



VERIFICATION AND VALIDATION GUIDELINES

FOR

VOLATILE ORGANICS

DA-SS01-v4

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1. PURPOSE AND INTRODUCTION

This document presents those data assessment steps which are unique to Volatile Organic Analyses. This Analytical Specific document is to be used in conjunction with DA-GR01, "General Guidelines for data Verification and Validation.

The purpose of this document is to provide guidance in the completion of Data Verification, and Data Validation activities as part of the Rocky Flats Environmental Technology Site (RFETS) Analytical Services Division Data Assessment Process as described in DA-GR01.

This version of DA-SS01 is applicable to Volatile Organic Sample Data Packages generated under the National Basic Ordering Agreement (BOA) Statement of Work (SOW) and the Rocky Flats Environmental Technology Site (Site) BOA Implementation Requirements documents, GR03 & GR04.

2. VERIFICATION AND VALIDATION INSTRUCTIONS

The instructions contained in this section are specific to Volatiles Organics analyses. They are to be used in conjunction with the general instructions for Verification and Validation found in Analytical Services Division's General Guidelines for Verification and Validation, DA-GR01.

2.1. Chain of Custody, Holding Times, and Sample Preservation

Review Items: COC, Laboratory Sample Receiving Documentation, Cover Page Comments, Sample Case Narrative, raw data, data summary forms, and sample preparation/extraction log (medium level only).

Objective: The objective is to ascertain the validity of results based on the method required holding times, sample preservation, and the continuity of sample custody.

Source: BOA Attachment 1, § 3.1.2, and Base Method

Evaluation: *The following items apply to both verification and validation:*

Item 1: Determine if the samples were properly preserved prior to laboratory sample receipt using the criteria provided in Table 1a and Table 1b.

Action 1: If samples were not acid-preserved and/or were not maintained at $4^{\circ} \pm 2^{\circ}$ C prior to receipt by the laboratory, do not qualify the sample results. However, comment and assign the reason code [703] to all applicable samples.

Item 2: Determine if samples were properly preserved after sample receipt.

Action 2: If documentation specifically indicates sample preservation was not maintained after sample receipt, but prior to analysis, issue a Non-Compliance Notification (NCN) requesting a corrective action to prevent recurrence and qualify all results as estimated [J 201].

Item 3: Determine the preparation and analysis holding times by comparing the preparation and analysis dates on the raw data and the sample collection date on the COC. If the actual holding time is greater than the

maximum allowable holding time identified in Table 1a or Table 1b, use the following actions to qualify all applicable data:

- Action 3a:** Qualify all positive results as estimated (J) if the actual holding time was greater than the 14-day holding time, but less than two times the maximum holding time. Assign code **[J 101]** if the holding time violation is attributed to the laboratory. If the holding time violation is not attributed to the laboratory, assign code **[J 701]**.
- Action 3b:** Qualify all non-detected results as estimated (UJ) if the actual holding time was greater than the 14-day holding time but less than two times the maximum holding time. Assign code **[UJ 101]** if the holding time violation is attributed to the laboratory. If the holding time violation is not attributed to the laboratory, assign code **[UJ 701]**.
- Action 3c:** Qualify all non-detects as rejected (R) and all detects (J) if the actual holding time was greater than two times the maximum holding time. Assign reason code **[R/J 102]** if the hold time violation is attributed to the lab. If the hold-time violation is not attributed to the laboratory, assign reason code **[R/J 702]**.

Note 1: Code 701 will apply when samples are received after holding times are expired, if samples are received after 7 days from collection, or if samples are received without acid preservation (water only).

Table 1a HOLDING TIME AND PRESERVATION CRITERIA

Method	Holding Time (maximum)	Preservation
CLP-SOW	14 days	All water samples preserved with acid; Storage at 4°C
	14 days	All water samples unpreserved Storage at 4°C
	14 days	All soil samples Storage at 4°C
Method 524.2, 624 & SW846 Method 8260	14 days	All samples preserved with HCl or ascorbic acid; Storage at 4°C
	14 days	All water samples unpreserved Storage at 4°C
	14 days	All soil samples Storage at 4°C

NOTE: The holding time is based on the date when collection was completed, rather than verified time of sample receipt (VTSR).

Table 1b TCLP EXTRACT HOLDING TIME AND PRESERVATION

Holding Time (Days)		Preservation	
TCLP Extraction	Extract Analytical	Non-Aqueous Matrix	Aqueous Matrix
14	14	Storage at 4°C	Storage at 4°C

2.2. Sample Data Package Narrative

Review Item: Sample Case Narrative

Objective: Review the narrative for compliance to requirements and for information useful to data assessment.

Source: GR03 § 3.2, BOA Attachment 1, § 3.1.6.2

Evaluation: *The following items apply to both verification and validation:*

Item 1: Check that the SDP Narrative is present and includes the following as applicable:

- Procedures and/or Standard Method reference for preparation and analysis.
- Descriptions of significant technical difficulties encountered in preparing and analyzing the samples.
- Justification of all dilutions.
- Explanations of any QC deficiencies, missed holding times, or inability to achieve the required detection limits (RDLs).
- Reasons for reanalysis, reanalysis Analytical Batch Identifications Numbers, and a synopsis of the reanalysis Analytical Batch QC Assessment.
- Explanations and descriptions of all deviations from routine protocols, including deviations from approved standard operating procedures (SOPs), detection limit modifications, etc. If it was necessary to contact the CTR for instructions due to the nature of the deviation, the laboratory shall document those instructions in the narrative.

Action 1: If any of the above items are non-compliant, do not qualify the results, comment and include the reason codes [227] and/or [805] as appropriate. Use professional judgement to determine if the issuance of a NCN is warranted.

2.3. System Monitoring Compound (Surrogate) Recovery

Review Items: Forms 2A/2B or equivalent, sample preparation/extraction log (medium level only), sample chromatograms and quantitation reports.

Objective: To assess laboratory performance based on the results of surrogate spike recoveries. Laboratory performance on individual samples is established by means of spiking samples with surrogate compounds prior to extraction and analysis to determine surrogate spike recoveries. The evaluation of the results of these surrogate spikes is not necessarily straightforward. The sample itself may produce effects due to such factors as interferences and high concentrations of analytes. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the review and validation of data based on specific sample results are frequently subjective and demand analytical experience and professional judgment.

Sources: Attachment I to BOA Attachment 1, and Base Method

Evaluation: ***The following items apply to both verification and validation:***

- Item 1:** Check that Forms 2A/2B are present.
- Action 1:** If forms are missing, issue a NCN, comment and assign reason code **[801]** to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.
- Item 2:** Check that surrogate recoveries are reported for all sample, spike, and blank analyses.
- Action 2:** If required surrogate recoveries are not provided, issue a NCN, comment and assign reason code **[803]** to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.
- Item 3:** Determine if appropriate reanalysis and reextraction/reanalysis were performed. Reanalysis and reextraction/reanalysis are required by all methods if any surrogate recovery is outside the control limits (excludes dilutions and sample used for MS/MSD).
- Action 3a:** If appropriate reanalyses or reextractions were not performed, comment and assign reason code **[142]** to all applicable data.
- Action 3b:** If appropriate reanalyses/reextractions were performed, determine whether the original analysis or the reanalysis/reextraction is to be reported and provide an explanation in the data quality assessment report.
- Item 4:** Check that the surrogate percent recoveries (%R) are within the limits of **Table 2**. If surrogate recoveries for a sample fall outside the control limits, qualify as follows:
- Action 4a:** If the recovery of any surrogate is greater than the control limits, estimate **[J 142]** positive results. (Determine that high bias was not due to interference with the surrogate compound only.)
- Action 4b:** If the recovery of any surrogate is less than the control limits but greater than or equal to 10%, estimate **[J 142]** positive results and **[UJ 142]** non-detected results.
- Action 4c:** If the recovery of any one surrogate is less than 10%, estimate **[J 142]** positive results and reject **[R 142]** non-detected results.

Table 2 SURROGATE CONTROL LIMITS

CLP-SOW	524.2	624	SW-846 8260A
Toluene-d8 (TOL) Bromofluorobenzene (BFB), 1,2-Dichloroethane d4 (DCA)	4-Bromofluorobenzene 1,2-Dichlorobenzene- d4	Minimum of 3 surrogates provided by the method.	4-Bromofluorobenzene (BFB), Toluene-d8 (TOL) Dichloroethane d4 (DCA) Dibromofluoromethane (DBF).
Limits: Water TOL: 88-110 BFB: 86-115 DCA: 76-114 Soil 84-138 59-113 70-121	Limits: 80-120 (or laboratory provided limits)	Limits: laboratory provided limits	Limits: Water BFB: 86-115 TOL: 88-110 DCA: 80-120 DBF: 86-118 Soil 74-121 81-117 80-120 80-120 (or laboratory provided limits)

Note: Laboratory limits will generally take precedent for 524.2, and SW-846 8260A. Professional judgement may be used to determine the reasonableness of laboratory limits. Limits in **Table 2** may be used if laboratory limits are not acceptable.

Dilutions (low level)

Compounds reported from the diluted sample will be assessed using the surrogate recoveries from the diluted sample.

Dilutions (medium level)

No action should be taken if a surrogate recovery cannot be reported because of sample dilution. However, professional judgment may be used to warrant qualification.

Item 5: If no surrogate recovery is reported due to dilution, determine if the dilution factor was high enough to justify the surrogates being diluted out.

Action 5: Comment that surrogates were diluted out of the sample and no action was taken. Assign code **[142]** to all sample results associated with diluted surrogates.

Evaluation: *The following items apply to validation only:*

Item 6: Check chromatograms and quantitation reports to evaluate the recoveries. Calculate at least one surrogate recovery per sample.

Action 6: If calculated recoveries are not within 5% of reported result, issue a NCN, comment and assign reason code **[803]** to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue data assessment until a new data package is received.

Item 7: Check raw data for interferences or misidentification when %R values are outside of control limits.

Action 7a: If raw data confirms % R, no action is required.

Action 7b: If raw data indicates misidentification, assign reason code **[804]**. Use professional judgment to assign a qualifier based on the severity of the problem.

2.4. MS/MSD Recovery

Review Items: Forms 3A/3B or equivalent, Form 6A or equivalent, MS/MSD chromatograms and quantitation reports.

Objective: To determine long-term precision and accuracy of the analytical method on various matrices. These data alone cannot be used to evaluate the precision and accuracy of individual samples.

Sources: Attachment I to BOA Attachment 1, and Base Method

Evaluation: *The following items apply to both verification and validation:*

Item 1: Check that Forms 3A/3B are present and that MS/MSD analyses were performed at the required frequency.

Action 1: If forms are not present or were not analyzed at the required frequency, comment that the SDP did not include an MS/MSD. No reason code is applied.

Item 2: Check that the MS/MSD percent recoveries (%R) and relative percent differences (RPD) for only the compounds in **Table 3** are within the identified limits.

Note: No action is taken on MS/MSD or matrix duplicate data alone to qualify an entire batch. However, using informed professional judgment the data Reviewer may use the MS/MSD results in conjunction with other QC criteria and determine the need for some qualification of data.

Action 2: If MS/MSD recoveries or RPDs are not within the limits of **Table 3**, comment that limits were not met. Do not qualify, but assign reason code **[231]** to the outlying compound in all associated samples. The data reviewer may use the MS/MSD results in conjunction with other QC criteria to determine if data qualification is warranted.

Table 3 MS/MSD FREQUENCY AND CONTROL LIMITS

Spiking Compound	CLP-SOW		SW-846 8260A, EPA 624 %R Limit
	%R Limits[RPD Limit]		
	Water	Soil	Use lab limits. If not provided, use CLP limits.
1, 1 -Dichloroethene	61-145[14]	59-172[22]	
Trichloroethene	71-120[14]	62-137[24]	
Benzene	76-127[11]	66-142[21]	
Toluene	76-125[13]	59-139[21]	
Chlorobenzene	75-130[13]	60-133[21]	
	Frequency: 1/20 samples		Frequency: 1/20 samples

Evaluation: *The following item applies to validation only:*

Item 3: Calculate at least one percent recovery and one RPD value in the MS/MSD data using the following calculations:

$$\%R = \frac{\text{Found_Value}}{\text{True_Value}} \times 100$$

$$RPD = \frac{|D_1 - D_2|}{\left(\frac{D_1 + D_2}{2}\right)} \times 100$$

where:

D_1 = MS Concentration.

D_2 = MSD Concentration.

Action 3: If the %R or % RPD values cannot be verified to within 5%, issue a NCN, comment and assign reason code **[803]** to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue data assessment until a new data package is received.

2.5. Instrument Performance Check

Review Items: Form 5A or equivalent, bromofluorobenzene (BFB) bar graph spectrum, mass listing, and RIC.

Objective: To determine if instrument tuning criteria have been met. Instrument performance checks (tuning) are performed to ensure mass resolution, identification, and to some extent, sensitivity. These criteria are not sample specific. Conformance is established by adherence to acceptance criteria using standard reference materials. These criteria must be met in all circumstances.

Sources: BOA Attachment 1, § 3.2.3; Attachment I to BOA Attachment 1, and Base Method

Evaluation: *The following items apply to both verification and validation:*

Item 1: Check that Form 5A is present for the all calibrations and that all samples are included.

Action 1: If forms are missing, issue a NCN, comment and assign reason code **[801]** to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.

Item 2: Verify that the sample analyses occurred within 12 hours (8 hours for 524.2) of the daily BFB instrument performance check.

Action 2: If the samples were analyzed outside the time limit, use professional judgment to qualify the data based upon the severity of the problem. At a minimum, comment and assign reason code **[139]** to all applicable data.

- Item 3:** Check that the BFB ion abundance criteria contained in **Table 4** are met.
- Action 3a:** If mass assignment is in error (e.g., m/z 96 is assigned as the base peak), reject **[R 139]** all associated data.
- Action 3b:** If ion abundance criteria are not met, reject all associated results **[R 139]**.
- Action 3c:** If alternate method criteria are used, comment and assign reason code **[139]**. No additional action is necessary.

Table 4 BFB ION ABUNDANCE CRITERIA

M/z	CLP-SOW	524.2	SW-846 8260A, EPA 624
50	8.0-40.0% of m/z 95	15-40% of m/z 95	15-40% of m/z 95
	30.0-66.0% of m/z 95	30-80% of m/z 95	30-60% of m/z 95
	Base peak, 100% Relative Abundance	Base peak	Base peak
	5.0-9.0% of m/z 95	5-9% of m/z 95	5-9% of m/z 95
	< 2% of m/z 174	< 2% of m/z 174	< 2% of m/z 174
	50.0-120.0% of m/z 95	> 50% of m/z 95	> 50% of m/z 95
	4.0-9.0% of m/z 174	5-9% of m/z 174	5-9% of m/z 174
	93.0-101.0% of m/z 174	> 95% but < 101% of m/z 174	> 95% but < 101% of m/z 174
	5.0-9.0% of m/z 176	5-9% of m/z 176	5-9% of m/z 176

Evaluation: *The following item applies to validation only:*

- Item 4:** Verify from the raw data that the mass assignment is correct and that the mass listing is normalized to the correct base peak. Verify that the mass calibration is correct and that there are not transcription errors. Compare the mass listings submitted in the raw data to the reported relative abundances. Recalculate two m/z ratios. If possible, verify that spectra were generated using appropriate background subtraction techniques.
- Action 4:** If any problems are found, issue a NCN, comment and assign reason code **[803]** to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue data assessment until a new data package is received.

2.6. Internal Standard Area and RT Summary

- Review Items:** Forms 8A, 8B/8C or equivalent, calibration quantitation reports, sample chromatograms and quantitation reports.
- Objective:** To determine if the GC/MS sensitivity and response are stable. Internal standard (IS) performance criteria ensure that the GC/MS sensitivity and response are stable for every analytical run.
- Sources:** Attachment I to BOA Attachment 1, and Base Method

Evaluation: *The following items apply to both verification and validation:*

Item 1: Check that Form 8A is present for all calibrations associated with sample analyses and that all samples and blanks are included.

Action 1: If form(s) are missing, issue a NCN, comment and assign reason code [801] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.

Item 2: Determine if the IS compounds vary from the recommended IS compounds identified in Table 5.

Action 2: If the IS compounds vary from the method, use professional judgment to assess the impact on the data. The following summarizes the recommended IS compounds by method:

Table 5 INTERNAL STANDARD CONTROL COMPOUNDS

CLP-SOW	524.2	624	SW-846 8260A
Bromochloromethane 1,4-Difluorobenzene Chlorobenzene-d5	Fluorobenzene	Minimum of 3 provided by method	Fluorobenzene 2-Bromo-1-chloropropane 1,4-Dichlorobenzene-d ₄

Item 3: Determine if the IS area count in the samples and blanks differ by more than a factor of two (-50% to +100%) from the area count measured in the associated calibration standard. If so, qualify as follows:

Action 3a: If the area count for any IS in a sample is above the acceptance limits (+100%), estimate [J 143] positive results for compounds quantitated using that IS.

Action 3b: If the area count for any IS in a sample is below the acceptance limits (-50%), estimate [J 143] positive results and [UJ 143] non-detected results for compounds quantitated using that IS.

Action 3c: If the area count for any IS in a sample is extremely low (i.e., less than 50% of the lower control limit), or if instrument sensitivity exhibits a major abrupt drop off, reject [R 143] non-detected results and estimate [J 143] positive results for compounds quantitated using that IS.

Evaluation: *The following item applies to validation only:*

Item 4: Determine if the IS retention time in the continuing calibration standard varies by more than ± 30 seconds from the last daily calibration standard.

Action 4: If so, examine the chromatogram for evidence of false positives or false negatives. Use professional judgment to qualify the data based upon the chromatogram and magnitude of the shift. If qualification is warranted, reject [R 143] affected non-detected results and estimate [J 143] affected positive results for compounds quantitated using that IS.

Item 5: Verify that area counts and retention times are correctly transcribed from the sample and standard quantitation reports onto the Forms 8B/8C.

Action 5: Depending upon the magnitude of the problem, issue a NCN to request clarification or explanation of the data. Comment and assign reason code [804] to all applicable data. Alternatively, use the times and area counts from the quantitation reports.

2.7. Sample Results (Target Identification)

Review Items: Form 1A or equivalent, Form 6A or equivalent, Form 7A or equivalent, COC record, sample extraction/preparation logs (medium level only), and sample chromatograms and quantitation reports.

Objective: To determine if false positives (reporting a compound present when it is not) or false negatives (not reporting a compound that is present) were reported by evaluating qualitative criteria for compound identification.

Sources: Attachment I to BOA Attachment 1, and Base Method

Evaluation: *The following items apply to both verification and validation:*

Item 1: Check that Form 1A is present for each sample.

Action 1: If forms are missing, issue a NCN, comment and assign reason code [801] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.

Item 2: Check that significant figures and flagging protocol are as specified in the latest version of CLP.

Action 2: If significant problems exist, issue a NCN, comment and assign reason code [803] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.

Item 3: Determine if Form 1A contains "B" qualifiers.

Action 3a: If "B" qualifiers are present, determine if bank contamination is addressed in the SDP Narrative. If contamination is not addressed, do not qualify the results. Comment and include the reason code [805].

Action 3b: If "B" qualifiers are present, proceed with the qualification specified under Blanks.

Evaluation: *The following item applies to validation only:*

Item 4: Verify that all significant peaks on the chromatogram are accounted for as target compounds, TICs, surrogates, and internal standards.

Action 4a: In the event a target compound is misidentified, correct the specific data point on the Form 1 (initial and date) and assign the reason code [251].

Action 4b: In the event a target compound was misidentified and the Form 1 was manually changed, the CTR or their designee shall be informed in writing of potential EDD discrepancies this change may cause.

Relative Retention Time

Item 5: Confirm positive results by reviewing the relative retention times (RRTs) for positive results on the sample integration reports to those for the associated calibration standard. Verify the RRTs are within ± 0.06 RRT units of the standard RRT for CLP and SW-846. The GC retention time of the sample component should be within 3 standard deviations of the mean retention time of the compound in the calibration mixture for 524.2.

$$RRT = \left(\frac{RT_{com}}{RT_{is}} \right)$$

where:

RT_{com} = Retention time of the compound of interest
 RT_{is} = Retention time of nearest internal standard

Action 5: If results are not within ± 0.06 RRT units, or 3 standard deviations (524.2), qualify the associated results as estimated, [J 145].

Item 6: Determine if the mass spectra of the sample compound and a laboratory-generated standard meet the following:

CLP, 524.2, & 624

- All ions present in the standard mass spectra at relative intensity greater than 10.0 percent (most abundant ion in the spectrum equals 100.0 percent) must be present in the sample spectrum.
- The relative intensities of these ions must agree within $\pm 20\%$ between the sample and standard spectrum.
- Ions greater than 10.0 percent in the sample spectrum but not present in the standard spectrum must be considered and accounted for by the analyst making the comparison. Favor false positives.

SW-846

- The intensities of characteristic ions maximize the same scan or within one scan of each other in the standard versus the sample.
- The relative intensities of these ions must agree within $\pm 30\%$ between the sample and standard spectrum.
- Structural isomers (very similar mass spectra) should be identified separately if the height of the valley between the isomer peaks is less than 25% of the sum of the two peaks. Otherwise, structural isomers are identified as isomeric pairs.

Note: The application of qualitative criteria for GC/MS analysis compounds requires professional judgment.

- Action 6a:** If it is determined that an incorrect false positive exists, the result should be reported as non-detected [U 145].
- Action 6b:** If it is determined that a false negative exists, reject [R 145] the non-detected result if the unreported positive result exceeds the RDL.
- Note:** Be aware of situations (e.g., high concentration samples preceding low concentration samples) when sample carry-over is a possibility. Use professional judgment to determine if carry-over occurred and that the data was qualified appropriately.

2.8. Compound Quantitation and RDLs

- Review Items:** Form 1A or equivalent, Form 6A or equivalent, COC record, sample preparation/extraction logs (medium level only), sample chromatograms and quantitation reports.
- Objective:** To ensure that the reported quantitation results and detection limits are accurate.
- Sources:** Attachment I to BOA Attachment 1, and Base Method
- Evaluation:** *The following items apply to both validation and verification:*
- Item 1:** Using the Line Item Code from the COC record, determine if the detection limits reported on Form 1A match the required detection limits (RDLs) listed in Attachment K to BOA Attachment 1, GR03, GR04, or other applicable Statement of Work (SOW). Note that dilutions, percent solids, and extraction steps will impact the final RDLs reported.
- If RDLs on Form 1A do not meet those required by the Line Item Code requested, check the RIN file for additional information, which may explain the deviation.
- Action 1:** If an explanation is not found, use professional judgement to qualify non-detected results with reason code [213].
- Item 2:** Evaluate Form 1A to ensure no "E" qualifiers are present. If "E" qualifiers are present, ensure that another Form 1A with a diluted sample analysis is present in the data package.
- Action 2:** If "E" qualifiers are present and there is not a Form 1A with a diluted sample analysis, comment and estimate [J 148] the positive "E" result.
- Note:** Generally, the analysis with the lower reporting limits are used with the exception of results that exceed the calibration range. Only compounds that originally exceeded the calibration range are reported from the dilution.
- Item 3:** Ensure that required dilutions are addressed in the SDP Narrative.
- Action 3:** If not addressed, do not qualify the results. Comment and include the reason code [805].

- Item 4:** Determine from the Form 1A the compounds that were outside the upper half of the calibration range prior to dilution, but fall within the upper half of the calibration range after dilution.
- Action 4:** Assign reason code [155] only to the data points that meet Item 4 criteria. Do not assign any qualifier to these data points. Any data qualification will be assigned to the data point reported from the dilution.
- Item 5:** Determine if the diluted sample analysis keeps the response of the major constituents in the upper half of the calibration range.
- Action 5:** If the diluted sample analysis fails to keep the response of the major constituents in the upper half of the calibration range, use professional judgment to qualify the data. At a minimum, comment and assign reason code [252] to all applicable data.
- Evaluation:** *The following items apply to validation only:*
- Item 6** Verify that compound quantitation, as well as the adjustment of the MDLs, is performed according to the method. Target compound quantitation should be performed using the internal standard associated by the method.
- Action 6:** If not compliant, use professional judgment to qualify the data.
- Item 7:** Ensure that the same internal standard was used in the standard as in the sample.
- Action 7:** If a different internal standard was used in the sample than in the standard, do not qualify any data. Issue a NCN to request corrected data, comment and assign reason code [803] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received..
- Item 8** Target compounds should be quantitated from the primary ion listed in the method unless the primary ion has interference from the sample.
- If a secondary quantitation ion was used, verify that the standard was also quantitated from the same secondary quantitation ion.
- Action 8:** If a different quantitation ion was used in the sample than in the standard, do not qualify any data. Issue a NCN to request the corrected data, comment, and assign reason code [804] to all applicable data.
- Item 9:** Verify that acceptable (NIST/EPA/MSDC) Mass Spectral Library Searches are provided for all sample identifications.
- Action 9a:** If reference spectra are not provided, but applicable reference spectra can be found elsewhere in the data package, comment and issue a NCN and assign the reason code [802] to all applicable data.
- Action 9b:** If acceptable reference spectra cannot be found, issue a NCN, comment and assign reason code [803] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.

- Item 10** Verify that all B and E qualifiers are explained in the case narrative.
Action 10: If not, comment and assign the reason code [805] to all applicable data.

Calculations

- Item 11:** Examine the raw data to verify the correct calculation of one positive result per sample. Quantitation reports, chromatograms, sample preparation/extraction logs, dilutions, and cleanups are compared to the reported sample results.

Calculate using the following equations:

Purgeables:

Water and water-miscible waste:

$$\frac{ug}{L} = \frac{A_x \times I_s \times DF}{A_{is} \times RRF \times V_0}$$

where:

- A_x = Response of the characteristic ion for the analyte in the sample, area counts.
 I_s = Amount of internal standard injected, ng.
 DF = Dilution factor.
 A_{is} = Response of the characteristic ion for the internal standard, area counts.
 RRF = Response factor for the analyte from the appropriate calibration standard.
 V_0 = Volume of water purged, mL.

Sediment/soil, sludge, and waste:

Medium Level

$$\frac{ug}{Kg} = \frac{A_x \times I_s \times V_t \times DF}{A_{is} \times RRF \times V_i \times W_s \times P}$$

Low-Level

$$\frac{ug}{Kg} = \frac{A_x \times I_s \times DF}{A_{is} \times RRF \times W_s \times P}$$

where:

- A_x, I_s, A_{is}, RRF = Same as in water and water-miscible waste above.
 V_t = Volume of total extract, uL.
 V_i = Volume of extract added for purging, uL.
 W_s = Weight of sample extracted or purged, g.
 P = Percent Solids/100.

TICs only:

- A_x = Total response of the TIC in the sample, area counts.
 A_{is} = Total response of the nearest internal standard free of interference, area counts.
 RRF = One (1.0).

Action 11a: If significant problems exist, issue a NCN, comment and assign reason code [803] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.

Action 11b: If the RRF values are not verified within 5%, issue a NCN, comment and assign reason code [803] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.

2.9. CLP Tentatively Identified Compounds (TICs)

Review Items: Form 1E or equivalent, sample extraction/preparation logs (medium level only), and sample chromatograms and quantitation reports.

Objective: To determine if TICs were qualitatively identified. Peaks not identified as target compounds, surrogates, or internal standards are potential TICs. TICs must be qualitatively identified by a NIST/EPA/MSDC mass spectral library search and the identifications assessed by the data reviewer.

Sources: Attachment I to BOA Attachment 1, and Base Method

Evaluation: *The following items apply to both verification and validation:*

Item 1: Check that Form 1E is present for each sample.

Action 1: If forms are missing, issue a NCN, comment and assign reason code [801] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.

Item 2: Verify that all TIC results are qualified by the laboratories as "NJ".

Action 2: If TIC results are not qualified as "NJ" by the laboratory, "NJ" shall be applied to all applicable results by the data assessor with reason code [804].

Evaluation: *The following items apply to validation only:*

Item 3: Verify that the alkane series are properly identified and reported as series (e.g., C5-C9 as a single entry along with the estimate for the total concentration of the series).

Action 3: If non compliant, issue a NCN, comment and assign reason code [803] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.

- Item 4:** Verify that no volatile target compounds are mistakenly reported as TICs.
- Action 4:** If target compounds are mistakenly reported as TICs, the quantitation is in error due to the use of total area. Issue a NCN, comment and assign reason code [226] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.
- Item 5:** Verify that semivolatile compounds reported as target analytes in the semivolatile fraction are not also reported as TICs in the volatile fraction.
- Action 5:** If non-compliant, reject [R 199] the TIC.
- Note:** If a TIC result in the sample is not sufficiently above the level in the blank, the TIC result should not be reported. (Generally, the 10X blank rule is applied here.)
- Item 6:** Verify that the laboratory has generated a NIST/EPA/MSDC mass spectral library search for all required peaks in the chromatograms for samples and blanks.
- Action 6a:** If non-compliant, issue a NCN, comment and assign reason code [803] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.
- Action 6b:** When a compound is not found in any blanks but is a suspected common laboratory artifact/contaminant, reject [R 199] the TIC. Examples:
- Common contaminants: CO₂ (m/z 44), siloxanes (m/z 73), diethyl ether, hexane, certain freons (1,1,2-trichloro-1,2,2-trifluoroethane or fluorotrichloromethane), and phthalates at less than 100ug/L or 4000 ug/Kg.
 - Solvent preservative cyclohexene (methylene chloride preservative). Related by-products cyclohexanone, cyclohexenone, cyclohexanol, cyclohexenol, chlorocyclohexene, and chlorocyclohexanol.
 - Aldol reaction products of acetone including: 4-hydroxy-4-methyl-2-pentanone, 4-methyl-2-penten-2-one, and 5,5-dimethyl-2(5H)-furanone.
- Item 7:** Evaluate the TIC Spectra using the following guidance:
- All ions present in the standard mass spectrum at a relative intensity greater than 10% should be present in the sample spectrum.
 - The relative intensities of these ions must agree within ±20% between the sample and reference spectrum.
 - Molecular ions present in the reference spectrum should be present in the sample spectrum.
 - Ions present in the sample spectrum but not present in the reference spectrum must be reviewed for possible background contamination, interference, or coelution of additional TIC or target compounds.
- Action 7a:** When the above criteria are not met but the identification is correct in the technical judgment of the data reviewer or mass spectral interpretation specialist, report the TIC as is.

- Action 7b:** If the identification is uncertain in the data reviewer's judgment, or there are extenuating factors affecting compound identification, the TIC result may be reported as "unknown" or changed to an appropriate identification.
- Action 7c:** If more than one possible match exists, the TIC may be reported as "either compound X or compound Y."
- Action 7d:** If isomer specificity is in question, the TIC result may be changed to a non-specific result (e.g., 1,3,5-trimethyl benzene to trimethyl benzene isomer).
- Action 7e:** If identification is uncertain but other samples have a TIC of similar RRT and the same ions, identification information may be inferred.
- Item 8:** Examine blank chromatograms to verify that sample TICs are not found in the blanks.
- Note:** Be aware that TICs at low levels in the samples may also be present in the blanks at levels below 10% of the internal standard height. This is particularly likely for common laboratory artifacts and contaminants.
- Action 8:** If a TIC identification is changed for any of the above reasons, add the reason code [226] to all affected data points.
- Item 9:** Examine the raw data to verify the correct calculation of one TIC result per sample. Use the equation in Section 2.8.
- Action 9:** If significant problems exist, issue a NCN, comment and assign reason code [803] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.

2.10. Calibration

- Review Items:** Form 6A or equivalent, Form 7A or equivalent, sample and standard chromatograms and quantitation reports.
- Objective:** To determine if the instrument calibration is capable of producing acceptable quantitative data. Initial calibration demonstrates that the instrument is capable of acceptable performance at the beginning of the analysis run and of producing a linear calibration curve. Continuing calibration establishes the 12-hour relative response factors on which the quantitations are based and checks satisfactory performance of the instrument on a day-to-day basis.
- Sources:** Attachment I to BOA Attachment 1, and Base Method

Evaluation: *The following items apply to both verification and validation:*

Initial Calibration

Item 1: Determine if the initial calibration includes all target compounds and surrogates, is performed within 8 (524.2) or 12 (others) hours of the associated instrument performance check, and is performed at the beginning of the sequence or when continuing calibration criteria are not met. The acceptance criteria for samples are contained in **Table 6**.

Table 6 INITIAL CALIBRATION CRITERIA

Method	Correlation Coefficient (r or r ²)	%RSD
CLP/CLP (low-level)	N/A	30%
8260	0.99	30%
524.2	0.99	20%
624	0.99	30%

Action 1a: If an inappropriate number of standards or inappropriate concentration levels are analyzed, use professional judgment to assess the impact on the data. At a minimum, comment and assign reason code **[168]** to all applicable data.

Action 1b: Estimate **[J 140]** positive results and **[UJ 140]** non-detected results for those compounds whose %RSDs or linearity exceed the criteria in the associated initial calibration.

Action 1c: Estimate **[J 140]** positive results for those compounds whose RRFs are less than 0.05.

Action 1d: Reject **[R 140]** non-detected results for those compounds whose RRFs are less than 0.05.

Note: Apply a RRF limit 0.01 to the following compounds: acetone, 2-butanone, 2-hexanone, methanol, N-butyl-alcohol, isobutyl alcohol, cyclohexanone, ethyl acetate, ethyl ether, acrolein, and acrylonitrile.

Continuing Calibration

Item 2: Determine if the continuing calibration includes all target compounds and surrogates, and is analyzed at the beginning of each 8 or 12-hour analysis period following the instrument performance check and prior to the sample and blank analyses. The acceptance criteria used for samples are contained in **Table 7**.

Table 7 CONTINUING CALIBRATION CRITERIA

Method	%D
CLP	25%
CLP (low-level)	30%
8260	25%
524.2	30%
624	± 30% of target concentration*

* Method 624 allows the use of the QC check sample in lieu of a continuing calibration check sample

- Action 2a:** If the continuing calibration frequency criteria are not met or if inappropriate concentration levels are analyzed, use professional judgment to assess the impact on the data. At a minimum, comment and assign reason code **[168]** to all applicable data.
- Action 2b:** Estimate **[J 141]** positive results and **[UJ 141]** non-detected results for those compounds whose %Ds exceed the criteria in the continuing calibration.
- Action 2c:** Estimate **[J 141]** positive results for those compounds whose RRFs are less than 0.05.
- Action 2d:** Reject **[R 141]** non-detected results for those compounds whose RRFs are less than 0.05.

Note: Apply a RRF limit 0.01 to the following compounds: acetone, 2-butanone, 2-hexanone, methanol, N-butyl-alcohol, isobutyl alcohol, cyclohexanone, ethyl acetate, ethyl ether, acrolein, and acrylonitrile.

Evaluation: *The following items apply to validation only:*

Initial Calibration

- Item 3:** Determine if the target compounds are quantitated from the primary ion listed in the method unless the primary ion has interference from the sample.
- Note:** If a secondary quantitation ion was used, verify that the standard was also quantitated from the same secondary quantitation ion.
- Action 3:** If a different quantitation ion was used in the sample than in the standard, issue a NCN, comment and assign reason code **[803]** to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.
- Item 4:** Check the raw data and verify at least one RRF per calibration standard. Recalculate at least one average RRF and %RSD:

$$RRF = \frac{A_X \times C_{is}}{A_{is} \times C_X}$$

where:

A_x = Response for the characteristic ion for the analyte to be measured, units area counts.

C_{is} = Concentration of the internal standard, ug/L.

A_{is} = Response for the characteristic ion for the internal standard, units area counts.

C_x = Concentration of the analyte to be measured, ug/L.

$$\%RSD = \frac{SD}{\bar{X}} \times 100$$

$$SD = \sqrt{\frac{\sum_{i=1}^n (X_i - \bar{X})^2}{(n-1)}}$$

where:

X_i = Each individual value used to calculate the mean

\bar{X} = The mean of n values

n = The total number of values

Action 4: If the RRF for the %RSD cannot be verified to within 0.5%, issue a NCN, comment and assign reason code **[803]** to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.

Continuing Calibration

Item 5: Determine if target compounds are quantitated from the primary ion listed in the method unless the primary ion has interference from the sample.

Note: If a secondary quantitation ion was used, verify that the standard was also quantitated from the same secondary quantitation ion.

Action 5: If a different quantitation ion was used in the sample than in the standard, issue a NCN, comment and assign reason code **[803]** to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.

Item 6: Recalculate at least one daily RRF and %D:

$$\%D = \frac{R_1 - R_2}{R_1} \times 100$$

where:

R_1 = Calibration factor from first analysis.

R_2 = Calibration factor from subsequent analysis.

Action 6: If calculated results are not verifiable to within 5%, issue a NCN, comment and assign reason code [803] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.

2.11. Quality Control Check Samples

Review Items: Form 3A or equivalent

Objective: To evaluate the results of the quality control check sample (also known as laboratory fortified blank [LFB]) to determine the accuracy of the analytical method and laboratory performance.

Sources: Attachment I to BOA Attachment 1, and Base Method

Evaluation: *The following items apply to both verification and validation:*

Item 1: Check that Form 3A is present.

Action 1: If a form 3A is missing, issue a NCN, comment and assign reason code [801] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.

QC Check Sample Frequency

Item 2: Determine if one LFB is analyzed with each batch of samples processed within a working shift (up to 20 samples).

Action 2a: If the frequency requirement is not met, do not qualify the data, however, assign reason code [168] to the data.

Action 2b: If LFB was not analyzed, qualify all results as [J 168].

QC Check Sample Percent Recovery

Item 3: Check that the QC Check sample/LFB percent recoveries (%R), for only the compounds in **Table 8**, are within the following limits:

Table 8 QUALITY CONTROL SAMPLE PERCENT RECOVERY LIMITS

SW-846 8260A		524.2	624
1, 1-Dichloroethene	61-145	All compounds within 80-120 (may <u>not</u> use lab limits)	All compounds within 70-130 (may <u>not</u> use lab limits)
Trichloroethene	71-120		
Benzene	76-127		
Toluene	76-125		
Chlorobenzene	75-130		
(may use lab limits)			

Note: Laboratory limits will generally take precedent for SW-846 8260A. Professional judgement may be used to determine the reasonableness of the laboratory limits. Limits in **Table 8** may be used if laboratory limits are not acceptable.

SW-846 8260A

Action 3a: No action is taken on quality control sample data alone to qualify an entire batch. However, using informed professional judgment the data reviewer may use the quality control sample results in conjunction with other QC criteria and determine the need for some qualification of data. Do not qualify the data. However, assign the reason code [110].

Method 524.2 only

Action 3b: If any target compound is absent from the LFB analyses, estimate [J] positive results and reject [R 110] non-detected results for that compound in the associated samples.

Action 3c: If the recovery of any compound is greater than the recovery limits in the LFB, estimate [J 110] positive results for that compound in the associated samples. Non-detected results are not qualified. However, a comment indicating the number of compounds exceeding the upper control limit should be provided. Do not assign a reason code.

Action 3d: If the recovery of any compound is less than the recovery limits but greater than 10% in the LFB, estimate [J 110] all positive and non-detected results for that compound in the associated samples.

Action 3e: If the recovery of any compound is less than 10% in the LFB, estimate [J 110] positive results and reject [R 110] non-detected results for that compound in the associated samples.

Evaluation: *The following item applies to validation only:*

Item 4: Calculate at least one percent recovery in the quality control sample data using the following calculation:

$$\% R = \frac{\text{Found_Value}}{\text{True_Value}} \times 100$$

Action 4: If calculated results are not verifiable to within 5%, issue a NCN, comment and assign reason code [803] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.

2.12. Blanks

Review Items: Form 4A or equivalent, Method Blank Form 1A, 1E or equivalent, chromatograms and quantitation reports.

Objective: To assess the laboratory blank analysis results to determine the existence and magnitude of contamination problems. The criteria for evaluation of laboratory blanks apply to any blank associated with the samples (e.g., method, instrument, trip, or equipment blanks). If problems with any blank exist, all data associated with the method blank must be carefully evaluated to determine whether or not there is an inherent variability in the data or if the problem is an isolated occurrence not affecting other data.

Sources: Attachment I to BOA Attachment 1, and Base Method

Evaluation: *The following items apply to both verification and validation:*

- Item 1:** Verify that Method Blank Summary Forms (4A) are present.
Action 1: If not provided, issue a NCN, comment and assign reason code [801] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.
- Item 2:** Check that Form 1A is present for each blank.
Action 2: If not provided, issue a NCN, comment and assign reason code [801] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.
- Item 3:** Check that Form 1E is present for each blank.
Action 3: If not provided, issue a NCN, comment and assign reason code [801] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.
- Item 4:** Determine if the blank criteria contained in **Table 9** are compliant for the given method.
Note: If more than one blank is associated with a sample, qualification should be based upon comparison of the blank with the highest level of contamination.

Table 9 BLANK CRITERIA

Method	Type and Frequency	Criteria
CLP	Method Blank: once every 12 hours Storage Blank: once per SDG Instrument Blank: after saturated ions in a sample	No contaminants should be present in the blanks. The method blanks should be analyzed after the calibration standards
524.2, 624	Method Blank: 1 per batch of samples processed as a group within a work shift	No target compounds at or above MDL
SW-846 8260A	Method Blank: once per batch (up to 20 samples), before processing any samples, when there is a change in reagents, and following any concentrated sample that has saturated ions from a compound.	No interferents at or above MDL. The blank should be carried through all stages of sample preparation and measurement (i.e., extraction blanks should be analyzed on each instrument used for sample analyses)

- Action 4a:** If the proper blanks were not analyzed at the appropriate frequency, determine the severity of the problem and its effect on the data using professional judgment. At a minimum, comment and assign reason code [168] to all applicable data.
- Action 4b:** If a target compound is found at any concentration in the blanks but not in the samples, no action is taken.

- Action 4c:** If a target compound is found in the blanks at any concentration and is also found in the sample, apply the following:
- If the sample concentration is less than 5 times the blank concentration (10 times for common contaminants) and less than or equal to the RDL, qualify the data as estimated [**JB 249**] (EDD results cannot be raised to the RDL).
 - If the sample concentration is less than or equal to 5 times the blank concentration (10 times for common contaminants) and greater than the RDL, qualify the data [**U249**].
 - If the sample concentration is greater than 5 (10 times for common contaminants) times the blank concentration and greater than the RDL do not qualify the reported value.

Note 1: The Reviewer must consider the weights, volumes, percent solids, and dilution factors when applying the 5x and 10x rules. These factors must be accounted for so that an actual comparison of the contamination is made. The Reviewer should be particularly aware of undiluted sample results which exceed the action level, but fall within the action level as a result of the subsequent dilution.

Note 2: The common contaminants according to the National Functional Guidelines for Organic Data Review are:

Purgeables:

- ◇ Acetone
 - ◇ 2-Butanone
 - ◇ Methylene chloride
- If an associated method blank exhibits gross contamination, reject [**R 249**] positive results for the affected compounds.

Note: The Functional Guidelines define gross contamination as saturated peaks. Professional judgment must be used to assess the impact the contamination has on the associated samples and which compounds are considered affected.

Action 4d: If an associated method blank was not analyzed for the samples, estimate [**J 249**] positive results.

Evaluation: *The following items applies to validation only:*

Item 5: Verify that all significant peaks on the chromatogram are accounted for as target compounds, TICs, surrogates, and internal standards.

Action 5a: In the event a target compound, surrogate, or internal standard are misidentified, issue a NCN, comment and assign reason code [**801**] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package and EDD is received.

Action 5b: In the event a TIC is misidentified, comment in the Data Quality Assessment Report.

Item 6: Recalculate one positive result per blank. Review the chromatograms and quantitation reports to evaluate blank results.

Action 6: If the calculated result does not agree within 5% or if a compound was misidentified, comment and assign reason code **[804]** to all applicable data. Review all other positive blank results.

2.13. Sample Preparation Raw Data

Review Items: Raw Data

Objective: To check that sample preparation raw data deliverable requirements have been met and that raw data are present in a form suitable for data assessment.

Sources: Attachment I to BOA Attachment 1, Base Methods

Evaluation: *The following items apply to validation activities only:*

Item 1: Check that preparation raw data (benchsheets and/or preparation logs) are included for all analyses performed and include the following:

- Analytical Batch identifier
- Date of preparation
- Identifiers for all samples, sample duplicates, and spikes
- Identifiers for at least one preparation blank and lab control sample
- For aqueous samples initial and final volumes for all samples and QC samples
- For solids and non-aqueous liquids reported by weight, initial weights and final volumes for all samples and QC samples
- For samples reported by weight, balance identifiers with dates of use.
- Dated signatures for at least one analyst and one reviewer

Action 1a: Check this item as complete if raw data were sufficient to perform calculations for all previous items.

Action 1b: Omissions or errors that do not have an impact on the assessor's ability to assess the data shall be documented with a comment and assigned the reason code **[804]**. An NCN shall be issued to prevent the recurrence of such errors or omissions in future data packages.

Action 1c: For other omissions or errors that impact the assessor's ability to complete the data review, issue a NCN, comment and assign reason code **[803]** to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.

Item 2: Verify that instrument run logs are available for all analytical sequences.

Action 2a: Omissions or errors that do not have an impact on the assessor's ability to assess the data shall be documented with a comment and assigned the reason code **[804]**. An NCN shall be issued to prevent the recurrence of such errors or omissions in future data packages.

Action 2b: For other omissions or errors that impact the assessor's ability to complete the data review, issue a NCN, comment and assign reason code [803] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.

2.14. TCLP Sample and Extract Preparation (Summary Form 2)

Review Items: Form 2 or equivalent, and raw data.

Objectives: To determine if samples were evaluated and prepared by the proper TCLP preparation method according to LIC, analyte, sample matrix, and analytical method utilized.

Sources: Attachment I to BOA Attachment 1, GR03 § 5, and Method 1311 for TCLP extraction.

Evaluation: *The following Items apply to both verification and validation:*

- Item 1:** Check that a Form 2 or equivalent is present and the following information is included:
- Lab name, Lab Code, Analytical Batch Identifier and the RIN.
 - Form 2 data for each sample.
 - Physical descriptions of the samples (e.g. *multiphase liquid*, or *solids with no free liquid*) and a statement about which samples are of the same matrix.
 - Result for the preliminary determination of percent solids and a description of the method of determination.
 - An indication of whether particle size reduction was completed and how the reduction was completed, if reduction was required.
 - A *Yes* or *No* to indicate whether free liquid was present in the sample.
 - A *Yes*, *No*, or *N/A* to indicate whether any free liquid present was miscible with the extraction fluid.
 - A volume recorded if a non-miscible liquid is present.
 - A check that the preliminary evaluation of the pH of solids is recorded.
 - A check that the evaluation of the pH of solids after the addition of acid is recorded, if applicable.
 - A *Net Sample Weight (g)* or total weight of sample taken for the extraction process is recorded.
 - A *Net Weight of Solids Extracted (g)* or the net weight of solids remaining after liquid solid separation is recorded.
 - The type and weight of the extraction fluid added to the extraction vessel is recorded.
 - The *Date and Time* of the start and end of the extraction period were recorded.
 - The pH for the leachate solution after extraction and filtration, but before preservation was recorded.
 - The method of preservation of the leachate was recorded.
 - At least one spike-sample was prepared per waste type and analytical batch.

- At least one extraction blank was prepared per extraction fluid type and analytical batch.
- At least one duplicate sample was prepared per waste type and analytical batch.

Action 1a: Omissions or errors that do not have an impact on the assessor's ability to assess the data shall be documented with a comment and assigned the reason code [804]. An NCN shall be issued to prevent the recurrence of such errors or omissions in future data packages.

Action 1b: For other omissions or errors that impact the assessor's ability to complete the data review, issue a NCN, comment and assign reason code [803] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.

Evaluation: *The following items apply to validation only:*

Item 2: Determine that the appropriate TCLP Extraction method was completed for each sample.

Action 2: If the incorrect method was used for sample preparation and a CTR approved deviation was not documented, estimate [J 207] all applicable data.

Item 3: Check for evidence that samples with solids less than 0.5% were filtered as a TCLP Extract.

Action 3: If the percent solids is less than 0.5% and the sample was not filtered, estimate [J 220] positive results that exceed the regulatory level.

Item 4: Check for evidence of particle size reduction when the sample particle size exceeds 9.5 mm or the surface area is less than 3.1cm².

Action 4: If particle size reduction is required and reduction was not performed, estimate [J 222] all sample results less than the regulatory level.

Item 5: Verify that TCLP results for extracts of samples with free liquids, both miscible and non-miscible, were reported appropriately.

Action 5a: If a single combined TCLP result was not reported for a sample with both miscible and non-miscible liquids and this deviation was not addressed in the narrative, issue a NCN, comment and assign reason code [803] to all applicable data. Inspect all other SDP deliverables for missing information and incorporate any deficiencies into the NCN. Discontinue the data assessment until a new data package is received.

Action 5b: If a single combined TCLP result was not reported for a sample with both miscible and non-miscible liquids and this deviation was addressed in the narrative, comment and assign the reason code [248].

Item 6: Verify that Extraction Fluid Type 1 was used for the TCLP of all analyses and the Type 1 Fluid has a pH of 4.93 ± 0.05.

Action 6a: If an incorrect or improperly prepared Extraction Fluid Type was used for the TCLP, comment and qualify using professional judgment, but qualify at a minimum as estimated [J 233].

Action 6b: If the extraction fluids are not numbered and cannot be identified from the

data, comment and qualify using professional judgment, but qualify at a minimum as estimated [J 224].

Item 7: Verify that the correct amount of sample was processed for the TCLP.

Action 7: If the net sample weight processed for TCLP VOA is less than 25 grams, use professional judgment to determine if the sample size is too small. Consider the physical state of the sample, the availability of sample, potential mixed waste issues (waste minimization priority), and whether particle size reduction was performed. At a minimum, comment and assign the reason code [123].

Item 8: Verify that the extraction period was within 16 to 20 hours.

Action 8: If the extraction start and end dates and times are not available or if the extraction time is not within 16-20 hours, use professional judgment to evaluate the data. Results near the regulatory limit may be biased low if the extraction time is less than 16 hours and results just above the regulatory limit may be biased high if the extraction time is greater than 20 hours. Results just below the regulatory limit that are suspected of low bias due to an insufficiently short extraction time are Rejected [R 225].

Item 9: Verify that TCLP Extracts were preserved appropriately, if analysis was not completed immediately.

Action 9: If the TCLP Extracts were not analyzed immediately after extraction and were not preserved at $4 \pm 2^\circ \text{C}$ after extraction, comment and qualify all results less than the regulatory limit as estimated [J 201].

Item 10: Verify that a minimum of one TCLP Spike, Blank, and Duplicate are processed per waste type, preparation batch and extraction fluid type.

Action 10: If evidence of a spiked sample, duplicate sample, or extraction blank are not provided, comment and qualify all results as rejected [R 168].

Item 11: Verify that the ambient temperature during the extraction was maintained at $23 \pm 2^\circ \text{C}$.

Action 11: If the ambient temperature during TCLP extraction was not maintained at $23 \pm 2^\circ \text{C}$, estimate [J 201] all results less than the regulatory limit.

3. DATA QUALITY ASSESSMENT REPORT PREPARATION

Prepare a Data Quality Assessment Report according to the General Data Assessment guidelines presented in DA-GR01. A Data Quality Assessment Report template for DV-SS01 is presented as Attachment 1.

4. REFERENCES

- USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, October 1999.
- Reason Codes for Data Assessment, Analytical Services Document
- RFETS BOA Implementation Requirements, GR03 Version A.5
- RFETS BOA Implementation Requirements, GR04 Version A
- Basic Ordering Agreement (BOA) for Laboratory Analytical Services administered by Westinghouse Savannah River Company on behalf of the Department of Energy.

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ATTACHMENT 1: DATA QUALITY ASSESSMENT REPORT TEMPLATE

VOA

**Data Quality Assessment Report
Rocky Flats Environmental Technology Site**

RIN Number	Analytical Method/Analytical Specific Line Item Code		Review Level
Analytical Laboratory	Assessment Performed by	Data Assessment Guideline Identifiers	Number of Samples

Sample Numbers: _____

Quality Control Items	Reviewed (Y or N)	Non-Compliance Identified
General (Cover Page, Narrative)		
Chain of Custody		
Holding Times		
Sample Preservation		
Surrogate Recovery		
Matrix Spike/Matrix Spike Duplicate		
Instrument Performance Check		
Internal Standards		
Sample Results		
Tentatively Identified Compounds		
Calibration		
Quality Control Check Samples		
Blanks		
EDD		
Other:		

Y Item was reviewed or non-compliance was identified
 N Item was not reviewed or non-compliance was not identified
 N/A Item is not applicable to the Line Item

VOA
Data Quality Assessment Report
Rocky Flats Environmental Technology Site

Data Assessment results are classified as either Action Items or Comments. Action Items are technical non-compliances that result in qualification of analytical results. Data may be qualified as valid (V), estimated (J), presumptively estimated (NJ), estimated at an elevated level of detection (UJ), or rejected (R). Multiple qualifiers may be associated with any given data point based on the number of problems identified, however, the assigned qualifier is based upon the following hierarchy: R, UJ, NJ, J, V. All data points that are not qualified based upon action items in this report are considered valid (V). Comments are technical non-compliances or contractual non-compliances that do not result in qualification of data.

Action Items:

Comments:

Verification/Validation Signature _____

Date: _____

Reviewer Signature _____
(Validation Only)

Date: _____

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