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Appendix B

SUMMARY OF CALIBRATION, INTERNAL QUALITY CONTROL, AND CORRECTIVE ACTION PROCEDURES

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Appendix B General Notes:

For methods that have no specific sample preparation steps to form a unique batch, the requirements for the analysis of the ICV and the LCS may be met by the analysis of a single standard. For continuous run analyses (such as TO-15) where a CCV/LCS is analyzed between each set of samples, a single standard analysis can be treated as the LCS for the group of samples that it falls just before and the LCSD for the group of samples that it falls just after.

All references to batch in Appendix B refer to the preparation batch.

Table B-1. Summary of Calibration and Internal Quality Control Procedures for Metals by ICP (EPA Method 6010B)

Method	Parameter	Calibration	Frequency	Acceptance Criteria	Corrective Action
SW6010B	Metals	Initial calibration (ICAL) Option 1: (minimum three standards plus a blank), low standard at the MQL	Daily, prior to sample analysis, or Biannually to establish linear range if Option 2 is chosen.	r≥0.995	1) Repeat outlying points. 2) Recalculate using valid points 3) If still out, correct problem and recalibrate.
		Initial calibration option 2: (single high standard, blank, and MQL check standard)	Initially/as needed; must be done one time per 24 hours	High std RSD <5% MQL check within ±30% of expected value	1) Repeat outlying points. 2) Recalculate using valid points 3) If still out, correct problem and recalibrate.
		Instrument Precision	Each calibration and calibration verification standard (ICAL/ICV/CCV)	%RSD of three exposures <5%	1) Repeat outlying points. 2) Recalculate using valid points. 3) If still out, correct problem and recalibrate. 4) Reanalyze all samples not bracketed by passing (ICV/CCVs).
		Second Source Initial Calibration Verification (ICV)	Daily, immediately following initial calibration	±10% of expected concentration for all metals	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV)	Every 10 samples and at the end of each analytical run	±10% of expected concentration for all metals	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last CCV.
		Calibration blank (ICB, CCB) (undigested).	Prior to sample analyses, after every 10 samples, and at the end of each analytical run	<1/2 MQL	1) Reanalyze calibration blank. 2) If still out, identify and correct problem. 3) Reanalyze samples back to last clean blank. 4) Recalibrate, if necessary.

Table B-1. Summary of Calibration and Internal Quality Control Procedures for Metals by ICP (EPA Method 6010B) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW6010B	Metals	ICP interference check (ICS).	Run at beginning of analytical run.	±20% of expected concentration for spiked analytes; ± 2xMDL for unspiked analytes.	1) Verify calibration. 2) Reanalyze all samples not analyzed with a passing ICS.
		Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results for analytes found in blank >MDL but ≤ 5X MB concentration, reanalyze blank. If passes, report. 6) If still out, re-prepare/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.
		Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. . Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Flag data as matrix interference. 5) If the MS and MSD recoveries differ by more than 25, and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.

Table B-1. Summary of Calibration and Internal Quality Control Procedures for Metals by ICP (EPA Method 6010B) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW6010B	Metals	Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)[1]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-prepare/reanalyze LCS and affected sample batch if sporadic marginal failures[1] allowance has been exceeded. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)[1,2]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCSD is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-prepare/reanalyze LCS and affected sample batch. 5) Narrate any outliers.
		Serial Dilution (five fold)	1 per batch, not to exceed 20 samples, if any concentration >50x MDL prior to dilution	±10% original concentration.	1) If results do not agree within 10%, assume matrix interference. Report any analyte that is above the MQL in the diluted sample from the dilution run. 2) Estimate data from results that must be reported from the undiluted run unless PDS data exist for that sample and analyte, which shows the absence of interferences. Evaluate remaining data for interferences.
		Post Digestion Spike (PDS)	1 per batch, not to exceed 20 samples on the sample chosen for MS analysis. (Not required for Na, K, Ca, or Mg in water or Na, K, Ca, Mg, Al, Fe, and Mn in soil.	±25% original concentration.	1) Check calculations. Evaluate all data (2x rule). 2) If 2x rule broken, re-spike at a higher concentration. 3) If PDS is still out, analyze a PDS for every sample in the batch. 4) Perform MSA on all samples where PSD recovery is not within acceptance criteria.

Table B-1. Summary of Calibration and Internal Quality Control Procedures for Metals by ICP (EPA Method 6010B) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW6010B	Metals	Method of standard additions (MSA)	Any sample/analyte where the post digestion spike does not meet ±25%	r≥0.995	1) Rerun MSA. 2) If still out, report. 3) Narrate any outliers.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required..
		MDL study.	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.

1 Sporadic Marginal Failures (SMFs) will be allowable with control limits of 70% to 130% at the following rate: For 1-6 metals from the same analytical run, no SMFs are allowed. For 7-15 metals reported from the same ICP analysis, 1 SMF is allowed. If greater than 15 metals are reported from the same ICP analysis, two SMFs are allowed.

2 Sporadic Marginal Failures (SMFs) will be allowable with control limits of <25% difference at the following rate: For 1-6 metals from the same analytical run, no SMFs are allowed. For 7-15 metals reported from the same ICP analysis, 1 SMF is allowed. If greater than 15 metals are reported from the same ICP analysis, two SMFs are allowed.

Table B-2. Summary of Calibration and Internal Quality Control Procedures for Metals by ICP/MS (EPA Method 6020)

Method	Parameter	Calibration	Frequency	Acceptance Criteria	Corrective Action
SW6020	Metals	Check of instrument tuning criteria using Mg, Cu, Rh, Pb, Be.	Daily, prior to calibration and sample analysis.	Mass resolution <1.0 amu at 10% peak height and mass calibration ±0.1 amu from the expected value.	1) Retune instrument. 2) Repeat tune solution and analysis.
		Laboratory mixed standard calibration (ICAL).	Daily, prior to sample analysis	$r \geq 0.995$	1) Recalibrate.
		Second Source Initial Calibration Verification (ICV)	Daily, immediately following initial calibration	±10% of expected concentration.	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV)	Every 10 samples and at the end of each analytical run	±10% of expected concentration.	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV.
		Calibration blank (ICB, CCB) (undigested)	Prior to sample analyses, after every 10 samples, and at the end of each analytical run	<1/2 MQL	1) Reanalyze calibration blank. 2) If still out, identify and correct problem. 3) Reanalyze samples back to last clean blank. 4) Recalibrate, if necessary.
		Interference Check Sample.	Beginning and end of run, after every 12 hours.	Within control limits specified by instrument manufacturer.	1) Suspend analysis. 2) Check correction factors. 3) Reanalyze affected samples.

Table B-2. Summary of Calibration and Internal Quality Control Procedures for Metals by ICP/MS (EPA Method 6020) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW6020	Metals	Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results >MDL but ≤ 5X MB concentration, reanalyze blank. If passes, report. 6) If still out, re-prepare/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.
		Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Flag data as matrix interference. 5) If the MS and MSD recoveries differ by more than 25, and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.
		Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)[1]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-prepare/reanalyze LCS and affected sample batch. 5) Narrate any outliers.

Table B-2. Summary of Calibration and Internal Quality Control Procedures for Metals by ICP/MS (EPA Method 6020) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW6020	Metals	Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)[1,2]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCSD is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-prepare/reanalyze LCS and affected sample batch. 5) Narrate any outliers.
		Internal Standard (IS)	Each blank, standard, QC and sample of the associated IS in the initial calibration blank	30%≤ x ≤ 120%, where x is the intensity.	1) Check calculations. 2) Dilute the digestate 5x and reanalyze. Repeat if needed. 3) Narrate any outliers.
		Serial Dilution (five fold)	1 per batch, not to exceed 20 samples, if any concentration >50x MDL prior to dilution	±10% original concentration.	1) If results do not agree within 10%, assume matrix interference. Report any analyte that is above the MQL in the diluted sample from the dilution run. 2) Estimate data from results that must be reported from the undiluted run unless PDS data exist for that sample and analyte, which shows the absence of interferences. Evaluate remaining data for interferences.
		Post Digestion Spike (PDS)	1 per batch, not to exceed 20 samples on the sample chosen for MS analysis. (Not required for Na, K, Ca, or Mg in water or Na, K, Ca, Mg, Al, Fe, and Mn in soil.	±25% original concentration.	1) Check calculations. Evaluate all data (2x rule). 2) If 2x rule broken, re-spike at a higher concentration. 3) If PDS is still out, analyze a PDS for every sample in the batch. 4) Perform MSA on all samples where PSD recovery is not within acceptance criteria.
		Method of standard additions (MSA)	Any sample/analyte where the post digestion spike does not meet ±25%	r≥0.995	1) Rerun MSA. 2) If still out, report. 3) Narrate any outliers.

Table B-2. Summary of Calibration and Internal Quality Control Procedures for Metals by ICP/MS (EPA Method 6020) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW6020	Metals	MDL study.	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required..

1 Sporadic Marginal Failures (SMFs) will be allowable with control limits of 70% to 130% at the following rate: For 1-6 metals from the same analytical run, no SMFs are allowed. For 7-15 metals reported from the same ICP/MS analysis, 1 SMF is allowed. If greater than 15 metals are reported from the same ICP/MS analysis, two SMFs are allowed.

2 Sporadic Marginal Failures (SMFs) will be allowable with control limits of <25% difference at the following rate: For 1-6 metals from the same analytical run, no SMFs are allowed. For 7-15 metals reported from the same ICP/MS analysis, 1 SMF is allowed. If greater than 15 metals are reported from the same ICP/MS analysis, two SMFs are allowed.

Table B-3 Summary of Calibration and Internal Quality Control Procedures for Metals by GFAA and Organic Lead (7000 Series Methods)

Method	Parameter	Calibration	Frequency	Acceptance Criteria	Corrective Action
SW7000 Series and Organic Lead	Metals	Multipoint calibration (minimum three points plus blank) (ICAL), low standard at the MQL.	Daily, prior to sample analysis.	$r \geq 0.995$ and intercept < ±MDL	1) Repeat outlying points. 2) Recalculate using valid points. 3) If still out, correct problem and recalibrate.
		Instrument Precision	Each calibration and calibration verification standard (ICAL/ICV/CCV)	RPD of 2 injections <10%	1) Repeat outlying points. 2) Recalculate using valid points. 3) If still out, correct problem and recalibrate.
		Second Source Initial Calibration Verification (ICV)	Daily, immediately following initial calibration	±10% of expected concentration.	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV)	Every 10 samples and at the end of each analytical run	±20% of expected concentration.	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV.
		Calibration blank (ICB, CCB)	Prior to sample analyses, after every 10 samples, and at the end of each analytical run	<1/2 MQL	1) Reanalyze calibration blank. 2) If still out, identify and correct problem. 3) Reanalyze samples back to last clean blank. 4) Recalibrate, if necessary.
		Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results for analytes found in >MDL but ≤ 5X MB concentration, reanalyze blank. If passes, report. 6) If still out, re-prepare/reanalyze all samples processed with the contaminated blank. 7) Flag results associated with blank contamination.

Table B-3. Summary of Calibration and Internal Quality Control Procedures for Metals by GFAA and Organic Lead (7000 Series Methods) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW7000 Series and Organic lead	Metals	Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Flag data as matrix interference. 5) If the MS and MSD recoveries differ by more than 25, and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.
		Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-prepare/reanalyze LCS and affected sample batch. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCSD is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-prepare/reanalyze LCS and affected sample batch. 5) Narrate any outliers.

Table B-3. Summary of Calibration and Internal Quality Control Procedures for Metals by GFAA and Organic Lead (7000 Series Methods) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW7000 Series and Organic lead		Serial Dilution	1 per batch, if at least one concentration is >25x MDL	+10% original concentration.	1) If final dilution is not within +10%, perform post digestion spike
		Post Digestion Spike (PDS)	If serial dilution does not meet ±10% of original concentration, or if all concentrations <25x MDL.	+15% of expected concentration	1) Check calculations. Evaluate all data (2x rule). 2) If 2x rule broken, re-spike at a higher concentration. 3) If PDS is still out, analyze a PDS for every sample in the batch. 4) Perform MSA on all samples where PSD recovery is not within acceptance criteria.
		Method of standard additions (MSA)	If serial dilution does not meet +10% and the analytical spike does not meet +15%	r≥0.995	4) Rerun MSA. 5) If still out, report. 6) Narrate any outliers.
		MDL study.	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required..

Table B-4. Summary of Calibration and Internal Quality Control Procedures for Mercury by CVAA (EPA Methods 7470A/7471A)

Method	Parameter	Calibration	Frequency	Acceptance Criteria	Corrective Action
SW7470A, SW7471A	Mercury	Multipoint calibration (minimum five points plus blank) (ICAL), low standard at the MQL.	Daily, prior to sample analysis.	$r \geq 0.995$ and intercept < ±MDL	1) Repeat outlying points. 2) Recalculate using valid points. 3) If still out, correct problem and recalibrate.
		Second Source Initial Calibration Verification (ICV)	Daily, immediately following initial calibration	±10% of expected concentration.	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV)	Every 10 samples and at the end of each analytical run	±20% of expected concentration.	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV.
		Calibration blank (ICB, CCB)	Prior to sample analyses, after every 10 samples, and at the end of each analytical run	<1/2 MQL	1) Reanalyze calibration blank. 2) If still out, identify and correct problem. 3) Reanalyze samples back to last clean blank. 4) Recalibrate, if necessary.
		Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results for analytes found in blank >MDL but ≤ 5X MB concentration, reanalyze blank. If passes, report. 6) If still out, re-prepare/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.

Table B-4. Summary of Calibration and Internal Quality Control Procedures for Mercury By CVAA (EPA Methods 7470A/7471A) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW7470A SW7471A	Mercury	Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Flag data as matrix interference. 5) If the MS and MSD recoveries differ by more than 25, and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.
		Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-prepare/reanalyze LCS and affected sample batch. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCSD is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-prepare/reanalyze LCS and affected sample batch. 5) Narrate any outliers.
		MDL study	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required..

Table B-5. Summary of Calibration and Internal Quality Control Procedures for Hexavalent Chromium (EPA Method 7196A)

Method	Parameter	Calibration	Frequency	Acceptance Criteria	Corrective Action
SW7196A	Hexavalent Chromium	Multipoint calibration (minimum three points) (ICAL), low standard at the MQL.	Daily, prior to sample analysis.	$r \geq 0.995$ and intercept < ±MDL	1) Evaluate system. 2) Recalibrate.
		Second Source Initial Calibration Verification (ICV)	Daily, immediately following initial calibration	±10% of expected concentration.	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV)	Every 10 samples and at the end of each analytical run	±10% of expected concentration.	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV.
		Instrument Blank	After any sample with a concentration > 5x high standard.	<1/2 MQL	1) Reanalyze calibration blank. 2) If still out, identify and correct problem. 3) Reanalyze samples back to last clean blank. 4) Recalibrate, if necessary.
		Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results for analytes found in blank >MDL but ≤ 5X MB concentration, reanalyze blank. If passes, report. 6) If still out, re-prepare/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.
		MDL study	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQL in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.

Table B-5. Summary of Calibration and Internal Quality Control Procedures for Hexavalent Chromium (EPA Method 7196A) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW7196A	Hexavalent Chromium	Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Flag data as matrix interference. 5) If the MS and MSD recoveries differ by more than 25, and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.
		Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-prepare/reanalyze LCS and affected sample batch. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCSD is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-prepare/reanalyze LCS and affected sample batch. 5) Narrate any outliers.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required..

Table B-6. Summary of Calibration and Internal Quality Control Procedures for Total Petroleum Hydrocarbons by GC (EPA Method 8015B)

Method	Parameter	QA Element	Frequency	Acceptance Criteria	Corrective Action
SW8015B	Total Petroleum Hydrocarbons	Initial Calibration (minimum five points) (ICAL), low standard at the MQL.	Initially and as needed.	%RSD ≤ 20% or r ≥ 0.995 with intercept ± MDL	1) Evaluate system. 2) Recalibrate
		Initial Calibration Verification (ICV) (gasoline, diesel). (Second Source preferred)	Once immediately following ICAL.	± 20% of expected concentration.	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV).	At the start of the run, every 10 samples and at the end of each analytical run.	± 15% of expected concentration.	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV.
		MDL study	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Instrument Blank	After any sample with the concentration of any analyte > 5x high standard.	< MDL	1) Run until system is clean. 2) Bake-out system. 3) Perform maintenance. 4) If not performed after a high concentration sample (e.g., due to use of an autosampler) the two samples immediately following the high concentration sample should be reanalyzed if the analyte that was high is detected.

Table B-6. Summary of Calibration and Internal Quality Control Procedures for Total Petroleum Hydrocarbons by GC (EPA Method 8015B) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8015B	Total Petroleum Hydrocarbons	Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results for analytes found in blank >MDL but ≤ 5X MB concentration, reanalyze blank. If passes, report. 6) If still out, re-prepare/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.
		Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-prepare/reanalyze LCS and affected sample batch. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCSD is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-extract/reanalyze LCS and affected sample batch. 5) Narrate any outliers.
		Surrogate Spike	Every sample, including QC	Control Limits (Appendix C)	1) Check calculations, standards, and system. 2) Evaluate impact on data. 3) Evaluate batch for adverse trends. 4) If any analyte not ND, re-analyze sample. 5) If not acceptable, re-extract/reanalyze sample. (Use an additional cleanup procedure for extractable TPH if recovery was <10%.) 6) If second analysis confirms matrix interference, consider cleanup procedures (contact client). 7) Narrate any outliers.

Table B-6. Summary of Calibration and Internal Quality Control Procedures for Total Petroleum Hydrocarbons by GC (EPA Method 8015B) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8015B	Total Petroleum Hydrocarbons	Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Consider cleanup (discuss with client). If cleanup is inappropriate or ineffective, flag data as matrix interference. If cleanup is effective, consider reanalysis of entire batch using cleanup procedure (discuss with client). 5) If the MS and MSD recoveries do not agree within ±25 and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required..

Table B-7. Summary of Calibration and Internal Quality Control Procedures for Aromatic and Halogenated Volatile Organics by GC (EPA Method 8021B)

Method	Parameter	QA Element	Frequency	Acceptance Criteria	Corrective Action
SW8021B	Aromatic and Halogenated Volatile Organics	Multipoint calibration (minimum five) (ICAL), low standard at the MQL.	Initially and as needed.	%RSD ≤ 20% or r≥ 0.995 with intercept <±MDL for each compound **OR** mean %RSD ≤20% for all analytes with no individual %RSD >40%.	1) Evaluate system. 2) Recalibrate
		Second Source Initial Calibration Verification (ICV).	Once immediately following ICAL.	± 20% of expected concentration.	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV).	At the beginning of the run, every 10 samples and at the end of each analytical run.	± 15% of expected concentration (± 20% for gasses).	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV.
		MDL study	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis
		Instrument Blank	After any sample with the concentration of any analyte > 5x high standard.	<MDL	1) Run until system is clean. 2) Bake-out system. 3) Perform maintenance. 4) If not performed after a high concentration sample (e.g., due to use of an autosampler) the two samples immediately following the high concentration sample should be reanalyzed if the analyte that was high is detected.

Table B-7. Summary of Calibration and Internal Quality Control Procedures for Aromatic and Halogenated Volatile Organics by GC (EPA Method 8021B) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8021B	Aromatic and Halogenated Volatile Organics	Method Blank (MB)	1 per batch, not to exceed 20 samples	< ½ MQL (Common lab contaminants <MQL)	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results for analytes found in blank >MDL but ≤ 5X MB concentration (10X for common lab contaminants), reanalyze blank. If passes, report. 6) If still out, re-prepare/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.
		Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)[1]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-prepare/reanalyze LCS and affected sample batch if sporadic marginal failures[1] allowance has been exceeded. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)[1,2]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-prepare/reanalyze LCSD and affected sample batch. 5) Narrate any outliers.
		Surrogate Spike	Every sample, including QC	Control Limits (Appendix C)	1) Check calculations, standards, and system. 2) Evaluate impact on data. 3) Evaluate batch for adverse trends. 4) If any analyte not ND, re-analyze sample. 5) If not acceptable, re-prepare/reanalyze sample. 6) Narrate any outliers.

Table B-7. Summary of Calibration and Internal Quality Control Procedures for Aromatic and Halogenated Volatile Organics by GC (EPA Method 8021B) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8021B	Aromatic and Halogenated Volatile Organics	Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data 2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within 25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Flag data as matrix interference. 5) If the MS and MSD recoveries differ by more than 25, and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required.

1 Sporadic Marginal Failures (SMFs) will be allowable with control limits of 55% to 145% at the following rate: If the SW8020 list is reported, 1 SMF is allowed. If the SW8010 list is reported, 2 SMFs are allowed. If the full target analyte list is reported, 3 SMFs are allowed.

2 Sporadic Marginal Failures (SMFs) will be allowable with control limits of <35% difference at the following rate: If the SW8020 list or BTEX/MTBE are reported, 1 SMF is allowed. If the SW8010 list is reported, 2 SMFs are allowed. If the full target analyte list is reported, 3 SMFs are allowed.

Table B-8. Summary of Calibration and Internal Quality Control Procedures for Total Recoverable Petroleum Hydrocarbons (EPA Method 8440)

Method	Parameter	QA Element	Frequency	Acceptance Criteria	Corrective Action
SW8440	Total Recoverable Petroleum Hydrocarbons	Multipoint calibration (minimum five points) (ICAL), low standard at the MQL.	Daily, prior to sample analysis.	%RSD ≤ 20% or r≥ 0.995 with intercept <±MDL	1) Evaluate system. 2) Recalibrate.
		Second Source Initial Calibration Verification (ICV)	Daily, immediately following initial calibration.	± 20% of expected concentration.	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV).	At the beginning of the run, every 10 samples and at the end of each analytical run.	± 15 % of expected concentration.	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV.
		Instrument Blank	After any sample with the concentration of any analyte > 5x high standard	<MDL	1) Run until system is clean. 2) Bake-out system. 3) Perform maintenance. 4) If not performed after a high concentration sample (e.g., due to use of an autosampler) the two samples immediately following the high concentration sample should be reanalyzed if the analyte that was high is detected.
		Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results for analytes found in blank >MDL but ≤ 5X MB concentration, reanalyze blank. If passes, report. 6) If still out, re-extract/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.

Table B-8. Summary of Calibration and Internal Quality Control Procedures for Total Recoverable Petroleum Hydrocarbons (EPA Method 8440) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8440	Total Recoverable Petroleum Hydrocarbons	MDL study.	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Flag data as matrix interference. 5) If the MS and MSD recoveries differ by more than 25, and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.
		Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-extract/reanalyze LCS and affected sample batch. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-extract/reanalyze LCSD and affected sample batch. 5) Narrate any outliers.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required..

Table B-9. Summary of Calibration and Internal Quality Control Procedures for Phenols (EPA Method 8041)

Method	Parameter	QA Element	Frequency	Acceptance Criteria	Corrective Action
SW8041	Phenols	Multipoint calibration (minimum five points) (ICAL), low standard at the MQL.	Initially and as needed	%RSD ≤ 20% or r≥ 0.995 with intercept <±MDL for each compound **OR** mean %RSD ≤20% for all analytes with no individual %RSD >40%.	1) Evaluate system. 2) Recalibrate.
		Second Source Initial Calibration Verification (ICV)	Once immediately following ICAL.	±20% of expected concentration.	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV).	At the beginning of the run, every 10 samples and at the end of each analytical run	± 15 % of expected concentration.	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV.
		MDL study.	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Instrument Blank	After any sample with the concentration of any analyte > 5x high standard	<MDL	1) Run until system is clean. 2) Bake-out system. 3) Perform maintenance. 4) If not performed after a high concentration sample (e.g., due to use of an autosampler) the two samples immediately following the high concentration sample should be reanalyzed if the analyte that was high is detected.

Table B-9. Summary of Calibration and Internal Quality Control Procedures for Phenols (EPA Method 8041) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8041	Phenols	Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results for analytes found in blank are not ND, reanalyze blank. If passes, report. 6) If still out, re-extract/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.
		Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)[1]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-extract/reanalyze LCS and affected sample batch if sporadic marginal failures[1] allowance has been exceeded. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)[1,2]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-extract/reanalyze LCSD and affected sample batch. 5) Narrate any outliers.
		Surrogate Spike	Every sample, including QC	Control Limits (Appendix C)	1) Check calculations, standards, and system. 2) Evaluate impact on data (2x rule). 3) Evaluate batch for adverse trends. 4) If any analyte not ND, re-analyze sample. 5) If not acceptable, re-extract/reanalyze sample. (Use a cleanup procedure if recovery was <10%.) 6) If second analysis confirms matrix interference, consider cleanup procedures (contact client). 7) Narrate any outliers.

Table B-9. Summary of Calibration and Internal Quality Control Procedures for Phenols (EPA Method 8041) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8041	Phenols	Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Consider cleanup (discuss with client). If cleanup is inappropriate or ineffective, flag data as matrix interference. If cleanup is effective, consider reanalysis of entire batch using cleanup procedure (discuss with client). 5) If the MS and MSD do not agree within 25% and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required..

1 Sporadic Marginal Failures (SMFs) will be allowable with control limits of 55% to 145% at the following rate: One SMF will be allowable if at least 7 of the target analytes are reported.
2 Sporadic Marginal Failures (SMFs) will be allowable with control limits of <35% difference at the following rate: One SMF will be allowable if at least 7 of the target analytes are reported.

Table B-10. Summary of Calibration and Internal Quality Control Procedures for Organochlorine Pesticides (EPA Method 8081A)

Method	Parameter	QA Element	Frequency	Acceptance Criteria	Corrective Action
SW8081A	Organochlorine Pesticides	Multipoint calibration (minimum five points) (ICAL), low standard at the MQL.	Initially and as needed.	%RSD ≤ 20% or r≥ 0.995 with intercept <±MDL for each compound **OR** mean %RSD ≤20% for all analytes with no individual %RSD >40%.	1) Evaluate system. 2) Recalibrate.
		Second Source Initial Calibration Verification (ICV)	Once immediately following ICAL.	±20% of expected concentration.	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV) (for single component pesticides)	At the beginning of the run, every 10 samples and at the end of each analytical run.	± 15 % of expected concentration.	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV.
		Degradation standard (Eval B)	Every 24 hours of analysis.	Breakdown of endrin or 4,4-DDT ≤15 percent.	1) Evaluate system. 2) Perform system maintenance. 3) Recalibrate as necessary.
		MDL study	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Instrument Blank	After any sample with the concentration of any analyte > 5x high standard.	<MDL	1) Run until system is clean. 2) Bake-out system. 3) Perform maintenance. 4) If not performed after a high concentration sample (e.g., due to use of an autosampler) the two samples immediately following the high concentration sample should be reanalyzed if the analyte that was high is detected.

Table B-10. Summary of Calibration and Internal Quality Control Procedures for Organochlorine Pesticides (EPA Method 8081A) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8081A	Organochlorine Pesticides	Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results for analytes found in blank > MDL but < 5X MB concentration, reanalyze blank. If passes, report. 6) If still out, re-extract/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.
		Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Consider cleanup (discuss with client). If cleanup is inappropriate or ineffective, flag data as matrix interference. If cleanup is effective, consider reanalysis of entire batch using cleanup procedure (discuss with client). 5) If the MS and MSD do not agree within 25% and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.
		Surrogate Spike	Every sample, including QC	Control Limits (Appendix C)	1) Check calculations, standards, and system. 2) Evaluate impact on data. 3) Evaluate batch for adverse trends. 4) If any analyte not ND, re-analyze sample. 5) If not acceptable, re-extract/reanalyze sample. (Use a cleanup procedure if recovery was <10%.) 6) If second analysis confirms matrix interference, consider cleanup procedures (contact client). 7) Narrate any outliers.

Table B-10. Summary of Calibration and Internal Quality Control Procedures for Organochlorine Pesticides (EPA Method 8081A) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8081A	Organochlorine Pesticides	Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)[1]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-extract/reanalyze LCS and affected sample batch if sporadic marginal failures[1] allowance has been exceeded. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)[1,2]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-extract/reanalyze LCSD and affected sample batch. 5) Narrate any outliers.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required..

1 Sporadic Marginal Failures (SMFs) will be allowable with control limits of 40% to 155% at the following rate: One SMF will be allowable if at least 7 of the target analytes are reported, two SMFs will be allowable if greater than 15 target analytes are reported.

2 Sporadic Marginal Failures (SMFs) will be allowable with control limits of <45% difference at the following rate: One SMF will be allowable if at least 7 of the target analytes are reported, two SMFs will be allowable if greater than 15 target analytes are reported.

Table B-11. Summary of Calibration and Internal Quality Control Procedures for PCBs (EPA Method 8082)

Method	Parameter	QA Element	Frequency	Acceptance Criteria	Corrective Action
SW8082	PCBs	Multipoint calibration (minimum five points) (ICAL), low standard at the MQL[a].	Initially and as needed.	%RSD ≤ 20% or r≥ 0.995 with intercept <±MDL	1) Evaluate system. 2) Recalibrate.
		Second Source Initial Calibration Verification (ICV).	Once immediately following ICAL.	±20% of expected concentration.	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV).	At the beginning of the run, every 10 samples and at the end of each analytical run .	± 15 % of expected concentration.	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV.
		MDL study.	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Instrument Blank	After any sample with the concentration of any analyte > 5x high standard	<1/2 MQL	1) Run until system is clean. 2) Bake-out system. 3) Perform maintenance. 4) If not performed after a high concentration sample (e.g., due to use of an autosampler) the two samples immediately following the high concentration sample should be reanalyzed if the analyte that was high is detected.

Note:

[a] Use a mixture of Aroclor 1016 and 1260 unless project objectives specify a different Aroclor. Initially perform a single calibration for additional Aroclors. If other Aroclor(s) are observed in samples, reanalyze samples after performing a five point calibration for the observed Aroclor.

Table B-11. Summary of Calibration and Internal Quality Control Procedures for PCBs (EPA Method 8082) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8082	PCBs	Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results for analytes found in blank > MDL but < 5X MB concentration, reanalyze blank. If passes, report. 6) If still out, re-extract/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.
		Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc. compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Consider cleanup (discuss with client). If cleanup is inappropriate or ineffective, flag data as matrix interference. If cleanup is effective, consider reanalysis of entire batch using cleanup procedure (discuss with client). 5) If the MS and MSD recoveries do not agree within ±25 and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.
		Surrogate Spike	Every sample, including QC	Control Limits (Appendix C)	1) Check calculations, standards, and system. 2) Evaluate impact on data. 3) Evaluate batch for adverse trends. 4) If any analyte not ND, re-analyze sample. 5) If not acceptable, re-extract/reanalyze sample. (Use a cleanup procedure if recovery was <10%.) 6) If second analysis confirms matrix interference, consider cleanup procedures (contact client). 7) Narrate any outliers.

Table B-11. Summary of Calibration and Internal Quality Control Procedures for PCBs (EPA Method 8082) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8082	PCBs	Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-extract/reanalyze LCS and affected sample batch. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-extract/reanalyze LCSD and affected sample batch. 5) Narrate any outliers.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required..

Table B-12. Summary of Calibration and Internal Quality Control Procedures for Organophosphorus Pesticides (EPA Method 8141A)

Method	Parameter	QA Element	Frequency	Acceptance Criteria	Corrective Action
SW8141A	Organophosphorus Pesticides	Multipoint calibration (minimum five points) (ICAL), low standard at the MQL.	Initially and as needed.	%RSD ≤ 20% or r≥ 0.995 with intercept <±MDL for each compound **OR** mean %RSD ≤20% for all analytes with no individual %RSD >40%.	1) Evaluate system. 2) Recalibrate.
		Second Source Initial Calibration Verification (ICV)	Once immediately following ICAL.	±20% of expected concentration.	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV).	At the beginning of the run, every 10 samples and at the end of each analytical run.	± 15 % of expected concentration.	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV.
		MDL study.	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Instrument Blank	After any sample with the concentration of any analyte > 5x high standard	<1/2 MQL	1) Run until system is clean. 2) Bake-out system. 3) Perform maintenance. 4) If not performed after a high concentration sample (e.g., due to use of an autosampler) the two samples immediately following the high concentration sample should be reanalyzed if the analyte that was high is detected.

Table B-12. Summary of Calibration and Internal Quality Control Procedures for Organophosphorus Pesticides (EPA Method 8141A) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8141A	Organophosphorus Pesticides	Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results for analytes found in blank > MDL but < 5X MB concentration, reanalyze blank. If passes, report. 6) If still out, re-extract/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.
		Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Consider cleanup (discuss with client). If cleanup is inappropriate or ineffective, flag data as matrix interference. If cleanup is effective, consider reanalysis of entire batch using cleanup procedure (discuss with client). 5) If the MS and MSD recoveries do not agree within ±25 and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.
		Surrogate Spike	Every sample, including QC	Control Limits (Appendix C)	1) Check calculations, standards, and system. 2) Evaluate impact on data. 3) Evaluate batch for adverse trends. 4) If any analyte not ND, re-analyze sample. 5) If not acceptable, re-extract/reanalyze sample. (Use a cleanup procedure if recovery was <10%.) 6) If second analysis confirms matrix interference, consider cleanup procedures (contact client). 7) Narrate any outliers.

Table B-12. Summary of Calibration and Internal Quality Control Procedures for Organophosphorus Pesticides (EPA Method 8141A) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8141A	Organophosphorus Pesticides	Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)[1]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-extract/reanalyze LCS and affected sample batch if sporadic marginal failures[1] allowance has been exceeded.. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)[1,2]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-extract/reanalyze LCSD and affected sample batch. 5) Narrate any outliers.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required..

1 Sporadic Marginal Failures (SMFs) will be allowable with control limits of 30% to 150% at the following rate: One SMF will be allowable if at least 7 of the target analytes are reported. Two SMFs will be allowed if the full target analyte list is reported.

2 Sporadic Marginal Failures (SMFs) will be allowable with control limits of <45% difference at the following rate: One SMF will be allowable if at least 7 of the target analytes are reported. Two SMFs will be allowed if the full target analyte list is reported.

Table B-13. Summary of Calibration and Internal Quality Control Procedures for Chlorinated Herbicides (EPA Method 8151A)

Method	Parameter	QA Element	Frequency	Acceptance Criteria	Corrective Action
SW8151A	Chlorinated Herbicides	Multipoint calibration (minimum five points) (ICAL), low standard at the MQL.	Initially and as needed.	%RSD ≤ 20% or r≥ 0.995 with intercept <±MDL for each compound **OR** mean %RSD ≤20% for all analytes with no individual %RSD >40%.	1) Evaluate system. 2) Recalibrate.
		Second Source Initial Calibration Verification (ICV)	Once immediately following ICAL.	±20% of expected concentration.	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV).	At the beginning of the run, every 10 samples and at the end of each analytical run.	± 15 % of expected concentration.	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV.
		MDL study.	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Instrument Blank	After any sample with the concentration of any analyte > 5x high standard	<1/2 MQL	1) Run until system is clean. 2) Bake-out system. 3) Perform maintenance. 4) If not performed after a high concentration sample (e.g., due to use of an autosampler) the two samples immediately following the high concentration sample should be reanalyzed if the analyte that was high is detected.

Table B-13. Summary of Calibration and Internal Quality Control Procedures for Chlorinated Herbicides (EPA Method 8151A) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8151A	Chlorinated Herbicides	Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results for analytes found in blank > MDL but < 5X MB concentration, reanalyze blank. If passes, report. 6) If still out, re-extract/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.
		Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Consider cleanup (discuss with client). If cleanup is inappropriate or ineffective, flag data as matrix interference. If cleanup is effective, consider reanalysis of entire batch using cleanup procedure (discuss with client). 5) If the MS and MSD recoveries do not agree within ±25 and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.
		Surrogate Spike	Every sample, including QC	Control Limits (Appendix C)	1) Check calculations, standards, and system. 2) Evaluate impact on data. 3) Evaluate batch for adverse trends. 4) If any analyte not ND, re-analyze sample. 5) If not acceptable, re-extract/reanalyze sample. (Use a cleanup procedure if recovery was <10%.) 6) If second analysis confirms matrix interference, consider cleanup procedures (contact client). 7) Narrate any outliers.

Table B-13. Summary of Calibration and Internal Quality Control Procedures for Chlorinated Herbicides (EPA Method 8151A) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8151A	Chlorinated Herbicides	Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)[1]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-extract/reanalyze LCS and affected sample batch if sporadic marginal failures[1] allowance has been exceeded.. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)[1,2]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-extract/reanalyze LCSD and affected sample batch. 5) Narrate any outliers.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required..

1 Sporadic Marginal Failures (SMFs) will be allowable with control limits of 45% to 145% at the following rate: One SMF will be allowable if at least 7 of the target analytes are reported.
2 Sporadic Marginal Failures (SMFs) will be allowable with control limits of <35% difference at the following rate: One SMF will be allowable if at least 7 of the target analytes are reported.

Table B-14. Summary of Calibration and Internal Quality Control Procedures for Volatile Organic Compounds by GC/MS (EPA Method 8260B)

Method	Parameter	QA Element	Frequency	Acceptance Criteria	Corrective Action
SW8260B	Volatile Organic Compounds	Check of instrument tuning criteria using BFB.	Every 12 hours.	Refer to Table B-15	1) Retune instrument. 2) Repeat BFB analysis.
		Multipoint calibration (minimum five points) (ICAL), low standard at the MQL.	Initially and as needed	%RSD for CCCs ≤ 30%, Avg. %RSD for all other compounds ≤15% with no individual compound % RSD ≥ 30% **OR** r≥0.995 with intercept <±MDL; Avg. RF≥0.30 (0.1 for bromoform, chloromethane, and 1,1-DCA) for SPCCs; Avg. RF≥0.050 for all other compounds except oxygenates (≥0.025) and ketones and vinyl acetate (≥0.01).	1) Evaluate system. 2) Recalibrate.
		Second Source Initial Calibration Verification.	Once per five-point ICAL	All compounds within ±25% of expected concentrations. Ave. RF requirements the same as for the ICAL.	1) Correct problem 2) Repeat ICAL
		Continuing Calibration Verification (CCV).	Every 12 hours.	% Difference ≤20% for all compounds[1]. Ave. RF requirements the same as for the ICAL.	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV if sporadic marginal failures[1] allowance has been exceeded.
		MDL study.	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.

Note: Laboratory will use tables and criteria specified in method for calibration and tuning GC/MS.

Table B-14. Summary of Calibration and Internal Quality Control Procedures for Volatile Organic Compounds by GC/MS (EPA Method 8260B) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8260B	Volatile Organic Compounds	Instrument Blank	After any sample with the concentration of any analyte > 5x high standard	<1/2 MQL	1) Run until system is clean. 2) Bake-out system. 3) Perform maintenance. 4) If not performed after a high concentration sample (e.g., due to use of an autosampler) the two samples immediately following the high concentration sample should be reanalyzed if the analyte that was high is detected.
		Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL (Common lab contaminants <MQL)	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration (10x for common lab contaminants), no action. 5) If sample results for analytes found in blank > MDL but < 5X MB concentration (10x for common lab contaminants), reanalyze blank. If passes, report. 6) If still out, re-extract/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.
		Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Flag data as matrix interference. 5) If the MS and MSD recoveries differ by more than 25, and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.

Table B-14. Summary of Calibration and Internal Quality Control Procedures for Volatile Organic Compounds by GC/MS (EPA Method 8260B) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8260B	Volatile Organic Compounds	Surrogate Spike	Every sample, including QC	Control Limits (Appendix C)	1) Check calculations, standards, and system. 2) Evaluate impact on data. 3) Evaluate batch for adverse trends. 4) If any analyte not ND, re-analyze sample. 5) If not acceptable, re-prepare/reanalyze sample. 6) Narrate any outliers.
		Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)[2]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-prepare/reanalyze LCS and affected sample batch if sporadic marginal failures[2] allowance has been exceeded.. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)[1,2]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-prepare/reanalyze LCSD and affected sample batch. 5) Narrate any outliers.
		Internal Standard (IS)	Every sample and continuing calibration standard	Retention time (RT) must be within 30 sec of avg. RT from ICAL; IS area in the samples must be within a factor of 2 of the avg. IS area in the ICAL.	1) Check sensitivity of instrument. 2) Evaluate all data. 3) Reanalyze sample or standard once. 4) Narrate any outliers.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required.

1 Sporadic Marginal Failures (SMFs) will be allowable with control limits of <30% (<35% for poor performers and gases) difference at the following rate: One SMF will be allowable if BTEX/oxygenates are reported. If the full list of 64 compounds is reported, 5 SMFs are allowable.

2 Sporadic Marginal Failures (SMFs) will be allowable with control limits of 60% to 140% (55%-145% for poor performers and gasses) at the following rate: One SMF will be allowable if BTEX/oxygenates are reported. If the full list of 64 compounds is reported, 5 SMFs are allowable.

Table B-15. Bromofluorobenzene Key Ion Abundance Criteria for Volatile Organic Compounds by GC/MS (EPA Method 8260B)

Mass	Ion Abundance Criteria
50	15% to 40% of mass 95
75	30% to 60% of mass 95
95	Base peak, 100% relative abundance
96	5% to 9% of mass 95
173	<2% of mass 174
174	>50% of mass 95
175	5% to 9% of mass 174
176	>95% but <101% of mass 174
177	5% to 9% of mass 176

Reference: EPA Test Methods for Evaluating solid Waste (SW-846), December 1996.

Table B-16. Summary of Calibration and Internal Quality Control Procedure for Semivolatile Organic Compound by GC/MS (EPA Method 8270C)

Method	Parameter	QA Element	Frequency	Acceptance Criteria	Corrective Action
SW8270C	Semivolatile Organic Compounds	Check of instrument tuning criteria using DFTPP.	Every 12 hours.	Refer to Table B-17.	1) Retune instrument. 2) Repeat DFTPP analysis.
		Multipoint calibration (minimum five points) (ICAL).	Initially and as needed.	%RSD for CCCs ≤30%, Avg. %RSD for all other compounds ≤15% with no individual compound % RSD ≥ 30% **OR** r≥0.995 with intercept <±MDL;	1) Evaluate system. 2) Recalibrate.
		Second Source Initial Calibration Verification	Once per five-point ICAL	All analytes within ±25% of expected concentrations.	1) Correct problem 2) Repeat ICAL
		Continuing Calibration Verification (CCV).	Every 12 hours.	% Difference ≤20% for all analytes; Avg. RF≥0.050 for all analytes	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV if sporadic marginal failures[1] allowance has been exceeded.
		MDL study.	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Instrument Blank	After any sample with the concentration of any analyte > 5x high standard	<1/2 MQL	1) Run until system is clean. 2) Bake-out system. 3) Perform maintenance. 4) If not performed after a high concentration sample (e.g., due to use of an autosampler) the two samples immediately following the high concentration sample should be reanalyzed if the analyte that was high is detected.

Table B-16. Summary of Calibration and Internal Quality Control Procedure for Semivolatile Organic Compound by GC/MS (EPA Method 8270C) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8270C	Semivolatile Organic Compounds	Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL (Common lab contaminants <MQL)	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration (10X for common contaminants), no action. 5) If sample results for analytes found in blank > MDL but < 5X MB concentration (10X for common contaminants), reanalyze blank. If passes, report. 6) If still out, re-extract/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.
		Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)[1]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-extract/reanalyze LCS and affected sample batch if sporadic marginal failures[2] allowance has been exceeded. 5) Narrate outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)[1,2]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-extract/reanalyze LCSD and affected sample batch. 5) Narrate any outliers.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required.

Table B-16. Summary of Calibration and Internal Quality Control Procedure for Semivolatile Organic Compound by GC/MS (EPA Method 8270C) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8270C	Semivolatile Organic Compounds	Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Consider cleanup (discuss with client). If cleanup is inappropriate or ineffective, flag data as matrix interference. If cleanup is effective, consider reanalysis of entire batch using cleanup procedure (discuss with client). 5) If the MS and MSD recoveries do not agree within ±25 and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.
		Surrogate Spike	Every sample, including QC	Control Limits (Appendix C)	1) Check calculations, standards, and system. 2) Evaluate impact on data. 3) Evaluate batch for adverse trends. 4) If any analyte not ND, re-analyze sample. 5) If two or more surrogate recoveries are <CL , re-extract/reanalyze sample. (Use a cleanup procedure if recovery was <10%.) 6) If second analysis confirms matrix interference, consider cleanup procedures (contact client). 7) Narrate any outliers.

Table B-16. Summary of Calibration and Internal Quality Control Procedure for Semivolatile Organic Compound by GC/MS (EPA Method 8270C) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8270C	Semivolatile Organic Compounds	Internal Standard (IS)	Continuing calibration standard and every sample	Retention time must be within 30 sec of continuing calibration verification (CCV); IS area in the samples must be within a factor of 2 of the IS in the CCV	1) Check sensitivity of instrument. 2) Evaluate all data. 3) Reanalyze sample or standard. 4) Narrate any outliers.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required..

1 Sporadic Marginal Failures (SMFs) will be allowable with control limits of up to 5% higher than the RPD listed in Table C-13 of Appendix C at the following rate: For 1-14 analytes, one SMF is allowable. For 15-28 analytes, two SMFs are allowable. For 29-42 analytes, three SMFs are allowable. For greater than 42 analytes, four SMFs are allowable.

2 Sporadic Marginal Failures (SMFs) will be allowable with control limits of 15% to 150% for waters and 25% to 150% for soils at the following rate: For 1-14 analytes, one SMF is allowable. For 15-28 analytes, two SMFs are allowable. For 29-42 analytes, three SMFs are allowable. For greater than 42 analytes, four SMFs are allowable.

Table B-17. Decafluorotriphenylphosphine Key Ion Abundance Criteria for Semivolatile Organic Compounds by GC/MS

Mass	Ion Abundance Criteria
51	30% to 60% of mass 198
68	<2% of mass 69
69	(reference only)
70	<2% of mass 69
127	<40% to 60% of mass 198
197	<1% of mass 198
198	Base peak, 100% relative abundance
199	5% to 9% of mass 198
275	10% to 30% of mass 198
365	>1% of mass 198
441	Present but less that mass 443
442	>40% of mass 198
443	17% to 23% of mass 442

Reference: EPA Test Methods for Evaluating solid Waste (SW-846), December 1996.

Table B-18. Summary of Calibration and Internal Quality Control Procedure for Dioxins/Furans by Low Resolution GC/MS (EPA Method 8280A)

Method	Parameter	QA Element	Frequency	Acceptance Criteria	Corrective Action
SW8280A	Dioxins and Furans	Check of instrument tuning using FC43 in high mass range.	Prior to analysis.	Tune for maximum sensitivity of m/z 414 and m/z 502±4 - 10% of m/z 219.	1) Retune instrument. 2) Repeat FC43 analysis.
		Window defining mix (WDM). Can be combined with CPSM.	Prior to ICAL, and each time adjustments or maintenance activities are performed that may affect retention times.	None; used to set retention time windows (RT).	1) Readjust windows. 2) Re-inject WDM/CPSM.
		Column performance solution mixture (CPSM).	Prior to ICAL and CCAL on the SP-2331 column only.	Resolution of TCDDs must be ≤25%.	1) Evaluate system. 2) Perform maintenance. 3) Reanalyze CPSM.
		Multipoint calibration (minimum five points - CC1-CC5) (ICAL), low standard at the MQL.	Initially and as needed.	Internal std S/N > 10:1. Unlabeled PCDDs/PCDFs S/N>2.5:1. 15% RSD. RTs consistent with WDM. Isotopic ratios are within limits listed in Table B-19.	1) Evaluate system. 2) Recalibrate.
		Continuing calibration check standard (CCAL).	Every 12 hours.	% Difference ≤30% from the average RRF (ICAL). Isotopic ratios are within limits listed in Table B-19.	1) Evaluate system. 2) Re-inject CCAL. 3) If still out, identify and correct problem. 4) Recalibrate, if necessary.
		Instrument Blank	After any sample with the concentration of any analyte > 5x high standard	<1/2 MQL	1) Run until system is clean. 2) Bake-out system. 3) Perform maintenance. 4) If not performed after a high concentration sample (e.g., due to use of an autosampler) the two samples immediately following the high concentration sample should be reanalyzed if the analyte that was high is detected.

Table B-18. Summary of Calibration and Internal Quality Control Procedure for Dioxins/Furans by Low Resolution GC/MS (EPA Method 8280A) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8280A	Dioxins and Furans	Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results for analytes found in blank > MDL but < 5X MB concentration, reanalyze blank. If passes, report. 6) If still out, re-extract/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.
		MDL study.	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Consider cleanup (discuss with client). If cleanup is inappropriate or ineffective, flag data as matrix interference. If cleanup is effective, consider reanalysis of entire batch using cleanup procedure (discuss with client). 5) If the MS and MSD recoveries do not agree within ±25 and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.

Table B-18. Summary of Calibration and Internal Quality Control Procedure for Dioxins/Furans by Low Resolution GC/MS (EPA Method 8280A) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8280A	Dioxins and Furans	Laboratory Control Sample (LCS) (include natives)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)[1]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-extract/reanalyze LCS and affect sample batch. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)[1,2]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-extract/reanalyze LCSD and affected sample batch. 5) Narrate any outliers.
		Internal Standard (IS)	Every sample, including QC	Internal standard recovery >40% or signal to noise ratio > 10:1	1) Recalculate signal to noise ratio. 2) Reanalyze extract. 3) Re-extract using a smaller sample aliquot.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required.

1 Sporadic Marginal Failures (SMFs) will be allowable with control limits of 40% to 160% at the following rate: One SMF will be allowable if at least 7 of the target analytes are reported.
2 Sporadic Marginal Failures (SMFs) will be allowable with control limits of <45% difference at the following rate: One SMF will be allowable if at least 7 of the target analytes are reported.

Table B-19. Criteria for Isotopic Ratio Measurements for Dioxins and Furans by Low Resolution GC/MS

Analyte	Selected Ions	Relative Intensity
PCDFs		
Tetra	304/306	0.65-0.89
Penta	340/342	1.32-1.78
Hexa	374/376	1.05-1.43
Hepta	408/410	0.88-1.20
Octa	442/444	0.76-1.02
PCDDs		
Tetra	320/322	0.65-0.89
Penta	356/358	1.32-1.78
Hexa	390/392	1.05-1.43
Hepta	424/426	0.88-1.20
Octa	458/460	0.76-1.02
Internal Standards		
^{13}C-2,3,7,8-TCDF	316/318	0.65-0.89
^{13}C-1,2,3,4-TCDD	332/334	0.65-0.89
^{13}C-1,2,3,6,7,8-HxCDD	402/404	1.05-1.43
^{13}C-1,2,3,4,6,7,8-HpCDF	420/422	0.88-1.20
^{13}C-OCDD	470/472	0.76-1.01
Recovery Standards		
^{13}C-1,2,3,4-TCDD	332/334	0.65-0.89
^{13}C-1,2,3,7,8,9-HxCDD	402/404	1.05-1.43

Table B-20. Summary of Calibration and Internal Quality Control Procedure for Dioxins/Furans by High Resolution GC/MS (EPA Method 8290)

Method	Parameter	QA Element	Frequency	Acceptance Criteria	Corrective Action
SW8290	Dioxins and Furans	Tune using PFK.	Prior to analysis.	Resolving power ≥ 10,000 at m/z 304.9824 and m/z 380.9760 ± 5 ppm of expected mass (5% determination).	1) Retune instrument. 2) Repeat PFK analysis.
		Window defining mix (WDM). Column Performance Check Solution (CPSM).	Prior to ICAL, once per 12 hours prior to sample analysis.	Set RT switching times, so that the first and last eluters of each congener group is seen. The height of the valley between 2,3,7,8-TCDD and the closest eluter on either side must not exceed 25% of the height of 2,3,7,8-TCDD.	1) Evaluate system. 2) Correct problem. 3) Reanalyze WDM/CPSM.
		Multipoint calibration (minimum five points (ICAL), low standard at the MQL.	Initially and as needed.	Int. std = %RSD≤30% Natives = %RSD≤20% Isotopic ratios within limits in Table B-21 and S/N≥10:1.	1) Evaluate system. 2) Recalibrate
		Continuing calibration check standard (CCAL).	Every 12 hours.	RRF of internal std. Must be ±30% from avg. RRF (ICAL). RRF of natives must be ±20% from avg. RRF (ICAL). Isotopic ratios are within limits listed in Table B-21.	1) Evaluate system. 2) Re-inject CCAL. 3) If still out, identify and correct problem. 4) Recalibrate, if necessary.
		Instrument Blank	After any sample with the concentration of any analyte > 5x high standard	<1/2 MQL	1) Run until system is clean. 2) Bake-out system. 3) Perform maintenance. 4) If not performed after a high concentration sample (e.g., due to use of an autosampler) the two samples immediately following the high concentration sample should be reanalyzed if the analyte that was high is detected.
		MDL study.	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.

Table B-20. Summary of Calibration and Internal Quality Control Procedure for Dioxins/Furans by High Resolution GC/MS (EPA Method 8290) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8290	Dioxins and Furans	Method Blank (MB)	1 per batch, not to exceed 20 samples	< 1/2 MQL	1) Reanalyze method blank. 2) If still exceeds and analyte concentration in sample <MQL or >10x blank concentration, report results. 3) If noncompliant and analyte concentration in sample is between MQL and 10x blank concentration, re-extract/re-analyze affected samples.
		Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Consider cleanup (discuss with client). If cleanup is inappropriate or ineffective, flag data as matrix interference. If cleanup is effective, consider reanalysis of entire batch using cleanup procedure (discuss with client). 5) If the MS and MSD recoveries do not agree within ±25 and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.
		Internal Standard (IS)	Every sample, method blank, and LCS	Internal standard recovery within limits stated in Appendix C	1) Check chromatogram for interference. If found, flag data. 2) Check instrument and reanalyze the extract if a problem is found and corrected. 3) Check signal to noise ratio. If <10:1, re-extract sample 4) Evaluate data usability and flag as appropriate. 5) Re-extract/reanalyze affect samples.

Table B-20. Summary of Calibration and Internal Quality Control Procedure for Dioxins/Furans by High Resolution GC/MS (EPA Method 8290) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8290	Dioxins and Furans	Laboratory Control Sample (LCS) (include natives)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)[1]	1) Review IS, as above. 2) Evaluate data for usability. 3) If sample results are ND and MQLs are met, no action required. 4) If samples have positives, re-extract/reanalyze samples for analytes outside the acceptance criteria.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)[1,2]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-extract/reanalyze LCSD and affected sample batch. 5) Narrate any outliers.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required.

1 Sporadic Marginal Failures (SMFs) will be allowable with control limits of 50% to 150% for waters and 40% to 160% for soils at the following rate: One SMF will be allowable if at least 7 of the target analytes are reported.

2 Sporadic Marginal Failures (SMFs) will be allowable with control limits of <35% difference for waters and <45 % for soils at the following rate: One SMF will be allowable if at least 7 of the target analytes are reported.

Table B-21. Criteria for Isotopic Ratio Measurements for Dioxins and Furans by High Resolution GC/MS

Number of Chlorine Atoms	Ion Type	Theoretical Ratio	Control Limits
4	M/(M+2)	0.77	0.65-0.89
5	(M+2)/(M+4)	1.55	1.32-1.78
6	(M+2)/(M+4)	1.24	1.05-1.43
6[a]	M/(M+2)	0.51	0.43-0.59
7[b]	M/(M+2)	0.44	0.37-0.51
7	(M+2)/(M+4)	1.04	0.88-1.20
8	(M+2)/(M+4)	0.89	0.76-1.02

[a] Used only for ^{13}C-HxCDF (internal standard).
[b] Used only for ^{13}C-HpCDF (internal standard).

Table B-22. Summary of Calibration and Internal Quality Control Procedures for Polynuclear Aromatic Hydrocarbons by HPLC (EPA Method 8310)

Method	Parameter	QA Element	Frequency	Acceptance Criteria	Corrective Action
SW8310	Polynuclear Aromatic Hydrocarbons	Multipoint calibration (minimum five points) (ICAL), low standard at the MQL.	Initially and as needed.	%RSD ≤ 20% or r≥0.995 with intercept <±MDL for each compound **OR** mean %RSD ≤20% for all analytes with no individual %RSD >40%.	1) Evaluate system. 2) Recalibrate.
		Second Source Initial Calibration Verification (ICV)	Once per five-point ICAL.	±20% of expected concentration	1) Correct problem. 2) Repeat ICAL
		Continuing Calibration Verification (CCV).	At the beginning of the run, every 10 samples and at the end of analytical run.	±15% of expected concentration.	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV.
		MDL study.	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Instrument Blank	After any sample with the concentration of any analyte > 5x high standard	<1/2 MQL	1) Run until system is clean. 2) Bake-out system. 3) Perform maintenance. 4) If not performed after a high concentration sample (e.g., due to use of an autosampler) the two samples immediately following the high concentration sample should be reanalyzed if the analyte that was high is detected.

Table B-22. Summary of Calibration and Internal Quality Control Procedures for Polynuclear Aromatic Hydrocarbons by HPLC (EPA Method 8310) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8310	Polynuclear Aromatic Hydrocarbons	Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results for analytes found in blank > MDL but < 5X MB concentration, reanalyze blank. If passes, report. 6) If still out, re-extract/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.
		Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Consider cleanup (discuss with client). If cleanup is inappropriate or ineffective, flag data as matrix interference. If cleanup is effective, consider reanalysis of entire batch using cleanup procedure (discuss with client). 5) If the MS and MSD recoveries do not agree within ±25 and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.
		Surrogate Spike	Every sample, including QC	Control Limits (Appendix C)	1) Check calculations, standards, and system. 2) Evaluate impact on data. 3) Evaluate batch for adverse trends. 4) If any analyte not ND, re-analyze sample. 5) If not acceptable, re-extract/reanalyze sample. (Use an additional cleanup procedure if recovery was <10%.) 6) If second analysis confirms matrix interference, consider cleanup procedures (contact client). 7) Narrate any outliers.

Table B-22. Summary of Calibration and Internal Quality Control Procedures for Polynuclear Aromatic Hydrocarbons by HPLC (EPA Method 8310) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8310	Polynuclear Aromatic Hydrocarbons	Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)[1]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-extract/reanalyze LCS and affected sample batch if sporadic marginal failures[1] allowance has been exceeded.. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)[1,2]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-extract/reanalyze LCSD and affected sample batch. 5) Narrate any outliers.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required.

1 Sporadic Marginal Failures (SMFs) will be allowable with control limits of 30% to 145% for waters and 25% to 145% for soils at the following rate: One SMF will be allowable if at least 7 of the target analytes are reported.

2 Sporadic Marginal Failures (SMFs) will be allowable with control limits of <45% difference at the following rate: One SMF will be allowable if at least 7 of the target analytes are reported.

Table B-23. Summary of Calibration and Internal Quality Control Procedures for Nitroaromatics/Nitroamines by HPLC (EPA Method 8330)

Method	Parameter	QA Element	Frequency	Acceptance Criteria	Corrective Action
SW8330	Nitroaromatics and Nitroamines	Multipoint calibration (minimum five points) (ICAL), low standard at the MQL.	Initially and as needed.	%RSD ≤20% or r≥0.995 with intercept <±MDL for each compound **OR** mean %RSD ≤20% for all analytes with no individual %RSD >40%.	1) Evaluate system. 2) Recalibrate.
		Second Source Initial Calibration Verification (ICV).	Once immediately following ICAL.	±20% of expected concentration.	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV).	At the beginning of the run, every 10 samples and at the end of analytical run.	±15% of expected concentration.	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV.
		MDL study.	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Instrument Blank	After any sample with the concentration of any analyte > 5x high standard	<1/2 MQL	1) Run until system is clean. 2) Bake-out system. 3) Perform maintenance. 4) If not performed after a high concentration sample (e.g., due to use of an autosampler) the two samples immediately following the high concentration sample should be reanalyzed if the analyte that was high is detected.

Table B-23. Summary of Calibration and Internal Quality Control Procedures for Nitroaromatics/Nitroamines by HPLC (EPA Method 8330) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8330	Nitroaromatics and Nitroamines	Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results for analytes found in blank > MDL but < 5X MB concentration, reanalyze blank. If passes, report. 6) If still out, re-extract/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.
		Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Consider cleanup (discuss with client). If cleanup is inappropriate or ineffective, flag data as matrix interference. If cleanup is effective, consider reanalysis of entire batch using cleanup procedure (discuss with client). 5) If the MS and MSD recoveries do not agree within ±25 and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.
		Surrogate Spike	Every sample, including QC	Control Limits (Appendix C)	1) Check calculations, standards, and system. 2) Evaluate impact on data. 3) Evaluate batch for adverse trends. 4) If any analyte not ND, re-analyze sample. 5) If not acceptable, re-extract/reanalyze sample. (Use a cleanup procedure if recovery was <10%.) 6) If second analysis confirms matrix interference, consider cleanup procedures (contact client). 7) Narrate any outliers.

Table B-23. Summary of Calibration and Internal Quality Control Procedures for Nitroaromatics/Nitroamines by HPLC (EPA Method 8330) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8330	Nitroaromatics and Nitroamines	Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C) [1]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-extract/reanalyze LCS and affected sample batch if sporadic marginal failures[1] allowance has been exceeded. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)[1,2]	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-extract/reanalyze LCSD and affected sample batch. 5) Narrate any outliers.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required.

1 Sporadic Marginal Failures (SMFs) will be allowable with control limits of 40% to 150% for waters and 30% to 150% for soils at the following rate: One SMF will be allowable if at least 7 of the target analytes are reported.

2 Sporadic Marginal Failures (SMFs) will be allowable with control limits of <40% difference for waters and <45% difference for soils at the following rate: One SMF will be allowable if at least 7 of the target analytes are reported.

Table B-24. Summary of Calibration and Internal Quality Control Procedures for Nitroglycerine by HPLC (EPA Method 8332)

Method	Parameter	QA Element	Frequency	Acceptance Criteria	Corrective Action
SW8332	Nitroglycerine	Multipoint calibration (minimum five points) (ICAL), low standard at the MQL.	Initially and as needed.	%RSD ≤20% or r≥0.995 with intercept <±MDL for each compound **OR** mean %RSD ≤20% for all analytes with no individual %RSD >40%.	1) Evaluate system. 2) Recalibrate.
		Second Source Initial Calibration Verification (ICV).	Once immediately following ICAL.	±20% of expected concentration.	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV).	At the beginning of the run, every 10 samples and at the end of analytical run.	±15% of expected concentration.	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV.
		MDL study	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Instrument Blank	After any sample with the concentration of any analyte > 5x high standard	<1/2 MQL	1) Run until system is clean. 2) Bake-out system. 3) Perform maintenance. 4) If not performed after a high concentration sample (e.g., due to use of an autosampler) the two samples immediately following the high concentration sample should be reanalyzed if the analyte that was high is detected.

Table B-24. Summary of Calibration and Internal Quality Control Procedures for Nitroglycerine by HPLC (EPA Method 8332) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8332	Nitroglycerine	Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results for analytes found in blank > MDL but < 5X MB concentration, reanalyze blank. If passes, report. 6) If still out, re-extract/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.
		Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Consider cleanup (discuss with client). If cleanup is inappropriate or ineffective, flag data as matrix interference. If cleanup is effective, consider reanalysis of entire batch using cleanup procedure (discuss with client). 5) If the MS and MSD recoveries do not agree within ±25 and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.

Table B-24. Summary of Calibration and Internal Quality Control Procedures for Nitroglycerine by HPLC (EPA Method 8332) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW8332	Nitroglycerine	Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-extract/reanalyze LCS and affected sample batch. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-extract/reanalyze LCSD and affected sample batch. 5) Narrate any outliers.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required.

Table B-25. Summary of Calibration and Internal Quality Control Procedures for Anions by Ion Chromatography (EPA Method 300.0 / 9056)

Method	Parameter	Calibration	Frequency	Acceptance Criteria	Corrective Action
E300.0 / SW9056	Anions	Multipoint calibration (minimum five points plus blank) (ICAL), low standard at the MQL.	Daily, prior to sample analysis.	$r \geq 0.995$ with intercept <±MDL	1) Repeat outlying points. 2) Recalculate using valid points. 3) If still out, correct problem and recalibrate.
		Second Source Initial Calibration Verification (ICV)	Once immediately following ICAL.	±10% of expected concentration.	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV)	At the beginning of the run, every 10 samples and at the end of each analytical run	±10% of expected concentration.	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV.
		Instrument Blank	After any sample with the concentration of any analyte > 5x high standard	<MDL	1) Run until system is clean. 2) Bake-out system. 3) Perform maintenance. 4) If not performed after a high concentration sample (e.g., due to use of an autosampler) the two samples immediately following the high concentration sample should be reanalyzed if the analyte that was high is detected.
		Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results for analytes found in blank > MDL but < 5X MB concentration, reanalyze blank. If passes, report. 6) If still out, re-prepare/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.

Table B-25. Summary of Calibration and Internal Quality Control Procedures for Anions by Ion Chromatography (EPA Method 300.0) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
E300.0 / SW9056	Anions	Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Flag data as matrix interference. 5) If the MS and MSD recoveries differ by more than 25, and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.
		Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-prepare/reanalyze LCS and affected sample batch. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples when the batch does not contain an MS/MSD pair.	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-prepare/reanalyze LCSD and affected sample batch. 5) Narrate any outliers.
		MDL study.	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required.

Table B-26. Summary of Internal Quality Control Procedures for Flash Point / Ignitability (EPA Method 1010/1030)

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW1010 SW1030	Flash Point Ignitability	Method Blank (MB)	1 per batch, not to exceed 20 samples	Does not flash	1) Investigate contamination source. 2) Take and document appropriate corrective action. 3) Reanalyze blank. 4) If sample results do not flash, no action. 5) If samples flash, reanalyze all samples processed with the contaminated blank.
		Laboratory Replicate (LR)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)	1) Check calculations. 2) Reanalyze duplicate pair. 3) If still out, report both sets of data. Narrate any outliers.
		Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. 4) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-prepare/reanalyze LCSD and affected sample batch. 5) Narrate any outliers.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required.

Table B-27. Summary of Calibration and Internal Quality Control Procedures for Total Cyanide (EPA Methods 9012A/9014)

Method	Parameter	Calibration	Frequency	Acceptance Criteria	Corrective Action
SW9012A/ SW9014	Total Cyanide	Multipoint calibration (minimum five points) (ICAL), low standard at the MQL.	Daily, prior to sample analysis.	$r \geq 0.995$ with intercept <±MDL	1) Evaluate system. 2) Recalibrate.
		Second Source Initial Calibration Verification (ICV)	Once immediately following ICAL.	±10% of expected concentration.	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV)	At the beginning of the run, every 10 samples and at the end of each analytical run	±10% of expected concentration.	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV.
		Instrument Blank	After any sample with the concentration of any analyte > 5x high standard.	<MDL	1) Reanalyze calibration blank. 2) If still out, identify and correct problem. 3) Reanalyze samples back to last clean blank. 4) Recalibrate, if necessary.
		Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results for analytes found in blank > MDL but < 5X MB concentration, reanalyze blank. If passes, report. 6) If still out, re-prepare/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.

Table B-27. Summary of Calibration and Internal Quality Control Procedures for Total Cyanide (EPA Methods 9012A/9014) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW9012A/ SW9014	Total Cyanide	Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) If spike amount exceeds 50% of parent conc., compare to MSD.
		Matrix Spike Duplicate (MSD)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Flag data as matrix interference. 5) If the MS and MSD recoveries differ by more than 25, and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.
		Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-prepare/reanalyze LCS and affected sample batch. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-prepare/reanalyze LCSD and affected sample batch. 5) Narrate any outliers.
		MDL study.	Annually for each matrix or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required..

Table B-28. Summary of Calibration and Internal Quality Control Procedures for pH (EPA Methods 9040B/9045C)

Method	Parameter	Calibration/ QC Element	Frequency	Acceptance Criteria	Corrective Action
SW9040B/ SW9045C	pH	Initial calibration (ICAL), 2 buffers, 3 pH units apart	Daily, prior to sample analysis.	±0.05 pH units of buffer solution value	1) Evaluate system. 2) Recalibrate.
		Second Source Initial Calibration Verification (ICV)	Daily, immediately following initial calibration	±0.1 pH units of buffer solution value	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV)	Every 10 samples and at the end of each analytical run	±0.1 pH units of buffer solution value	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV.
		Laboratory Replicate (LR)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)	1) Check calculations. 2) Reanalyze duplicate pair. 3) If still out, report both sets of data. Narrate any outliers.
		Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. 4) Narrate any outliers.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required..

Table B-29. Summary of Calibration and Internal Quality Control Procedures for Total Organic Carbon (EPA Method 9060)

Method	Parameter	Calibration	Frequency	Acceptance Criteria	Corrective Action
SW9060	Total Organic Carbon	Multipoint calibration (minimum three) (ICAL), low standard at the MQL	Daily, prior to sample analysis.	$r \geq 0.995$; intercept $<\pm$ MDL	1) Repeat outlying points. 2) Recalculate using valid points 3) If still out, correct problem and recalibrate.
		Second Source Initial Calibration Verification (ICV)	Daily, immediately following initial calibration	±10% of expected concentrations	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV)	Every 10 samples and at the end of each analytical run	±10% of expected concentration	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last CCV.
		Instrument Blank	After any sample with the concentration of any analyte > 5x high standard.	<MDL	1) Reanalyze calibration blank. 2) If still out, identify and correct problem. 3) Reanalyze samples back to last clean blank. 4) Recalibrate, if necessary.
		Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Check calculations. 2) Investigate contamination source. 3) Take and document appropriate corrective action. 4) If sample results ND or > 5X MB concentration, no action. 5) If sample results for analytes found in blank > MDL but < 5X MB concentration, reanalyze blank. If passes, report. 6) If still out, re-prepare/reanalyze all samples processed with the contaminated blank. 7) Flag sample results associated with blank contamination.

Table B-29. Summary of Calibration and Internal Quality Control Procedures for Total Organic Carbon (EPA Method 9060) Continued

Method	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
SW9060	Total Organic Carbon	Matrix Spike (MS)	1 per 20 samples	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule) 2) If spike amount exceeds 50% of parent conc., compare to MS.
		Matrix Spike Duplicate (MSD)	1 per 20 samples.	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Flag data as matrix interference. 5) If the MS and MSD recoveries differ by more than 25, and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.
		Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples.	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-prepare/reanalyze LCS and affected sample batch. 5) Narrate any outliers
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples if there are no MS/MSD samples in the batch.	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCSD is high and samples have detects or LCSD is low, re-prepare/reanalyze LCSD and affected sample batch. 5) Narrate any outliers.
		MDL study.	Annually or quarterly MDL check at ~2X MDL.	≤1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required.

Table B-30. Summary of Calibration Procedures for Total Dissolved Solids (TDS) (EPA Method 160.1) and Total Recoverable Petroleum Hydrocarbons (TRPH) (EPA 1664)

Method	Parameter	Calibration	Frequency	Acceptance Criteria	Corrective Action
E160.1 E1664	TDS TRPH	Analytical balance calibration by a certified technician.	Annually.	Manufacturer's tolerances.	1) Repairs or maintenance by a certified technician.
		Analytical balance calibration check.	Daily using S-class weights.	±1% of certified weight.	1) Make sure weights are clean and free of residue and recheck. 2) Perform internal calibration if balance is so equipped. 3) If still out, have the balance serviced by a qualified technician.
		Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Identify and correct problem 2) Reanalyze blank and affected samples.
		Matrix Spike (MS)	1 per 20 samples (TRPH only)	Control Limits (Appendix C)	1) Check calculations. Evaluate all data (2x rule) 2) If spike amount exceeds 50% of parent conc., compare to MS.
		Matrix Spike Duplicate (MSD)	1 per 20 samples. (TRPH only)	Control Limits (Appendix C)	1) Check calculations. . Evaluate all data (2x rule). 2) Evaluate sample homogeneity. 3) If no apparent inhomogeneity present and if spike amount exceeds 50% of parent conc., compare to MS. 4) If MSD is out in the same direction and in the same general magnitude (i.e., agreement within ±25% recovery), the MSD can be used as confirmation of matrix interference in the MS. Flag data as matrix interference. 5) If the MS and MSD recoveries differ by more than 25, and at least one of them is not within control limits, the MS/MSD/parent sample grouping should be re-prepared/reanalyzed.

Table B-30. Summary of Calibration Procedures for Total Dissolved Solids (TDS) (EPA Method 160.1) and Total Recoverable Petroleum Hydrocarbons (TRPH) (EPA 1664) Continued

Method	Parameter	Calibration	Frequency	Acceptance Criteria	Corrective Action
E160.1 E1664	TDS TRPH	Laboratory Replicate (LR)	1 per batch, not to exceed 20 samples (TDS only)	Control Limits (Appendix C)	1) Check calculations. 2) Reanalyze duplicate pair. 3) If still out, re-prepare/reanalyze duplicate pair. 4) Report both sets of data.
		Laboratory Control Sample (LCS) and/or Laboratory Control Sample Duplicate (LCSD)	1 LCS per batch, not to exceed 20 samples 1 LCSD per batch, not to exceed 20 samples (TDS only)	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS and/or LCSD. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-prepare/reanalyze LCS and affected sample batch. 5) Narrate any outliers.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required.
		MDL study.	Annually or quarterly check at ~2 times MDL.	≤1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.

Table B-31. Summary of Calibration and Internal Quality Control Procedures for Alkalinity (EPA Method 310/SM2320B)

Method	Parameter	Calibration	Frequency	Acceptance Criteria	Corrective Action
E310 / SM2320B	Alkalinity	Initial calibration (ICAL), 3 buffers at 3 pH units apart	Daily, prior to sample analysis.	±0.05 pH units of buffer solution value	1) Evaluate system. 2) Recalibrate.
		Second Source Initial Calibration Verification (ICV)	Daily, immediately following initial calibration	±0.1 pH units of buffer solution value	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV)	Every 10 samples and at the end of each analytical run	±0.1 pH units of buffer solution value	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last CCV.
		MDL study.	Annually for each matrix or quarterly check at ~2 times MDL.	≤1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Identify and correct problem 2) Reanalyze blank and affected samples.
		Laboratory Replicate (LR)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)	1) Check calculations. 2) Reanalyze duplicate pair. 3) If still out, re-prepare/reanalyze duplicate pair. 4) Report both sets of data. 5) Narrate any outliers
		Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS and/or LCSD. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-prepare/reanalyze LCS and affected sample batch. 3) Narrate any outliers.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required.

Table B-32. Summary of Calibration and Internal Quality control Procedures for Total Organic Carbon (Walkley Black)

Method	Parameter	Calibration	Frequency	Acceptance Criteria	Corrective Action
WBLACK	Total Organic Carbon in Soils	Multipoint calibration (minimum three) (ICAL), low standard at the MQL	Daily, prior to sample analysis.	$r \geq 0.995$; intercept $<\pm$ MDL	1) Repeat outlying points. 2) Recalculate using valid points 3) If still out, correct problem and recalibrate.
		Second Source Initial Calibration Verification (ICV)	Daily, immediately following initial calibration	±10% of expected concentration for all metals	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV)	Every 10 samples and at the end of each analytical run	±10% of expected concentration for all metals	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last CCV.
		MDL study.	Annually for each matrix or quarterly check at ~2 times MDL.	≤1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		Method Blank (MB)	1 per batch, not to exceed 20 samples	<1/2 MQL	1) Identify and correct problem 2) Reanalyze blank and affected samples.
		Laboratory Replicate (LR)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)	1) Check calculations. 2) Reanalyze duplicate pair. 3) If still out, re-prepare/reanalyze duplicate pair. 4) Report both sets of data. 5) Narrate any outliers
		Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples	Control Limits (Appendix C)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS and/or LCSD. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-prepare/reanalyze LCS and affected sample batch. 5) Narrate and outliers
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required.

Table B-33. Summary of Calibration and Internal Quality Control Procedures for EPA Method TO-15

Method	Parameter	Calibration/ QC Element	Frequency	Acceptance Criteria	Corrective Action
TO-15	VOCs in ambient air and soil gas	Check mass spectral ion intensities using BFB	Start of each day and every 12 hours.	Ion abundance criteria as described in Method 8260B	1) Evaluate system. 2) Recalibrate.
		Multipoint calibration (minimum five points) (ICAL), low standard at the MQL.	Initially and as needed.	%RSD ≤ 30% (40% poor performers) or r ≥ 0.995	1) Evaluate system. 2) Recalibrate.
		Initial Calibration Verification (ICV) (Second source preferred)	Once per five point ICAL.	±30% of expected concentration for 90% of "standard" compounds; ±40% of expected concentration for 80% of poor performers.	1) Evaluate system. 2) Repeat ICV. 3) If still out, identify and correct problem and repeat ICV. 4) If still out, repeat initial calibration.
		Continuing Calibration Verification (CCV)	At the start or each day and every 12 hours.	±30% of expected concentration for 90% of "standard" compounds; ±40% of expected concentration for 80% of poor performers.	1) Evaluate system. 2) Repeat CCV. 3) If still out, identify and correct problem. 4) Recalibrate and reanalyze all samples since last valid CCV.
		MDL study	Annually or quarterly MDL check at ~2X MDL.	< 1/3 max MQLs in Appendix A	1) MDLs that exceed established criteria shall be submitted to the TM for approval prior to any sample analysis.
		System or reagent blank	Start of each day and every 12 hours	Concentration less than quantitation limit	1) Identify and correct problem 2) Reanalyze blank and affected samples.
		Laboratory Replicate (LR)	5% of samples submitted.	Relative percent difference < 25%	1) Check calculations. 2) Reanalyze duplicate pair. 3) If still out, re-prepare/reanalyze duplicate pair. 4) If still out, report both sets of data. Narrate any outliers.

Table B-33 Summary of Calibration and Internal Quality Control Procedures for EPA Method TO-15 Continued

Method	Parameter	Calibration/ QC Element	Frequency	Acceptance Criteria	Corrective Action
TO-15	VOCs in ambient air and soil gas	Laboratory Control Sample (LCS)	1 per batch, not to exceed 20 samples	±30% of expected concentration for 90% of "standard" compounds; ±40% of expected concentration for 80% of poor performers.	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-prepare/reanalyze LCS and affected sample batch. 5) Narrate any outliers.
		Laboratory Control Sample Duplicate (LCSD)	1 per batch, not to exceed 20 samples	±30% of expected concentration for 90% of "standard" compounds; ±40% of expected concentration for 80% of poor performers. Precision: %RSD ≤ 30% (40% poor performers)	1) Check calculations. 2) Identify and correct problem. 3) Reanalyze LCS. If passes, report. 4) If LCS is high, and samples are ND, report; if LCS is high and samples have detects or LCS is low, re-prepare/reanalyze LCS and affected sample batch. 5) Narrate any outliers.
		Surrogate Spike	Every sample, including QC	Control Limits (Appendix C)	1) For blanks, inspect the system and reanalyze the blank. 2) For samples, reanalyze the sample unless obvious matrix interference is documented. If the percent recoveries are within limits on the second analysis, report the reanalysis. If the percent recoveries are out of limits a second time, report both results and narrate.
		Internal Standard (IS)	Every sample, including QC	Retention time (RT) for the blanks and samples within ±0.5 minutes of the RT of the ICAL. The IS area within ±40% of ICAL's IS area	1) For blanks, inspect the system and reanalyze the blank. 2) For samples, reanalyze the sample unless obvious matrix interference is documented. If the IS areas are within limits on the second analysis, report the reanalysis. If the IS areas are out of limits a second time, report both results and narrate.
		Holding times	Each Sample	Within hold time in Table 2-1	1) Report HT problem to the contractor project chemist for discussion. Resampling and reanalysis may be required.