Select the preferred sampling design
[a] *Guidance for the Data Quality Objectives Process* (EPA 19942006)	

Table 3B-2 Quality Control Parameters for SW-846 Test Methods

Analytes	**Method**	**QC Acceptance Criteria**			
		LCS % Recovery	**Spike % Recovery**	**MSD / Dup Relative Percent Difference**	**Replicate % Relative Standard Deviation**
Metals	6010D	80-120%	75-125%	≤ 20%	≤ 20%
Hg	7470A or 7471B	80-120%	75-125%	≤ 20%	≤ 20%
pH	9040C	±0.1 pH unit	NA	NA	NA
Volatile organic compounds	8260B	70-130%	50-150%	≤ 30%	≤ 30%
Semivolatile organic compounds	8270D	70-130%	50-150%	≤ 30%	≤ 30%
PCBs	8082	70-130%	50-150%	≤ 30%	≤ 30%
Inorganic anions	9056A	80-120%	75-125%	< 20%	< 20%
Cyanide	Method 9010C / 9014 or 9012B	80-120%	75-125%	< 20%	< 20%
Ammonia	SM 4500-NH_3 F (APHA 1992) or Method 350.3 (EPA 1989)	80-120%	75-125%	< 20%	< 20%
Pesticides	8081B	70-130%	50-150%	≤ 30%	≤ 30%

Table 3B-3 Analytical Method Requirements for Tank Waste Acceptance Samples

Constituent	Target EQL	Analytical Method [a]	
		Solid	Liquid
Total organic carbon	10 mg/L	Method 9060A	Method 9060A or Method 415.2 (EPA 1997)
PCBs	3.3 mg/L	8082A	8082A
pH	2 to 12.5 pH units	9040C	9040C
Compatibility	± 1 °C	Not Applicable	ASTM D5058-12
Metals, except mercury	See RDQO Optimization Report, Section 9.8.3	6010D	6010D
Mercury	See RDQO Optimization Report, Section 9.8.3	7471B	7470A
Volatile organic compounds	See RDQO Optimization Report, Section 9.8.3	8260B	8260B
Semivolatile organic compounds	See RDQO Optimization Report, Section 9.8.3	8270D	8270D
Inorganic anions	See RDQO Optimization Report, Section 9.8.3	Method 300.0 (EPA 1993) / 9056A or ASTM D3987-85 / 9056A	9056A
Cyanide	See RDQO Optimization Report, Section 9.8.3	9010C/9014 or 9012B	9010C/9014 or 9012B
Ammonia	See RDQO Optimization Report, Section 9.8.3	Not Applicable	SM 4500-NH_3-F (APHA 1992) or Method 350.3 (EPA 1974)
Pesticides	See RDQO Optimization Report, Section 9.8.3	8081B	8081B

[a] SW-846 Method (EPA 2014), unless specified otherwise.

Table 3B~~2~~-~~2~~4 Proposed Sample~~ing~~ Collection Methods

Waste Category	Waste Type	Sample Purpose	Type of Sample
DST system unit waste feed	Staged tank waste	Waste ~~verification~~[a] acceptance [a]	Representative ~~split~~ grab sample ~~from the Department of Energy~~
	~~As received waste~~	~~Waste acceptance~~[b]	~~Grab~~
Solid	**Mixed Waste Streams**		
	ILAW/IHLW product verification	ILAW/IHLW characterization	Grab

Waste Category	Waste Type	Sample Purpose	Type of Sample
	Entrained solids	Secondary waste characterization	Grab
	Spent ion exchange resin	Secondary waste characterization	Grab
	~~Off-gas~~Offgas treatment system equipment and components	Secondary waste characterization	Grab or smear
	Spent carbon and catalyst from off-gas treatment	Secondary waste characterization	Grab
	Out-of-service equipment	Secondary waste characterization	Grab or smear
	Dangerous or Mixed Waste Streams		
	Lab~~oratory~~ waste	Secondary waste characterization	Grab
	Maintenance waste	Secondary waste characterization	Grab
	Used personal protective equipment	Secondary waste characterization	Grab
Liquid	**Mixed Waste Streams**		
	Waste feed evaporator ~~condensate[c]~~condensate [b]	Secondary waste characterization	Grab
	LAW melter feed evaporator ~~condensate[c]~~condensate [b]	Secondary waste characterization	Grab
	LAW and HLW ~~off-gas condensate[c]~~offgas condensate [b]	Secondary waste characterization	Grab
	LAW and HLW melter off-gas scrubber ~~blowdown[c]~~blowdown [b]	Secondary waste characterization	Grab
	Cesium process ~~condensate[c]~~condensate [b]	Secondary waste characterization	Grab
	Cesium ion exchange rinse ~~water[c]~~water [b]	Secondary waste characterization	Grab
	Plant wastewater containing DST ~~waste[c]~~waste [b]	Secondary waste characterization	Grab
	Dangerous or Mixed Waste Streams		
	Maintenance waste	Secondary waste characterization	Grab
	Off-specification chemicals	Secondary waste characterization	Grab
Effluent	EMF effluent	Verification that effluents meet the disposal facility waste acceptance criteria	Grab or in-line

Waste Category	Waste Type	Sample Purpose	Type of Sample
	Nonradioactive liquid waste disposal system effluent	Verification that effluents meet the Treated Effluent Disposal Facility system unit waste acceptance criteria	Grab

[a] ~~Subject~~[a] Subject to requirements of the RDQO Optimization Report (24590-WTP-RPT-MGT-04-001).

[b] ~~Refer to table B2-2.~~

[c] ~~These~~[b] These aqueous waste streams are collected in the effluent mixing tank prior to sampling.

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Table 3B-4 Sample Preservatives, Containers, and Holding Times for Tank Waste Acceptance Samples

Analysis	Container [a]	Preservative [b]	Holding Time
Liquid Samples			
Total organic carbon	Plastic	None	28 days
PCB compounds	Glass with Teflon-lined screw cap	None	14 days (extraction) 40 days (analysis)
pH	Plastic	None	Analyze as soon as possible
Compatibility	Plastic	None	Analyze as soon as possible
Inorganic anions	Plastic	None	7 days
Ammonia	Glass with Teflon-lined screw cap	None	28 days
Metals, except mercury	Plastic	None	6 months
Mercury	Plastic	None	28 days
Cyanide	Glass with Teflon-lined screw cap	None	14 days
Volatile organic compounds	Glass with Teflon-lined screw cap	None	14 days
Semivolatile organic compounds	Amber glass	None	14 days (extraction) 40 days (analysis)
Organic acids	Glass with Teflon-lined screw cap	None	14 days
Pesticides	Glass with Teflon-lined screw cap	None	14 days (extraction) 40 days (analysis)
Solid Samples			

Table 3B-4 Sample Preservatives, Containers, and Holding Times for Tank Waste Acceptance Samples

Analysis	Container [a]	Preservative [b]	Holding Time
Total organic carbon	Plastic	None	28 days
PCB compounds	Glass with Teflon-lined screw cap	None	14 days (extraction) 40 days (analysis)
pH	Plastic	None	Analyze as soon as possible
Compatibility	Plastic	None	Analyze as soon as possible
Inorganic anions	Plastic	None	7 days
Metals, except mercury	Glass	None	6 months
Mercury	Glass	None	28 days
Cyanide	Glass with Teflon-lined screw cap	None	14 days
Volatile organic compounds	Glass with Teflon-lined screw cap	None	14 days
Semivolatile organic compounds	Glass	None	14 day (extraction) 40 days (analysis)
Organic acids	Glass with Teflon-lined screw cap	None	14 days
Inorganic anions	Plastic	None	28 days
Pesticides	Glass with Teflon-lined screw cap	None	14 days (extraction) 40 days (analysis)

Notes: [a] Collection of samples is in accordance with ALARA requirements for contamination control and to minimize sampler exposure. The RDQO Optimization Report (24590-WTP-RPT-MGT-04-001) specified a minimum 350 g of sludge solids (if present in the tank) and 500 mL of liquid to complete the regulatory compliance testing for each WTP feed tank, however, it is anticipated that 300 mL slurry containing at least 30 g of solids per HLW sample, and 170 mL of supernatant liquid per sample shall be sufficient. Per the sampling event requirements described in the RDQO Optimization Report, the specific sample volume and number of samples to be collected are to be specified in the TSAP for the corresponding staged feed. The sample material is collected in the field, and then sub-aliquoted (and centrifuged, if necessary) in the laboratory under controlled conditions to further reduce exposures. Per the Performance Based Measurement System approach and safe handling procedures required to limit radiological dose, sample sizes may be reduced from those recommended in the analytical methods identified in Table 3B-3 and Table 3B-2.

[b] Methodologies may be modified per requirements of the RDQO Optimization Report.

Table ~~B2~~ 43B-6 Field Sampling Quality Control

Sample Type	Frequency	Purpose
Water blank	The frequency will be determined and documented in operating procedures before sampling operations are begun. The minimum frequency shall be once per sampling event.	This will be a water sample that receives the same analysis steps as the sample for the specified procedure. The blank will confirm that the water is not contaminated.
Equipment blank		A sample of analyte-free water used to rinse the sampling equipment. It is used to document ~~of~~ adequate decontamination of sampling equipment[a]. Analysis will be for tests performed for the specified procedure.
Duplicate		This QC sample is a second aliquot of the collected sample and is used to determine method precision.
Trip blank	The frequency will be determined and documented in operating procedures before sampling operations are begun. The minimum frequency shall be once per shipping container for samples subject to volatile organic compound analysis.	A sample of analyte-free water that accompanies sample containers to and from the field. These samples are used to detect any contamination or cross-contamination during sample handling and transportation.

[a] Decontamination will be performed if disposable equipment cannot be used.

~~Table B2-5 Analytical Method Requirements for Tank Waste Acceptance Samples~~

~~CAS[a] Number~~	~~Constituent of Concern~~	~~Target EQL[b]~~	~~SW-846 Method (EPA 1997)~~		~~Precision[c]~~	~~Accuracy~~
			~~Solid~~	~~Liquid~~		
~~None~~	~~Total organic carbon (TOC)~~	~~10 mg/L~~	~~9060~~	~~9060~~	~~80-120 %~~	~~80-120 %~~
~~1336-36-3~~	~~Polychlorinated biphenyls (PCBs)~~	~~3.3 mg/L~~	~~3550B/8082~~	~~3510C/8082~~	~~70-130 %~~	~~80-120 %~~
~~None~~	~~pH~~	~~2 to 12.5 pH units~~	~~9040B/ EPA 150.1~~	~~9040B/ EPA 150.1~~	~~± 0.1 pH unit[d]~~	~~± 0.1 pH unit[e]~~
~~None~~	~~Compatibility~~	~~± 1 °C~~	~~NA[f]~~	~~ASTM[g] D 5058-90~~	~~NA[f]~~	~~90-110 %~~

~~Notes:~~
~~[a] Chemical Abstracts Service~~
~~[b] estimated quantitation limit~~
~~[c] Methodologies may be modified per requirements of the RDQO Optimization (24590-WTP-RPT-MGT-04-001).~~
~~[d] results of replicate measurements~~
~~[e] comparison to calibration solution~~
~~[f] not applicable~~
~~[g] American Society for Testing and Materials (ASTM 2001)~~

Table ~~B2-6~~3B-7 Analytical Laboratory Quality Control

Sample Type	Frequency	Purpose
Duplicate	The frequency will be determined and documented in operating procedures before analytical operations are begun. The minimum frequency will be once per sample batch.	This QC sample is a second aliquot of the collected sample and is used to determine method precision.
Method blank		An analyte-free matrix to which reagents are added in the same volumes or proportions as those used in sample processing. It is used to document contamination resulting from the analytical process. This method blank will be carried through the complete sample preparation and analytical procedure.
Matrix spike or matrix spike duplicate		This QC sample is spiked with known quantities of analytes. ~~The QC spike ensures that the analysis is testing for the specified analyte.~~Matrix spikes and matrix spike duplicate quality control samples are used to assess the accuracy and precision of the analytical method.

Table ~~B2-6~~3B-7 Analytical Laboratory Quality Control

Sample Type	Frequency	Purpose
Laboratory Control Sample	The frequency will be determined and documented in operating procedures before analytical operations are begun.	The LCS may be a matrix-matched reference material, or if one is not available, a blank spike that is put through the analytical process. For methods that lack a suitable LCS, or when no sample preparation is required, calibration verification standards (initial calibration verification or continuing calibration verification) or system performance checks may be used to verify analytical accuracy.

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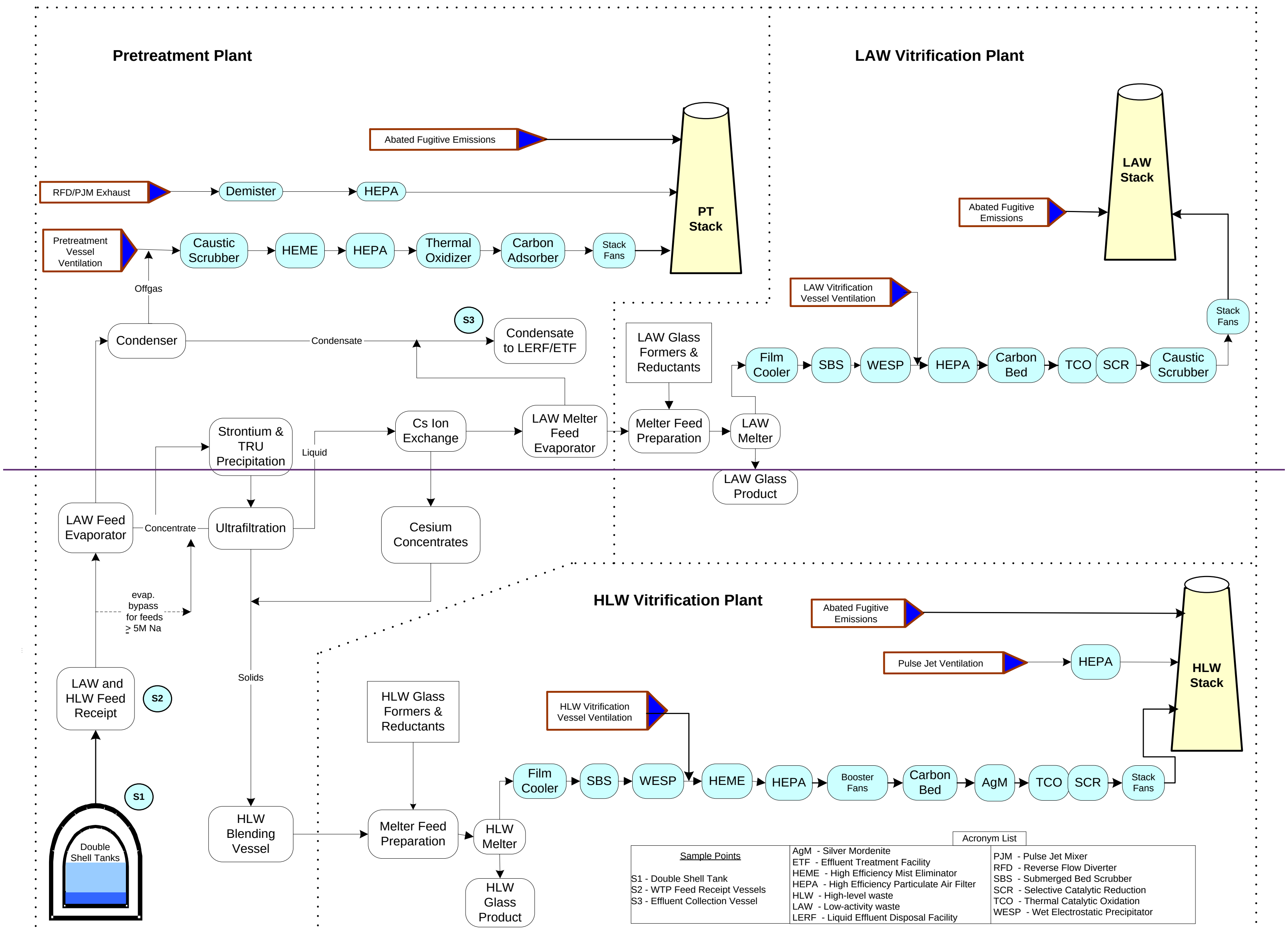

~~Figure 3B2 1 Simplified Flow Diagram and Sample Locations~~

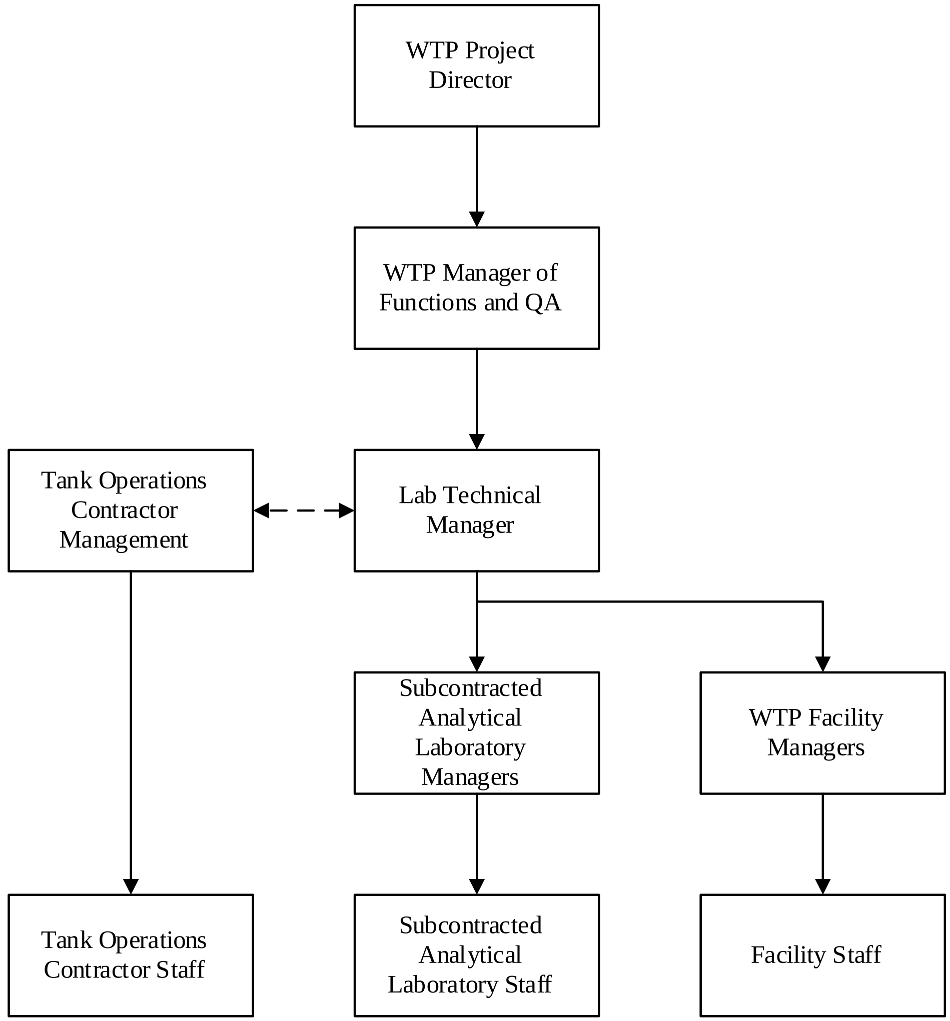

Figure 3BB2-12 WTP Sampling and Analysis Program Organization

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