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# Sampling and Analysis Plan for Single-Shell Tanks Component Closure

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Abstract: This sampling and analysis plan provides regulatory requirements for field sampling, laboratory analysis, and data reporting for residual waste samples taken from single-shell tanks to ensure appropriate data are collected to support closure activities. This plan covers the regulatory requirements for residual waste chemical and radiological characterization and determination of residual waste volume.

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## LIST OF TERMS

| | |
|---|---|
| CAD | computer-aided design |
| CCMS | video camera/computer-aided design modeling system |
| CH2M HILL | CH2M HILL Hanford Group, Inc. |
| CFR | *Code of Federal Regulations* |
| DOE | U.S. Department of Energy |
| DQO | data quality objective |
| Ecology | Washington State Department of Ecology |
| EPA | U.S. Environmental Protection Agency |
| HFFACO | *Hanford Federal Facility Agreement and Consent Order* |
| IC | ion chromatography |
| ICP/AES | inductively coupled plasma/atomic emissions spectroscopy |
| PCB | polychlorinated biphenyl |
| QA | quality assurance |
| QC | quality control |
| RPP | River Protection Project |
| SAP | sampling and analysis plan |
| SST | single-shell tank |
| SVOA | semivolatile organic analysis |
| SVOC | semivolatile organic compound |
| TIC | tentatively identified compound |
| TSAP | tank sampling and analysis plan |
| UCI | upper confidence interval |
| VOA | volatile organic analysis |
| VOC | volatile organic compound |
| WMA | Waste Management Area |

## 1.0 SAMPLING AND ANALYSIS PLAN OBJECTIVES

The primary controlling document for this sampling and analysis plan (SAP) is the *Single-Shell Tank System Closure Plan* (RPP-13774). The closure plan proposes closure actions in accordance with the *Hanford Federal Facility Agreement and Consent Order* (HFFACO) (Ecology et al. 1989), and Washington State's "Dangerous Waste Regulations" (WAC 173-303). These proposed closure actions are a basis for modification of the *Dangerous Waste Portion of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste* (Ecology 2001). The closure plan requires generation of a SAP(s) to support closure-related sampling activities that meet objectives defined using a data quality objective (DQO) process. The Washington State Department of Ecology (Ecology), the U.S. Department of Energy (DOE) and its contractors participated in the DQO process. Results of the DQO process are documented in the *Single-Shell Tank Component Closure Data Quality Objectives* (RPP-23403).

This SAP provides regulatory requirements for field sampling, laboratory analysis, and data reporting for residual waste samples taken to ensure appropriate data are collected to support closure activities conducted at the single-shell tanks (SST). Specifically, the SAP covers the regulatory requirements for residual waste chemical and radiological characterization and determination of residual waste volume. Operational sampling and analysis requirements will be documented in tank sampling and analysis plans (TSAP). The TSAPs will be prepared for individual tanks or tank groups in accordance with approved CH2M HILL Hanford Group, Inc. (CH2M HILL) procedures. The TSAPs will meet requirements in the SAP and will be provided to Ecology for information prior to sample collection.

Where information regarding treatment, management, and disposal of the radioactive source, byproduct material, and/or special nuclear components of mixed waste (as defined by the *Atomic Energy Act of 1954*, as amended) has been incorporated, it is not incorporated for the purpose of regulating radiation hazards of such components under the authority of this SAP or the "Hazardous Waste Management Act" (70.105 RCW), but is only presented for general knowledge in support of project discussion.

## 2.0 FACILITY AND WASTE DESCRIPTION

There are 133 100-series SSTs located in 12 tank farms on the Hanford Site with working capacities ranging from 530,000 to 1 million gal. There are 16 200-series SSTs in four of the 12 tank farms, each with a capacity of 55,000 gal. A description of the SST system is presented in RPP-13774, Section 1.2 "Overview of SST Farms." For purposes of closure planning, the 12 tank farms have been divided into seven Waste Management Areas (WMA). The seven WMAs and associated tanks are described in RPP-13774 and respective WMA Closure Action Plans. Descriptions of the individual tanks will be provided in the TSAPs.

# 3.0 SAMPLING EVENT REQUIREMENTS

## 3.1 WASTE SAMPLE COLLECTION METHODS

This section describes the sampling approach that is currently identified for the collection of solid and liquid waste samples from Hanford Site SSTs. Detailed sample design depends on tank-specific information (i.e., optimum riser location and waste characteristics) and therefore will be included in the TSAPs.

Access to the tank will occur through existing tank risers. Riser configuration and availability is tank specific. The tank-specific risers for a specific sampling event(s) will be identified in the TSAP. For each sample matrix (solids and liquids), three samples will be collected: one sample for one riser and two samples from the other riser (a sample and a duplicate sample). Each sample may consist of multiple grabs to obtain sufficient sample material for the required analyses. A grab is defined as the deployment of the sampling device (one clamshell or one finger trap or one bottle-on-a-string sampler). Two risers may not always be available to collect samples because equipment is in a riser, there is an absence of waste under the riser, etc. In cases where only one riser is available, a minimum of two samples (sample and duplicate) will be obtained. In addition, a minimum of one duplicate analysis is required for one of the samples; therefore, sufficient sample material must be obtained in one of the samples.

### 3.1.1 Sampling Methodology for Solids

Solids samples will be obtained using finger trap samplers or clamshell samplers. The clamshell sampler has a sample body that is pneumatically operated, and sample jaws that are capable of collecting sludge or solid tank waste samples. The finger trap sampler relies on dropping the sampler into the waste to collect the sample. Solids enter the sampler and are trapped within the stainless steel pipe of the sampler by thin, flexible, overlapping steel blades at the open end of the sampler. The samplers were designed per CH2M HILL design matrices using SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA 1986) as a guideline to ensure the materials of construction were compatible with the waste and do not interfere with laboratory analysis of the waste. The *RCRA Waste Sampling Draft Technical Guidance* (EPA 2002) was also utilized in sampler design. Prior to sampling, the samplers shall be cleaned using a procedure that follows SW-846 sampling equipment cleaning protocol.

Currently off-riser sampling is not available but the capability is under development. When off-riser sampling becomes available, the sampling design will be re-evaluated for future tank waste sampling events, and the DQO (RPP-23403) and this SAP updated accordingly. If additional sampling technologies become available for sampling the residual waste, the technology will be evaluated to determine inclusion in the DQO (RPP-23403) and this SAP for application to tanks scheduled to be retrieved following the SAP revision.

The optimal quantity of solid sample to run the required analytical methods required by the DQO is 169 g. This would allow sufficient material to optimize detection limits. However, it does not allow for any loss of sample volume during sample handling and processing.

Additional solid sample volume will be collected from specific tanks identified by the risk assessment group to allow testing to support development and validation of the closure risk assessment model. These samples will undergo testing at the Pacific Northwest National Laboratory to characterize the waste solids and assess the leachability of contaminants. Sample collection and testing for these samples will be governed by an approved test plan. The sample quantity required for the risk assessment testing is 120 g; therefore, the total quantity of solid sample material necessary to meet analytical requirements required by the DQO and to support risk assessment tests is 289 g.

### 3.1.2 Sampling Methodology for Liquid Waste

Liquid samples will be collected using bottle-on-a-string grab samplers by lowering the sampler through the riser into the liquid column in the tank. The size and volume requirements for the sample bottles will be specified in the individual sampling event TSAPs. Two bottles are required per sample to conduct the volatile organic compound (VOC) analyses (primary and duplicate analysis) and another two are required to conduct the semivolatile organic compound (SVOC) analyses (primary and duplicate analysis). If sufficient sample material is not available for the required analyses, the contents from each pair of bottles may be combined after the VOC and SVOC subsamples are taken.

Samples for VOC or SVOC analyses will be taken using glass bottles with Teflon[1]-lined lids. Different lids (i.e., non-Teflon-lined caps) may be used for samples collected for other analyses.

When the modified sluicing retrieval method is used, liquid samples will be collected after completion of the final washing activity and prior to pumping the remaining liquid out of the tank. These samples will be representative of any liquid remaining in the tank (after final pumping) because no additional liquid will be added and the retrieval process will leave the liquid well mixed. In addition, the timing of the sampling activity (before rather then after final pumping) will increase the likelihood of obtaining sufficient liquid samples with current grab sampling techniques. When other retrieval methods are used, liquid samples may be collected after completion of the final washing activity and prior to pumping the remaining liquid out of the tank, or following the completion of retrieval.

The optimum volume of liquid sample needed to perform the required analytical methods is 2,650 mL. This would allow sufficient material to optimize detection limits; however, it does not allow for any loss of sample volume during sample handling and processing. Additional liquid sample volume will be collected from specific tanks identified by the risk assessment group to allow testing to support development and validation of the closure risk assessment model. The sample quantity required for the risk assessment testing is 150 mL of liquid. Therefore, the total volume of liquid sample necessary from tanks identified to provide sample material for risk assessment tests is 2,800 mL.

[1] Teflon is a registered trademark of E. I. DuPont DeNemours, Wilmington, Delaware.

### 3.1.3 Sample Handling

If the solid sample from a riser is taken using a clamshell, the sample matrix may be removed from the clamshell sampling devices and placed in sample bottles within a glove box or glove bag in the field, allowing the operators to determine when the required volume has been achieved. This approach will be used if operator exposure is considered to be sufficiently low. Alternatively, the clamshell sampler containing the sample may be shipped directly to the laboratory. The finger trap sampler and liquid sampler are designed to be placed in a container and shipped directly to the laboratory.

The sample transport containers cannot maintain the sample temperature at 4 °C as recommended by SW-846 (EPA 1986). To maintain sample integrity, care will be taken to avoid exposing the samples to high temperatures and, if possible, samples will be shipped to the laboratory within 24 hours in order to support analytical holding time requirements. If the holding times cannot be met, the laboratory shall notify the Tank Farm Contractor project manager or assigned task lead. The laboratory shall perform the analyses as soon as possible. Data not meeting the holding time requirements shall be flagged when reported in the Format IV data package. The impact on the subsequent use or interpretation of these data will be evaluated on a case-by-case basis by the Tank Farm Contractor.

## 3.2 SAMPLE CUSTODY

The sampling team shall initiate a chain-of-custody form for each sample bottle. The chain-of-custody form shall accompany each sample bottle. The following sampling information shall be included on the chain-of-custody form:

- Signature of the collector
- Date and Time of Collection
- Waste Type (e.g., liquid, solid, sludge, filter, etc.)
- Signature of person's involved in the chain of possession
- Dates of possession
- Unique sample identification number assigned to the sample bottle
- Tank and riser location from which the sample was obtained
- A notation of pertinent sampling information including unusual waste characteristics or sampling problems shall be recorded in the comments section
- A description of the sample matrix including the color and consistency (e.g., runny, lumpy, or chunky) shall be provided if possible.

Each sample bottle will be shipped to the laboratories in an approved shipping container per approved procedure. The sampling team shall use Waste Tank Sample Seals to demonstrate that samples have reached the laboratory without alteration.

The information documented on the chain-of-custody forms should match the instructions within the TSAP. Sampling activities are documented in the work package(s), and any deviations from the TSAP instructions, and the justification for the deviations, will be captured in the work package. Sample integrity and traceability are maintained via the chain-of-custody forms, which are included in the Format IV laboratory report. The Format IV laboratory report includes a narrative section that documents known deviations from the TSAP requirements. A description of the Format IV report is provided in Section 6.0.

## 3.3 VOLUME MEASUREMENT

Volume measurement of residual waste in each SST is expected to meet HFFACO Milestone series M-45-00 volume requirements. The method for estimating residual waste volume is visual assessment of waste against known tank geometry using the validated video camera/computer-aided design modeling system (CCMS).

The CCMS represents the best currently available technology for developing the post-retrieval waste volume estimates. This system has been tested in the Cold Test Facility for application to both 100-series and 200-series SSTs. Testing on the CCMS has been completed and the results are documented in the *Results of the Video Camera/CAD Modeling System Test* (RPP-18744). The CCMS also was used for determining the post-retrieval residual waste volume in SST C-106 and results are documented in the *Calculation for the Post-Retrieval Volume Determination for Tank 241-C-106* (RPP-19866). Based on the testing at the Cold Test Facility and use in SST C-106, the CCMS is sufficiently refined to allow future use without additional development.

Waste volume estimation using the CCMS is initiated at the completion of waste retrieval operations. The volume measurement process starts with the collection of in-tank videos. Based on the visual interpretation of these videos, a 3-dimensional (3-D) model of the surface topography of the residual waste on the bottom of the tank is generated taking into account the configuration of the tank. The 3-D computer-aided design (CAD) system algorithms then generate an estimate of the residual waste volume remaining on the bottom of the SST. The 95% upper confidence interval (UCI) for the residual waste volume on the bottom of the tank is determined using the following regression from *Revised Methodology to Calculating Residual Waste Volume at 95% Confidence Interval* (RPP-22891) equation:

$$\textit{Actual Waste Volume @95\%UCI}\,ft^3 = 1.043 \times \textit{CCMS In-Tank Volume Est.}\,ft^3 + 0.852 \qquad (1)$$

If the in-tank video identifies residual waste adhering to an internal tank stiffener ring or the tank walls, then the volume of that waste is evaluated using a visual estimate of the thickness of the waste on the ring or tank wall and how much of the ring or tank wall has waste. Residual waste associated with abandoned in-tank equipment is calculated based on the conservative assumption

that the waste completely fills the void space of the equipment. The assumptions concerning the residual waste on the stiffener rings, on the tank walls, and in the void space of abandoned in-tank equipment are best estimate values and do not require the determination of a confidence interval.

The total residual waste volume in the tank is then calculated as the sum of:

- Residual waste on the tank bottom (Waste Volume @ 95% UCI $ft^3$)
- Residual waste on the stiffener rings and tank walls
- Residual waste in the abandoned equipment void space.

## 4.0 LABORATORY ANALYSIS REQUIREMENTS

This section specifies requirements for analysis of samples collected to support tank closure activities. All analyses shall be performed in accordance with the requirements of this SAP. Direction for sample preparation is provided in Section 4.1. Analytical requirements are specified in Section 4.2. In case the sample volumes are not sufficient for all analyses, further direction is provided in Section 4.3. Sample holding time requirements are summarized in Section 4.4.

### 4.1 SAMPLE HANDLING REQUIREMENTS

For solid samples, the laboratory shall remove waste material from each finger trap, clamshell assembly, or bottle as necessary and place it in an individual empty jar (i.e., solids from individual samplers shall be stored separately). Solids removal methods that may alter chemical characteristics of the sample material (e.g., rinsing) shall not be used. Each sample shall be weighed and the approximate net weight recorded. Close-up photographs of materials in each bottle shall be taken. The photographs should show, as clearly as possible, the physical characteristics of the sample.

The laboratory will observe and record the following sample characteristics:

- Color and consistency of solid samples
- Color and clarity of liquid samples
- Suspended or settled solids in liquid samples, if present (volume of solids will be estimated as a percentage of the sample total volume).

In addition to liquid analyses, suspended solids will be analyzed if they are present in significant amounts. It is unlikely that sufficient solids will be available from these samples to analyze the complete set of solid analyses. The analytical priorities given in order of preference as stated in the DQO (RPP-23403) are as follows:

- Radiochemistry (particularly for long half-life radionuclides)
- Inorganic metals
- Inorganic anions
- SVOCs
- Polychlorinated biphenyl (PCB)
- VOCs.

The highest priority analyses, radiochemicals, would require approximately 10 g of solids. Therefore, if the total amount of settled solids in all bottles from each sample (primary and duplicate) is estimated to be 10 g or more, the phases shall be separated and the solids subsampled for analysis; otherwise, no solids analyses will be performed. Characterization data of suspended solids, if present in liquid grab samples, will only be used to supplement the solids sample data.

## 4.2 METHODS AND REQUIREMENTS FOR ANALYSIS

Analytical requirements for the solid and liquid samples are summarized in Tables 4-1 and 4-2. The analytical strategy for this SAP was developed using the DQO process and is documented in the DQO (RPP-23403). The waste samples will be analyzed for major constituent categories (VOCs, SVOCs, inorganics, and radionuclides) using specified analytical methods. Waste analyses will be performed utilizing the methods outlined in SW-846, where applicable. However, SW-846 methods may require some deviation to address radiological concerns and some matrix conditions found in the tank waste. All attempts will be made to meet the DQO requirements.

The DQO (RPP-23403) subdivides the list of analytes into primary and secondary constituents. Analytes are listed as primary constituents if they are included in any of the following:

- The SST Part A Permit (Part A) tank waste inventory

- Underlying hazardous constituents listed in WAC 173-303-610, "Closure and post-closure"; or Title 40, *Code of Federal Regulations*, Part 268, "Land Disposal Restrictions" (40 CFR 258) (40 CFR 268.48, "Universal treatment standards")

- Radionuclides from 10 CFR 61, "Licensing Requirements for Land Disposal of Radioactive Waste" (10 CFR 61.55, "Waste classification")

- Analytes required for risk assessment calculations.

Table 4-1. Chemical, Radiological, and Physical Analytical Requirements for Solid Samples. (3 sheets)

| Instrument | Analyte | 222-S Laboratory analytical method | Prep method (a/d/f/w/e/dist) | Quality control | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Duplicate for one riser from each tank | Matrix spike | Matrix spike DUP | Blank | LCS | Units |
| Gravimetric | Bulk density or SpG[1] | LA-519-132 or LA-510-116 | d | DUP for field primary sample | NA | NA | NA | ea AB | g/mL |
| Thermogravimetric | Wt% $H_2O$ | LA-514-115 | d | | NA | NA | NA | ea AB | wt% |
| ICP/AES | Primary inorganics (Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Fe, Pb, Mn, Ni, Sb, Se, Sr, Tl, U, V, Zn)<br>Secondary inorganics (B, Bi, Ca, K, Li, Mo, Mg, Na, P, Rh, S, Si, Sn, Ta, W, Y, Zr, S, Ce, Eu, La, Nb, Nd, Pd, Pr, Rb, Ru, Sm, Te, Th, Ti) | LA-505-161 (EPA Method 6010B) | for a | DUP for field primary sample | ea PB or AB[2] | NR | ea PB or AB | ea PB or AB | µg/g |
| ICP/MS[3] | $^{237}Np$, $^{233}U$, $^{234}U$, $^{235}U$, $^{236}U$, $^{238}U$, $^{230}Th$, $^{232}Th$ | LA-506-101 (EPA Method 6020) | for a | DUP for field primary sample | ea PB or AB | NR | ea PB or AB | ea PB or AB | µg/g |
| Distillation/ISE | $S^{2-}$ | LA-361-101 (EPA Method 9030B/9215) | d | DUP for field primary sample | ea AB | NR | ea AB | ea AB | µg/g |
| Liquid scintillation | $^{63}Ni$ | LA-285-102 | for a | DUP for field primary sample | NA | NR | ea PB or AB | ea PB or AB | µCi/g |
| IC | Primary inorganics ($F^-$, $NO_2^-$, $NO_3^-$)<br>Secondary inorganics ($Br^-$, $Cl^-$, $PO_4^-$, $SO_4^{2-}$, $C_2H_3O_2^-$, $CHO_2^-$, $C_2H_3O_3^-$, $C_2O_4^{2-}$) | LA-533-115 (EPA Method 9056) | w | DUP for field primary sample | ea AB[5] | NR | ea PB | ea AB | µg/g |
| IC | $NH_4^+$ | LA-533-101 | dist | DUP for field primary sample | ea PB | NR | ea PB | ea PB | µg/g |
| CVAA | Hg | LA-325-106 (EPA Method 7471A) | d | DUP for field primary sample | ea AB | NR | ea AB | ea AB | µg/g |
| Spectrophotometric | $CN^-$ | LA-695-103 | d | DUP for field | ea AB | NR | ea AB | ea AB | µg/g |

Table 4-1. Chemical, Radiological, and Physical Analytical Requirements for Solid Samples. (3 sheets)

| Instrument | Analyte | 222-S Laboratory analytical method | Prep method (a/d/f/w/c/dist) | Quality control | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Duplicate for one riser from each tank | Matrix spike | Matrix spike DUP | Blank | LCS | Units |
| | | (EPA Method 9010B/9014) | | primary sample | | | | | |
| Sep & beta count | $^{90}Sr$ | LA-220-101 | f | DUP for field primary sample | NA | NR | ea AB | ea AB | µCi/g |
| Separation, AEA[4] | $^{238,239,240}Pu$, $^{241}Am$, $^{243,244}Cm$, $^{242}Cm$ | LA-953-104 | f | DUP for field primary sample | NA | NR | ea AB | ea AB | µCi/g |
| Sep/liquid scintillation | $^{3}H$ | LA-218-114 | w | DUP for field primary sample | ea AB[5] | NR | ea PB | ea AB | µCi/g |
| Sep/liquid scintillation | $^{14}C$ | LA-348-104 | w | DUP for field primary sample | ea AB[5] | NR | ea PB | ea AB | µCi/g |
| Anion-cation exchange/distilla-tion/liquid scintillation | $^{79}Se$ | LA-365-132 | a | DUP for field primary sample | NA | NA | ea PB or AB | Standard not available | µCi/g |
| ICP/MS | $^{99}Tc$ | LA-506-101 (EPA Method 6020) | f or a | DUP for field primary sample | ea AB[5] | NR | ea PB or AB | ea PB or AB | µg/g |
| Sep/GEA | $^{129}I$ | LA-378-103 | f/w | DUP for field primary sample | NA | NA | ea AB | ea AB | µCi/g |
| GEA[6] | Primary gamma emitters: $^{152,154,155}Eu$, $^{137}Cs$, $^{60}Co$, $^{125}Sb$<br>Secondary gamma emitters: all other analytes detected by GEA | LA-548-121 | f | DUP for field primary sample | NA | NA | ea AB | ea AB | µCi/g |

Table 4-1. Chemical, Radiological, and Physical Analytical Requirements for Solid Samples. (3 sheets)

| Instrument | Analyte | 222-S Laboratory analytical method | Prep method (a/d/f/w/e/dist) | Quality control | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Duplicate for one riser from each tank | Matrix spike | Matrix spike DUP | Blank | LCS | Units |
| GC/MS | Primary VOA (see Table 4-3)<br>Secondary VOA (see Table 4-4) | LA-523-118 (EPA Method 8260B) | d | DUP for field primary sample | ea AB | ea AB | ea AB | ea AB | µg/kg wet wt. |
| GC/MS | Primary SVOA (see Table 4-3)<br>Secondary SVOA (see Table 4-4) | LA-523-135 (EPA Method 8270C) | e | DUP for field primary sample | ea PB | ea PB | ea PB | ea PB | µg/kg wet wt. |
| pH Meter | pH | LA-212-105 | d | DUP for field primary sample | NA | NA | NA | ea AB | pH |
| GC/ECD | PCBs (Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260) | LA-523-140 (EPA Method 8082) | e | DUP for field primary sample | ea PB | ea PB | ea PB | ea PB | µg /kg dry wt. |

Notes:

[1]Use SpG procedure LA-510-116 when solids are too dry or are observed to contain significant air "pockets" that may affect accuracy or repeatability of the measurements. The LCS is applicable to the SpG analysis only.
[2]Serial dilutions or matrix spikes may be used as necessary.
[3]LCS and spike for $^{232}$Th and $^{235}$U only. Initial calibration verification and post-digest spike for $^{237}$Np and $^{233}$U.
[4]LCS for $^{238,240}$Pu and $^{241}$Am only.
[5]Post-digest spike
[6]LCS for $^{137}$Cs and $^{60}$Co only.

Prep Method Abbreviations:
e = extraction, d = direct, f = fusion, a = acid, w = water, dist = distillation.

AB = analytical batch.
AEA = alpha energy analysis.
COMP = composite sample.
CVAA = cold vapor atomic absorption.
DUP = duplicate analyses.
ea = each.
GC/ECD = gas chromatography/electron capture detector.
GC/MS = gas chromatography/mass spectrometry.
GEA = gamma energy analysis.
IC = ion chromatography.
ICP/AES = inductively coupled plasma/atomic emission spectrometry.
ICP/MS = inductively coupled plasma/mass spectrometry.
ISE = ion selective electrode.
LCS = laboratory control sample.
NA = not applicable.
NR = not required.
PB = preparation batch.
PCB = polychlorinated biphenyl.
Sep = separation.
SpG = specific gravity.
SVOA = semivolatile organic analysis.
VOA = volatile organic analysis.

Table 4-2. Chemical, Radiological, and Physical Analytical Requirements for Liquid Samples. (3 sheets)

| Instrument | Analyte | 222-S Laboratory analytical method | Prep method (d/e) | Quality control | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Duplicate for one riser from each tank | Matrix spike | Matrix spike DUP | Blank | LCS | Units |
| Gravimetric | SpG | LA-510-112 | d | DUP for field primary sample | NA | NA | NA | ea AB | unitless |
| Thermo-gravimetric | Wt% $H_2O$ | LA-514-115 | d | DUP for field primary sample | NA | NA | NA | ea AB | wt% |
| ICP/AES | Primary inorganics (Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, Sb, Se, Sr, Tl, U, V, Zn) Secondary inorganics (B, Bi, Ca, K, Li, Mo, Mg, Na, P, Rh, S, Si, Sn, Ta, W, Y, Zr, U, Ce, Eu, La, Nb, Nd, Pd, Pr, Rb, Ru, Sm, Te, Th, Ti) | LA-505-161 or LA-505-170 (EPA Method 6010B) | d | DUP for field primary sample | ea AB[1] | NR | ea AB | ea AB | µg/mL |
| ICP/MS[2] | $^{237}Np$, $^{233}U$, $^{234}U$, $^{235}U$, $^{236}U$, $^{238}U$, $^{230}Th$, $^{232}Th$ | LA-506-101 (EPA Method 6020) | d | DUP for field primary sample | ea AB | NR | ea AB | ea AB | µg/mL |
| Distillation/ISE | $S^{2-}$ | LA-361-101 (EPA Methods 9030/9215) | d | DUP for field primary sample | ea AB | NR | ea AB | ea AB | µg/mL |
| Liquid scintillation | $^{63}Ni$ | LA-285-102 | d | DUP for field primary sample | NA | NA | ea AB | ea AB | µCi/mL |
| IC | Primary inorganics ($F^-$, $NO_2^-$, $NO_3^-$) Secondary inorganics ($Br^-$, $Cl^-$, , $PO_4^-$, $SO_4^{2-}$, $C_2H_3O_2^-$, $ClO_2^-$, $C_2H_3O_3^-$, $C_2O_4^{2-}$) | LA-533-115 (EPA Method 9056) | d | DUP for field primary sample | ea AB | NR | ea AB | ea AB | µg/mL |
| IC | $NH_4^+$ | LA-533-101 | d | DUP for field primary sample | ea AB | NR | ea AB | ea AB | µg/mL |
| CVAA | Hg | LA-325-106 (EPA Method 7470A) | d | DUP for field primary sample | ea AB | ea AB | ea AB | ea AB | µg/mL |
| Spectrophoto-metric | $CN^-$ | LA-695-103 (EPA Method 9010B/9014) | d | DUP for field primary sample | ea AB | NR | ea AB | ea AB | µg/mL |

Table 4-2. Chemical, Radiological, and Physical Analytical Requirements for Liquid Samples. (3 sheets)

| Instrument | Analyte | 222-S Laboratory analytical method | Prep method (d/e) | Quality control | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Duplicate for one riser from each tank | Matrix spike | Matrix spike DUP | Blank | LCS | Units |
| Sep & beta count | $^{90}Sr$ | LA-220-101 | d | DUP for field primary sample | NA | NA | ea AB | ea AB | µCi/mL |
| Separation, AEA[3] | $^{238,239,240}Pu$, $^{241}Am$, $^{243,244}Cm$, $^{242}Cm$ | LA-953-104 | d | DUP for field primary sample | NA | NA | ea AB | ea AB | µCi/mL |
| Sep/liquid scintillation | $^{3}H$ | LA-218-114 | d | DUP for field primary sample | ea AB | NR | ea AB | ea AB | µCi/mL |
| Sep/liquid scintillation | $^{14}C$ | LA-348-104 | d | DUP for field primary sample | ea AB | NR | ea AB | ea AB | µCi/mL |
| Anion-cation exchange/distillation/liquid scintillation | $^{79}Se$ | LA-365-132 | d | DUP for field primary sample | NA | NA | ea AB | Standard not available | µCi/mL |
| ICP/MS | $^{99}Tc$ | LA-506-101 (EPA Method 6020) | d | DUP for field primary sample | ea AB | NR | ea AB | ea AB[4] | µg/mL |
| Sep/GEA | $^{129}I$ | LA-378-103 | d | DUP for field primary sample | NA | NA | ea AB | ea AB | µCi/mL |
| GEA[5] | Primary gamma emitters: $^{152,154,155}Eu$, $^{137}Cs$, $^{60}Co$ Secondary gamma emitters: $^{94}Nb$, $^{106}Ru$, $^{125}Sb$, $^{134}Cs$, $^{144}Ce$, $^{226}Ra$, $^{241}Am$ and all other analytes detected by GEA | LA-548-121 | d | DUP for field primary sample | NA | NA | ea AB | ea AB | µCi/mL |
| GC/MS | Primary VOA (See Table 4-3) Secondary VOA (See Table 4-4) | LA-523-118 (EPA Method 8260B) | d | DUP for field primary sample | ea AB | ea AB | ea AB | ea AB | µg/L |
| GC/MS | Primary SVOA (See Table 4-3) Secondary SVOA (See Table 4-4) | LA-523-135 (EPA Method 8270C) | e | DUP for field primary sample | ea PB | ea PB | ea PB | ea PB | µg/L |
| pH Meter | pH | LA-212-106 | d | DUP for field primary sample | NA | NA | NA | ea AB | pH |

Table 4-2. Chemical, Radiological, and Physical Analytical Requirements for Liquid Samples. (3 sheets)

| Instrument | Analyte | 222-S Laboratory analytical method | Prep method (d/e) | Quality control | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Duplicate for one riser from each tank | Matrix spike | Matrix spike DUP | Blank | LCS | Units |
| Potentiometric-titration | OH[6] | LA-211-102 | d | DUP for field primary sample | NA | NA | ea AB | ea AB | µg/mL |
| GC/ECD | PCBs (Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260) | LA-523-140 (EPA Method 8082) | e | DUP for field primary sample | ea PB | ea PB | ea PB | ea PB | µg/L |

Notes:

[1]Serial dilutions or matrix spikes may be used as necessary.
[2]LCS and spike for $^{232}$Th and $^{238}$U only. Initial calibration verification and post-digest spike for $^{237}$Np and $^{235}$U.
[3]LCS for $^{239,240}$Pu and $^{241}$Am only.
[4]Post-digest spike.
[5]LCS for $^{137}$Cs and $^{60}$Co only.
[6]Perform titration for hydroxide only if pH of the liquids >12.5.

Prep Method Abbreviations:
e = extraction, d = direct

AB = analytical batch.
AEA = alpha energy analysis.
ea = each.
CVAA = cold vapor atomic absorption.
DUP = duplicate analyses.
GC/ECD = gas chromatography/electron capture detector.
GC/MS = gas chromatography/mass spectrometry.
GEA = gamma energy analysis.
IC = ion chromatography.
ICP/AES = inductively coupled plasma/atomic emission spectrometry.
ICP/MS = inductively coupled plasma/mass spectrometry.
ISE = ion selective electrode.
LCS = laboratory control sample.
NA = not applicable.
NR = not required.
PB = preparation batch.
PCB = polychlorinated biphenyl.
Sep = separation.
SpG = specific gravity.
SVOA = semivolatile organic analysis.
VOA = volatile organic analysis.

Table 4-3. Primary Organic Analytes.

| Primary VOA analytes | CAS | Primary SVOA analytes | CAS |
|---|---|---|---|
| 1,1,1-Trichloroethane | 71-55-6 | 2-Methylphenol (o-cresol) | 95-48-7 |
| 1,1,2,2-Tetrachloroethene | 127-18-4 | Butylbenzylphthalate | 85-68-7 |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 2,4,5 Trichlorophenol | 95-95-4 |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 76-13-1 | 2,4,6-Trichlorophenol | 88-06-2 |
| 1,1,2-Trichloroethane | 79-00-5 | 2,6-Bis(tert-butyl)-4-methylphenol | 128-37-0 |
| 1,1,2-Trichloroethylene | 79-01-6 | 2-Chlorophenol | 95-57-8 |
| 1,1,Dichloroethene | 75-35-4 | 2-Ethoxyethanol | 110-80-5 |
| 1,2-Dichloroethane | 107-06-2 | 4-Methylphenol (p-cresol) | 106-44-5 |
| Chloroethene (vinyl chloride) | 75-01-4 | Acenaphthene | 83-32-9 |
| 2-Butanone (MEK) | 78-93-3 | Cresylic acid (cresol, mixed isomers) | 1319-77-3 |
| 2-Nitropropane | 79-46-9 | Cyclohexanone | 108-94-1 |
| 2-Propanone (Acetone) | 67-64-1 | Di-n-butylphthalate | 84-74-2 |
| 4-methyl-2-pentanone (MIBK) | 108-10-1 | Di-n-octylphthalate | 117-84-0 |
| Benzene | 71-43-2 | N-nitroso-di-n-propylamine | 621-64-7 |
| Carbon disulfide | 75-15-0 | Fluoranthene | 206-44-0 |
| Carbon tetrachloride | 56-23-5 | o-Nitrophenol | 88-75-5 |
| Chlorobenzene | 108-90-7 | p-Chloro-m-cresol (4-Chloro-3-methylphenol) | 59-50-7 |
| Chloroform | 67-66-3 | m-Cresol (3-Methylphenol) | 108-39-4 |
| Dichloromethane (methylene chloride) | 75-09-2 | Pyrene | 129-00-0 |
| Ethyl acetate | 141-78-6 | N-Nitrosomorpholine | 59-89-2 |
| Ethylbenzene | 100-41-4 | 1,2,4-Trichlorobenzene | 120-82-1 |
| Diethyl ether | 60-29-7 | 2,4-Dinitrotoluene | 121-14-2 |
| Toluene | 108-88-3 | Hexachloroethane | 67-72-1 |
| trans-1,3,-Dichloropropene | 542-75-6 | Hexachlorobutadiene | 87-68-3 |
| Trichlorofluoromethane | 75-69-4 | Nitrobenzene | 98-95-3 |
| Xylenes | 1330-20-7 | Naphthalene | 91-20-3 |
| o-Xylene | 95-47-6 | o-Dichlorobenzene | 95-50-1 |
| m-Xylene | 108-38-3 | Pyridine | 110-86-1 |
| p-Xylene | 106-42-3 | Isobutanol[1] | 78-83-1 |
| -- | -- | n-Butyl alcohol (1-butanol)[1] | 71-36-3 |
| -- | -- | Tributyl phosphate | 126-73-8 |

Notes:

[1]Included in VOA list in RPP-23403, but will be analyzed by SVOA.

RPP-23403, 2004, *Single-Shell Tank Component Closure Action Data Quality Objectives*, Rev. 0, CH2M HILL Hanford Group, Inc., Richland, Washington.

CAS = Chemical Abstracts Service.
SVOA = semivolatile organic analysis.
VOA = volatile organic analysis.

Table 4-4. Secondary Organic Analytes "Hanford Library." (2 sheets)

| Secondary VOA analytes | CAS | Secondary SVOA analytes | CAS |
|---|---|---|---|
| cis-1,3 -Dichloropropene | 10061-01-5 | p-Nitrochlorobenzene | 100-00-5 |
| Ethylene dibromide (1,2, Dibromoethane) | 106-93-4 | 1,4-Dinitrobenzene | 100-25-4 |
| Butane | 106-97-8 | 1,4-Dichlorobenzene | 106-46-7 |
| 1,3 - Butadiene | 106-99-0 | Phenol | 108-95-2 |
| Acrolein (propenal) | 107-02-8 | Hexachlorobenzene | 118-74-1 |
| 3-Chloropropene (Allyl chloride) | 107-05-1 | N,N-Diphenylamine | 122-39-4 |
| Propionitrile (Ethyl cyanide) | 107-12-0 | Pentachloronaphthalene | 1321-64-8 |
| Acrylonitrile | 107-13-1 | Hexachloronaphtahlene | 1335-87-1 |
| 2-Pentanone | 107-87-9 | Tetrachloronaphthalene | 1335-88-2 |
| Methylcyclohexane | 108-87-2 | Octachloronaphthalene | 2234-13-1 |
| n-Pentane | 109-66-0 | Isodrin | 465-73-6 |
| 5-Methyl-2-hexanone | 110-12-3 | Benzo[a]pyrene | 50-32-8 |
| 2-Heptanone | 110-43-0 | Dibenz[a,h]anthracene | 53-70-3 |
| n-Hexane | 110-54-3 | 1,3-Dichlorobenzene | 541-73-1 |
| Cyclohexane | 110-82-7 | 3-Methyl-2-butanone | 563-80-4 |
| n-Octane | 111-65-9 | N-Nitroso-N,N-dimethylamine | 62-75-9 |
| 4-Heptanone | 123-19-3 | Hexafluoroacetone | 684-16-2 |
| Acetic acid n-butylester | 123-86-4 | Pentachloronitrobenzene (PCNB) | 82-68-8 |
| 1,4-Dioxane | 123-91-1 | Pentachlorophenol | 87-86-5 |
| n-Heptane | 142-82-5 | 2-sec-Butyl-4,6-dinitrophenol (Dinoseb) | 88-85-7 |
| Cyclopentane | 287-92-3 | 1,1'-Biphenyl | 92-52-4 |
| Ethyl alcohol | 64-17-5 | Acetophenone | 98-86-2 |
| 2-Propyl alcohol | 67-63-0 | Toxaphene | 8001-35-2 |
| n-Propyl alcohol (1-propanol) | 71-23-8 | Nitric acid, propyl ester | 627-13-4 |
| Bromomethane | 74-83-9 | Aldrin | 309-00-2 |
| Chloroethane | 75-00-3 | alpha-BHC | 319-84-6 |
| Acetonitrile | 75-05-8 | beta-BHC | 319-85-7 |
| 1,1-Dichloroethane | 75-34-3 | gamma-BHC (Lindane) | 58-89-9 |
| Dichlorofluoromethane | 75-43-4 | Dieldrin | 60-57-1 |
| Chlorodifluoromethane | 75-45-6 | Endrin | 72-20-8 |
| 3-Methy-2-butanone | 563-80-4 | 1,1-Dimethylhydrazine | 57-14-7 |
| Hexafluoroacetone | 684-16-2 | Methyl hydrazine | 60-34-4 |
| 2-Butenaldehyde (2-Butenal) | 4170-30-3 | -- | -- |
| Methyl isocyanate | 624-83-9 | -- | -- |

Table 4-4. Secondary Organic Analytes "Hanford Library." (2 sheets)

| Secondary VOA analytes | CAS | Secondary SVOA analytes | CAS |
|---|---|---|---|
| n-Propionaldehyde | 123-38-6 | -- | -- |
| 3-Heptanone | 106-35-4 | -- | -- |
| Chloromethane | 74-87-3 | -- | -- |
| n-Nonane | 111-84-2 | -- | -- |
| Styrene | 100-42-5 | -- | -- |
| Tetrahydrofuran | 109-99-9 | -- | -- |
| Cyclohexene | 110-83-8 | -- | -- |
| 2-Methyl-2-propenenitrile | 126-98-7 | -- | -- |
| 2-Hexanone | 591-78-6 | -- | -- |
| Triethylamine | 121-44-8 | -- | -- |
| Oxirane | 75-21-8 | -- | -- |
| 2-Methyl-2-propanol | 75-65-0 | -- | -- |
| Dichlorodifluoromethane | 75-71-8 | -- | -- |
| 1,2-Dichloro-1,1,2,2-tetrafluoroethane | 76-14-2 | -- | -- |
| Heptachlor | 76-44-8 | -- | -- |
| 1,2-Dichloropropane | 78-87-5 | -- | -- |
| 1-Methylpropyl alcohol | 78-92-2 | -- | -- |
| 3-Pentanone | 96-22-0 | -- | -- |

Notes:
CAS = Chemical Abstracts Service.
SVOA = semivolatile organic analysis.
VOA = volatile organic analysis.

Secondary constituents consist of the remaining analytes that can be detected using the specified analytical methods but not considered a primary constituent. Selected secondary analytes may be re-listed as primary constituents during the course of the sampling program based on a technical or regulatory evaluation. Re-listing of a secondary or primary constituent will require changes to appropriate sections and tables contained in the DQO (RPP-23403) and SAP.

It is recognized that some constituents may be measured by more than one method. In these cases, the selection of the method may depend on the action levels required for a decision, the expectation that the constituent is present, or the detection limit that can be achieved for each method.

## 4.3 SAMPLE VOLUME NOTIFICATIONS

If the total solids amount is equal to or greater than 169 g and the total liquid volume is equal to or greater than 2,650 mL, sample processing will commence. If the total amount of solid sample material from the tank is less than 169 g, and/or the total amount of liquid from the tank is less

than 2,650 mL, the laboratory shall contact the Tank Farm Contractor project manager or assigned task lead within one working day of the volume measurement. Once notified, the Tank Farm Contractor will contact the established leads of the Office of River Protection and Ecology to evaluate the need for collecting additional samples and/or proceed with sample analysis. Based on this evaluation, the Tank Farm Contractor will notify the assigned laboratory task lead via e-mail to convey the decision. A copy of this e-mail will be included as an attachment in the Format IV report.

If the analyses require prioritization, the analytical priorities (in order of preference) are radiochemistry (particularly for long half-life radionuclides), inorganic metals, inorganic anions, SVOCs, PCB, and VOCs, as stated in the DQO (RPP-23403). Any analyses prescribed by this SAP, but not performed, shall be identified in the data report. In addition, justification for not performing the analyses shall be provided in the Format IV data package.

## 4.4 SAMPLE HOLDING TIMES

It is recognized in the DQO (RPP-23403) that some analytical holding times may not be met because of the extra precautions required to handle highly radioactive waste samples. However, the laboratory shall strive to meet the applicable SW-846 holding times. If the holding times cannot be met, the laboratory shall notify the Tank Farm Contractor project manager or assigned task lead. The laboratory shall perform the analyses as soon as possible. Data not meeting holding time requirements shall be flagged when reported in the Format IV data package. The impact on the subsequent use or interpretation of these data will be evaluated on a case-by-case basis by the Tank Farm Contractor. Applicable SW-846 holding times for the requested analyses are provided in Table 4-5.

Table 4-5. Applicable SW-846 Holding Times.

| Analyte | Holding time |
|---|---|
| pH | 24 hours (liquid only) |
| Nitrate/Nitrite | 48 hours (liquid only) |
| Sulfate/Chloride | 28 days (liquid only) |
| Ammonia | 28 days (liquid only) |
| Volatile organic compounds | 14 days |
| Semivolatile organic compounds | Samples extracted within 14 days and extracts analyzed within 40 days following extraction |
| Inorganic analytes (except Hg) | 6 months |
| Sulfide | 7 days |
| Cyanide | 14 days |
| Mercury | 28 days |
| Radionuclides | 6 months |
| Polychlorinated biphenyl | Samples extracted within 14 days and extracts analyzed within 40 days following extraction |

# 5.0 QUALITY ASSURANCE AND QUALITY CONTROL

Quality requirements for conducting River Protection Project (RPP) sampling and analysis are described in *Hanford Analytical Services Quality Assurance Requirements Documents* (DOE/RL-96-68). The *222-S Laboratory Quality Assurance Plan* (HNF-SD-CP-QAPP-016) specifies the requirements for ensuring the quality of sample analysis conducted at the 222-S Laboratory. This quality assurance (QA) plan meets DOE/RL-96-68 minimum requirements as the baseline for laboratory quality systems.

All activities (sampling and analysis) will be performed using approved methods, procedures, and work packages that are written in accordance with approved operational and laboratory QA plans, which are consistent with the requirements of this SAP. Sampling and analysis activities shall be performed by qualified personnel using properly maintained and calibrated equipment.

## 5.1 FIELD QUALITY CONTROL SAMPLES

To determine the representativeness of the samples collected in the field, QA samples in the form of duplicate samples, field blanks, and trip blanks will be collected.

Two field blanks and two trip blanks shall be collected with the liquid samples. One field blank and one trip blank will be used for VOC analyses and the other field and trip blanks for SVOC analyses. The blanks shall be prepared with deionized water. Each field blank shall be lowered into the tank headspace, the stopper removed, and the blank retrieved. The trip blanks shall be shipped in the same manner as the waste samples.

Field blanks are not required for the solid sampling activity because there is no way to mimic the appearance of the residual waste material, thereby rendering an undetectable blank.

## 5.2 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS FOR LABORATORY ANALYSIS

Laboratories performing analyses in support of this SAP shall have approved and implemented QA plans. These QA plans shall meet the minimum requirements of DOE/RL-96-68 as the baseline for laboratory quality systems. Samples collected according to this SAP will be analyzed at the 222-S Laboratory in the 200 West Area. The 222-S Laboratory conducts sample analyses according to HNF-SD-CP-QAPP-016, which meets the minimum requirements of DOE/RL-96-68.

### 5.2.1 Quality Control Requirements

Required quality assurance (QC) analyses (duplicates, matrix spikes, blanks, laboratory control samples) are identified in Tables 4-1 and 4-2. The laboratory shall also use calibration and

calibration check standards appropriate for the analytical instrumentation as defined in DOE/RL-96-68. The QC acceptance criteria for laboratory control samples, spikes, and duplicate are specified in the DQO (RPP-23403). Laboratory blanks shall be evaluated against the method detection limits. The QC criteria are goals for demonstrating reliable method performance.

The laboratory will use its internal QA system for addressing any QC failures. If the QC failures are systematic and cannot be resolved by the internal protocols, the project manager/assigned task lead shall be consulted to determine the proper action. The laboratory should suggest a course of action at that time. All data not meeting the QC requirements shall be properly noted and the associated QC failures discussed in the narrative section of the Format IV data report.

### 5.2.2 Required Quantitation Limits

Required quantitation limits are commonly established at an order of magnitude below the action levels specified in a DQO. Action levels are currently under development; therefore, the DQO (RPP-23403) specifies "initial quantitation limits." The specified initial quantitation limits may be conservative (i.e., low) and many of the limits may not be met by existing analytical methods. The laboratory shall consider these initial quantitation limits as targets. Method detection limits are dependent on such things as sample size (caused by sample activity and sample availability), methods, and matrix effects. The laboratory shall take necessary steps (e.g., use the least dilutions and large sample sizes, etc.) to minimize method detection limits.

### 5.2.3 Primary and Secondary Constituent Requirements

As described in Section 4.2, the DQO (RPP-23403) subdivides the list of analytes into primary and secondary constituents. The primary and secondary constituent designations influence the rigor of laboratory QC and data evaluation. Figures 4-1 through 4-5 of the DQO (RPP-23403) are flowcharts that depict the strategies developed for the major constituent categories including VOCs/SVOCs, inorganics, and radionuclides. These flowcharts provide a decision matrix for sample analysis through data evaluation for primary and secondary constituents. The flowcharts also provide the framework for evaluating tentatively identified compounds (TIC) from VOC and SVOC analyses.

The primary constituents for each analytical method will be analyzed with the QC requirements specified in Section 4.2 of the DQO (RPP-23403). The secondary constituents will be analyzed with the same QC requirements as the primary constituents. However, unlike the primary constituents, the secondary constituents may not be reanalyzed if they fall outside of the QC acceptance criteria.

The primary VOC and SVOC constituents listed in Table 4-3 will be included in the calibration of the gas chromatograph/mass spectrometer and method detection limits will be determined for each constituent for the appropriate sample preparation. Data produced from these analyses will be evaluated for TICs. The TICs shall be evaluated against the "Hanford Library" of organics

(Table 4-4) and the National Institute of Standards and Testing library. The laboratory shall provide the project manager/assigned task lead a summary of a preliminary evaluation of TICs in order to determine if a TIC toxicity is near a level of concern. TIC concentrations at or near a level of concern may warrant further investigation. The laboratory shall report data for the primary constituents and all TICs meeting the evaluation criteria in the DQO.

The primary constituents for ion chromatography (IC) and inductively coupled plasma/atomic emissions spectroscopy (ICP/AES) will be analyzed with the QC requirements specified in Section 4.2 of the DQO (RPP-23403). Data for the secondary constituents shall be summarized and provided to the project manager/assigned task lead as soon as possible. If the project manager/assigned task lead determines that the concentration of a constituent is near a level of concern, the laboratory shall be requested to evaluate quality of the data and recommend whether or not to re-analyze (i.e., re-analysis to improve data quality). The laboratory shall report data for all primary constituents and secondary constituents identified for these methods.

For gamma energy analysis, the data for secondary analytes shall be dispositioned in the same manner as described for the IC and ICP/AES secondary analytes. The laboratory shall report results for the primary constituents and detected secondary constituents. In most Hanford Site tank waste, $^{137}Cs$ is the dominant gamma-emitting isotope. Other isotopes (minor activity contributors) may not be detected by gamma energy analysis because of the elevated $^{137}Cs$ background. For the secondary constituents that are not detected, reporting the large detection limits as analytical results would not support the DQO (RPP-23403) objectives.

## 6.0 DATA REPORTING

The data package(s) from the 222-S Laboratory will be in Format IV. A Format IV data package, as defined in HNF-SD-CP-QAPP-016, is necessary because the data are expected to receive extensive review from outside individuals and organizations. The Format IV data package is subject to internal laboratory QA verification and review including peer review prior to release. Upon release, the data package will receive a third party validation.

The Format IV data package requires a comprehensive report of analytical data. All analytical data, including waste sample analyses, blank analyses, holding time checks, matrix spike duplicate analyses, and surrogate recoveries shall be verified by the laboratory prior to reporting. The data package shall also include TICs found in volatile organic analysis (VOA) and semivolatile organic analysis (SVOA). The secondary organic TICs shall be identified as "Hanford Library TICs" and their chromatographs shall be included in the data package. A discussion of the TIC evaluation process shall be provided in the narrative.

In addition to the data package(s), an electronic version of the analytical results shall be provided to the Tank Characterization Database within seven (7) calendar days of release of a data package. The electronic version shall be in the *Standard Electronic Format Specification for Tank Characterization Data Loader: Version 3.5* (HNF-3638) (or higher revision).

## 7.0 CHANGE CONTROL

Field activity and laboratory work scope changes may be required because of unexpected field conditions, new information, health and safety concerns, or other circumstances. Changes to work scope may result in modifications to this SAP. Work scope changes that do not result in deviation from the SAP requirements, can be made in the field or laboratory with the approval of the project manager or assigned task lead. These work scope changes will be documented in the sampling work package and/or Format IV laboratory report and the retrieval data report. Justification for the changes to work scope shall be provided in sufficient detail to understand the basis for the change. Alternately, if field or laboratory conditions result in substantial work scope changes, the SAP can be revised and issued as an Engineering Change Notice, requiring Office of River Protection and regulatory approval.

Waste sampling and volume measurement methodologies and analytical strategies (e.g., constituent listings and data analysis) may be updated as new technologies or information become available. The impact of these updates to the SAP will be judged as they are identified to determine if revisions to the SAP will be necessary. Ecology, DOE and its contractors will participate in the SAP update evaluation process and any subsequent revisions to the SAP.

## 8.0 REFERENCES

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