



EcoChem, INC.
Environmental Data Quality

DATA QUALITY EVALUATION

PORTLAND HARBOR

Round 3A Surface Water – Low Flow Sampling Event, Fall 2006

Semivolatile Organic Compounds (SVOC) - Method SW8270C
Polycyclic Aromatic Hydrocarbons (PAH) - Method SW8270-SIM
Phthalate Esters – Method 525.2
Chlorinated Herbicides - Method SW8151A
Butyltins - Krone Method
Dioxin/Furan Compounds – Method 1613
Metals - Methods SW6020 & SW7470A
Conventionals - Methods 160.1, 160.2, 415.1 & 6010B
Hexavalent Chromium – Method SW7196A

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DATA QUALITY EVALUATION

BASIS OF DATA EVALUATION

The data were validated using guidance and quality control (QC) criteria documented in the analytical methods; *Guidance on Environmental Data Verification and Validation* (EPA 2002c); *Portland Harbor RI/FS, Round 2, Quality Assurance Project Plan (QAPP) Addendum 1: Surface Water* (Integral, 10/4/04); *Supplement 1 to QAPP Addendum 1: Round 3A Surface Water Sampling* (Integral, 8/11/06); and *National Functional Guidelines for Organic and/or Inorganic Data Review* (USEPA 1994, 1999 & 2002).

Data qualifier definitions, reason codes, and validation criteria are included as **Appendix A**. Findings for each quality control (QC) element are discussed in the data validation reports, which are provided in **Appendix B**. Data validation worksheets and all communication records are organized by SDG and will be kept on file at EcoChem.

PROCESS FOR DATA VALIDATION

All electronic data deliverables (EDD) were verified by comparing 100% of the field sample results and 10% of the QC sample results to the hardcopy data package.

The surface water data received a Level III validation, which included evaluation of (as appropriate for each method):

- Package completeness
- Sample chain-of-custody and sample preservation
- Analytical holding times
- Blank contamination
- Precision (duplicate analyses)
- Accuracy (compound recovery)
- Detection limits
- Instrument performance (initial calibration, continuing calibration, tuning, sensitivity and degradation)

Ten percent (10%) of all surface water data packages received full (Level IV) data validation, which includes evaluation of compound identification and quantitation (transcription and calculation checks).

A dual-tier system of primary and secondary reviewers is utilized to ensure technical correctness and QC of the validation process; and all data validation is documented using standardized and controlled validation worksheets and spreadsheets. These worksheets are completed for each SDG, documenting all deficiencies, outliers and subsequent qualifiers.

After qualifiers are entered into the EcoChem database, a second party verifies 100% of the qualifier entry. Interpretive qualifiers are then applied to the field samples and qualified data is exported to the Project Database (Integral).

SUMMARY OF DATA VALIDATION: SEMIVOLATILE ORGANIC COMPOUNDS

A total of 14 peristaltic pump samples were analyzed for semi-volatile organic compounds (SVOC) for the Portland Harbor Surface Water Low Flow sampling event. Two rinsate blanks were collected to monitor the field collection process and two system blanks (Lab Blank and Decon Blank) were also analyzed. Columbia Analytical Services, Kelso, Washington completed the SVOC analyses.

The SVOC data for the Low Flow samples were generally acceptable. Five data points (0.6% of all SVOC results) were rejected. Rejected data must not be used for any purpose.

Thirty-two (32) data points (3.7% of all SVOC results) were qualified as estimated because control limits were exceeded in one or more laboratory QC samples or procedures. Qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 99% complete for the Low Flow SVOC analyses.

Holding Times and Sample Preservation

The holding time requirements were met for all SVOC surface water samples and associated field QC samples.

The sample preservation requirements (cooler temperature of $4^{\circ}\text{C} \pm 2^{\circ}$) were not met for most samples. The majority of the coolers were received at the laboratory at temperatures below the control limits. These temperature outliers did not impact data quality and no qualifiers were required.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. All initial calibration analyses met linearity and recovery acceptance criteria. A total of two results (0.2% of all SVOC results) were qualified as estimated (UJ) with potential low bias based on continuing calibration outliers.

Method Blank Analyses

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all associated samples.

Various target analytes were detected in the method blanks. A total of three results for phenol (0.3% of all SVOC results) were qualified as not detected (U) based on method blank contamination.

Accuracy

The accuracy of the analytical results is evaluated in the following sections in terms of analytical bias (surrogate compound, laboratory control sample [LCS] and matrix spike [MS] recoveries) and precision (duplicate LCS and MS analyses).

Surrogate Compound Recoveries

Surrogate compounds were added to all field and QC samples. All field sample surrogate recoveries reported by the laboratory met the criteria for acceptable performance.

Matrix Spike Recoveries

MS analyses were not performed with some data sets. For these sets, laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses were used to assess accuracy and precision. The recoveries of 3,3-dichlorobenzidine from one MS/MSD set were below 10%. One reporting limit for this compound (0.1% of all SVOC results) was rejected for potential very low bias in the parent sample. The recoveries of aniline and n-nitrosodimethylamine from one MS/MSD set were below the control limits. Reporting limits for these compounds (0.2% of all SVOC results) in the parent sample were qualified as estimated (UJ) with potential low bias.

Laboratory Control Sample Recoveries

LCS/LCSD analyses met the criteria for frequency of analysis. The recoveries of 3,3-dichlorobenzidine from one LCS/LCSD set were less than 10%. Reporting limits for this compound were rejected for potential very low bias in the four associated samples. A total of four results (0.4% of all Low Flow SVOC results) were rejected for accuracy. The recovery values of numerous other analytes from LCS analyses were below the control limits. Reporting limits for these compounds (3.2% of all SVOC results) in the associated samples were qualified as estimated (UJ) with potential low bias.

Precision

LCS/LCSD and MS/MSD analyses were evaluated for laboratory precision. Relative percent difference (RPD) values for numerous analytes were greater than the control limits. As the affected compounds were not detected in associated samples, no precision qualifiers were required.

Method Detection Limits and Method Reporting Limits

The laboratory reporting limits are based on the method detection limit (MDL), adjusted for sample size and dilution. The laboratory reporting limits ranged from 0.0058 to 2 µg/L for the non-detected results. The laboratory reporting limits met the target MRL stated in *Round 2 QAPP, Addendum 1: Surface Water*, with the following exception.

The MRL for n-nitrosodimethylamine is 0.002 µg/L however; the laboratory reporting limit was 2.0 µg/L.

Field Quality Control Samples

Field QC samples collected for the SVOC analysis included field blank and system blank samples. The results for the field QC samples are discussed in the following sections.

Field Blanks

Two field blanks (LW3-W2902 and LW3-W2903) were associated with all samples. Positive results for 1,4-dichlorobenzene, azobenzene, and phenol were reported in these field blanks. One phenol result (0.1% of all SVOC results) was qualified as not detected (U) based on field blank contamination.

System Blanks

Two system blanks (Decon Blank and Lab Blank) were generated and analyzed with the peristaltic pump samples. Numerous target analytes were reported in the Lab Blank. There was no direct association between these blanks and other field samples. No data were qualified based on system blank contamination.

Field Duplicate Samples

No field duplicate samples were analyzed with this sampling event.

SUMMARY OF DATA VALIDATION: POLYCYCLIC AROMATIC HYDROCARBONS

A total of 14 peristaltic pump samples were analyzed for semi-volatile polycyclic aromatic hydrocarbon compounds (PAH) for the Portland Harbor Surface Water Low Flow sampling event. Two rinsate blanks were collected to monitor the field collection process and two system blanks (Lab Blank and Decon Blank) were also analyzed. Columbia Analytical Services, Kelso, Washington completed the PAH analyses.

The PAH data for the Low Flow samples were acceptable. No data points were rejected or estimated.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the surface water PAH analyses.

Holding Times and Sample Preservation

The extraction and analytical holding time requirements were met for all samples and associated field QC samples.

The sample preservation requirements (cooler temperature of $4^{\circ}\text{C} \pm 2^{\circ}$) were not met for most samples. The majority of the coolers were received at the laboratory at temperatures below the control limits. These temperature outliers did not impact data quality and no qualifiers were required.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. All initial and continuing calibration analyses met linearity and recovery acceptance criteria.

Method Blank Analyses

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all associated samples. No target analytes were detected in the method blanks.

Accuracy

The accuracy of the analytical results is evaluated in the following sections in terms of analytical bias (surrogate compound, laboratory control sample [LCS] and matrix spike [MS] recoveries) and precision (duplicate LCS and MS analyses).

Surrogate Compound Recoveries

Surrogate compounds were added to all field and QC samples. All surrogate recoveries reported by the laboratory met the criteria for acceptable performance.

Matrix Spike Recoveries

MS analyses were not performed with some data sets. For these sets, laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses were used to assess accuracy and precision. All reported recoveries met the criteria for acceptable performance.

Laboratory Control Sample Recoveries

LCS/LCSD analyses met the criteria for frequency of analysis. The recovery values reported by the laboratory met the criteria for acceptable performance.

Precision

LCS/LCSD and MS/MSD analyses were evaluated for laboratory precision. All of the relative percent difference (RPD) values were acceptable.

Method Detection Limits and Method Reporting Limits

The laboratory reporting limits are based on the method detection limit (MDL), adjusted for sample size and dilution. The laboratory reporting limits ranged from 0.0046 to 0.013 µg/L for the non-detected results. The laboratory reporting limits met the target MRL stated in *Round 2 QAPP, Addendum 1: Surface Water*.

Field Quality Control Samples

Field QC samples collected for the PAH analysis included field blank and system blank samples. The results for the field QC samples are discussed in the following sections.

Field Blanks

Two field blanks (LW3-W2902 and LW3-W2903) were associated with all samples. Positive results for naphthalene and 2-methylnaphthalene were reported in these field blanks, but were not detected in the associated field samples. No data were qualified based on field blank contamination.

System Blanks

Two system blanks (Decon Blank and Lab Blank) were generated and analyzed with the peristaltic pump samples. All 18 target PAH analytes were reported in the Lab Blank. There was no direct association between these blanks and other field samples. No data were qualified based on system blank contamination.

Field Duplicate Samples

No field duplicate samples were analyzed with this sampling event.

SUMMARY OF DATA VALIDATION: PHTHALATE ESTERS

A total of 14 peristaltic pump samples were analyzed for semi-volatile phthalate ester compounds (phthalates) for the Portland Harbor Surface Water Low Flow sampling event. Two rinsate blanks were collected to monitor the field collection process and two system blanks (Lab Blank and Decon Blank) were also analyzed. Columbia Analytical Services, Kelso, Washington completed the analyses.

The phthalate data for the Low Flow samples were generally acceptable. No data points were rejected. Twelve data points (11% of all phthalate results) were qualified as estimated because control limits were exceeded in one or more laboratory quality control (QC) samples or procedures. Qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the surface water phthalate analyses.

Holding Times and Sample Preservation

The extraction and analytical holding time requirements were met for all samples and associated field QC samples.

The sample preservation requirements (cooler temperature of $4^{\circ}\text{C} \pm 2^{\circ}$) were not met for most samples. The majority of the coolers were received at the laboratory at temperatures below the control limits. These temperature outliers did not impact data quality and no qualifiers were required.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. All initial calibration analyses met linearity and recovery acceptance criteria. No qualifiers were required based on continuing calibration outliers.

Method Blank Analyses

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all associated samples. Various target analytes were detected in the method blanks. A total of 12 results (11% of all phthalate results) were qualified as estimated (J) and 18 results (17% of all phthalate results) were qualified as not detected (U) based on method blank contamination.

Accuracy

The accuracy of the analytical results is evaluated in the following sections in terms of analytical bias (surrogate compound, laboratory control sample [LCS] and matrix spike [MS] recoveries) and precision (duplicate LCS and MS analyses).

Surrogate Compound Recoveries

Surrogate compounds were added to all field and QC samples. All surrogate recoveries reported by the laboratory met the criteria for acceptable performance.

Matrix Spike Recoveries

MS analyses were not performed with some data sets. For these sets, laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses were used to assess accuracy and precision. All reported recoveries met the criteria for acceptable performance.

Laboratory Control Sample Recoveries

LCS analyses met the criteria for frequency of analysis. The recovery values reported by the laboratory met the criteria for acceptable performance.

Precision

Duplicate analyses were not performed with some data sets. When available, LCS/LCSD and MS/MSD analyses were evaluated for laboratory precision. All reported relative percent difference (RPD) values were acceptable.

Method Detection Limits and Method Reporting Limits

The laboratory reporting limits are based on the method detection limit (MDL), adjusted for sample size and dilution. The laboratory reporting limits ranged from 0.005 to 0.098 µg/L for the non-detected results. The laboratory reporting limits met the target MRL stated in *Round 2 QAPP, Supplement 1 to Addendum 1: Surface Water*.

Field Quality Control Samples

Field QC samples collected for the phthalate analysis included field blank and system blank samples. The results for the field QC samples are discussed in the following sections.

Field Blanks

Two field blanks (LW3-W2902 and LW3-W2903) were associated with all samples. Numerous target analytes were reported in these field blanks. A total of 40 results (37% of all phthalate results) were qualified as not detected (U) based on field blank contamination.

System Blanks

Two system blanks (Decon Blank and Lab Blank) were generated and analyzed with the peristaltic pump samples. Two target analytes were reported in the Decon Blank. There was no direct association between these blanks and other field samples. No data were qualified based on system blank contamination.

Field Duplicate Samples

No field duplicate samples were analyzed with this sampling event.

SUMMARY OF DATA VALIDATION: CHLORINATED HERBICIDES

A total of 14 peristaltic pump samples were analyzed for chlorinated herbicide compounds for the Portland Harbor Surface Water Low Flow sampling event. Two rinsate blanks were collected to monitor the field collection process and two system blanks (Lab Blank and Decon Blank) were also analyzed. Columbia Analytical Services, Kelso, Washington performed the herbicide analyses.

The herbicide data for the Low Flow samples were generally acceptable. No data points were rejected. Four data points (2.2% of all herbicide results) were qualified as estimated because control limits were exceeded in one or more laboratory quality control (QC) samples or procedures. Qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the surface water herbicide analyses.

Holding Times and Sample Preservation

The extraction and analytical holding time requirements were met for all samples and associated field QC samples.

The sample preservation requirements (cooler temperature of $4^{\circ}\text{C} \pm 2^{\circ}$) were not met for most samples. The majority of the coolers were received at the laboratory at temperatures below the control limits. These temperature outliers did not impact data quality and no qualifiers were required.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. All initial and continuing calibration analyses met linearity and recovery acceptance criteria.

Method Blank Analyses

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all associated samples. Dalapon was detected in the method blanks. A total of five results (2.8% of all herbicide results) were qualified as not detected (U) based on method blank contamination.

Accuracy

The accuracy of the analytical results is evaluated in the following sections in terms of analytical bias (surrogate compound, laboratory control sample [LCS] and matrix spike [MS] recoveries) and precision (duplicate LCS and MS analyses).

Surrogate Compound Recoveries

A surrogate compound was added to all field and QC samples. The recoveries reported by the laboratory met the criteria for acceptable performance.

Matrix Spike Recoveries

MS analyses were not performed with some data sets. For these sets, laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses were used to assess accuracy and precision. All reported recoveries met the criteria for acceptable performance.

Laboratory Control Sample Recoveries

LCS/LCSD analyses met the criteria for frequency of analysis. The recoveries reported by the laboratory met the criteria for acceptable performance.

Precision

LCS/LCSD and MS/MSD analyses were evaluated for laboratory precision. All of the relative percent difference (RPD) values were acceptable.

Method Detection Limits and Method Reporting Limits

The laboratory reporting limits are based on the method detection limit (MDL), adjusted for sample size and dilution. The laboratory reporting limits ranged from 0.034 to 78 µg/L for the non-detected results. The laboratory reporting limits met the target MRL stated in *Round 2 QAPP, Addendum 1: Surface Water*.

Compound Identification

The results from the two analytical columns were compared for agreement. In cases where the percent difference (%D) value between the two columns was greater than 40% the reported result was "P" flagged by the laboratory. As an elevated %D value may indicate the presence of an interferent resulting in a high bias, the associated results were estimated (J). If the %D value was greater than 60%, the result was qualified as a tentative identification (NJ). Three data points (1.7% of herbicide results) were estimated (J) and one data point (0.6%) was qualified as tentative identification (NJ).

Field Quality Control Samples

Field QC samples collected for the herbicide analysis included field blank and system blank samples. The results for the field QC samples are discussed in the following sections.

Field Blanks

Two field blanks (LW3-W2902 and LW3-W2903) were associated with the samples. No target analytes were detected in any field blank.

System Blanks

Two system blanks (Decon Blank and Lab Blank) were generated and analyzed with the peristaltic pump samples. No target analytes were detected in any system blank.

Field Duplicate Samples

No field duplicate samples were analyzed with this sampling event.

SUMMARY OF DATA VALIDATION: BUTYLTINS

A total of 14 peristaltic pump samples were analyzed for butyltin compounds for the Portland Harbor Surface Water Low Flow sampling event. Two rinsate blanks were collected to monitor the field collection process and two system blanks (Lab Blank and Decon Blank) were also analyzed. Columbia Analytical Services, Kelso, Washington performed the butyltin analyses.

The butyltin data for the surface water samples were generally acceptable. No data points were rejected. Four data points (5.6% of all butyltin results) were qualified as estimated because control limits were exceeded in one or more laboratory quality control (QC) samples or procedures. Qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the surface water butyltin analyses.

Holding Times and Sample Preservation

The extraction and analytical holding time requirements were met for all samples and associated field QC samples.

The sample preservation requirements (cooler temperature of $4^{\circ}\text{C} \pm 2^{\circ}$) were not met for most samples. The majority of the coolers were received at the laboratory at temperatures below the control limits. These temperature outliers did not impact data quality and no qualifiers were required.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. All initial and continuing calibration analyses met linearity and recovery acceptance criteria.

Method Blank Analyses

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all associated samples.

Di-n-butyltin was detected in the method blank. A total of 14 di-n-butyltin results (19% of all butyltin results) were qualified as not detected (U) based on method blank contamination.

Accuracy

The accuracy of the analytical results is evaluated in the following sections in terms of analytical bias (surrogate compound, laboratory control sample [LCS] and matrix spike [MS] recoveries) and precision (duplicate LCS and MS analyses).

Surrogate Compound Recoveries

A surrogate compound was added to all field and QC samples. The surrogate recovery from one sample was below the control limit. Reporting limits in the associated sample were qualified as estimated (UJ) with potential low bias. A total of four results (5.5% of butyltin results) were qualified for accuracy.

Matrix Spike Recoveries

Matrix spike analyses were not performed with some data sets. For these sets, laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses were used to assess accuracy and precision. All reported recoveries met the criteria for acceptable performance.

Laboratory Control Sample Recoveries

LCS/LCSD analyses met the criteria for frequency of analysis. All recoveries met the criteria for acceptable performance.

Precision

LCS/LCSD and MS/MSD analyses were evaluated for laboratory precision. All of the relative percent difference (RPD) values were acceptable.

Method Detection Limits and Method Reporting Limits

The laboratory reporting limits are based on the method detection limit (MDL), adjusted for sample size and dilution. The laboratory reporting limits ranged from 0.0006 to 0.028 µg/L for the non-detected results. The laboratory reporting limits met the target MRL stated in *Round 2 QAPP, Addendum 1: Surface Water*.

Field Quality Control Samples

Field QC samples collected for the butyltin analysis included field blank and system blank samples. The results for the field QC samples are discussed in the following sections.

Field Blanks

Two field blanks (LW3-W2902 and LW3-W2903) were associated with the samples. No target analytes were detected in any field blank.

System Blanks

Two system blanks (Decon Blank and Lab Blank) were generated and analyzed with the peristaltic pump samples. No target analytes were detected in these blanks.

Field Duplicate Samples

No field duplicate samples were analyzed with this sampling event.

SUMMARY OF DATA VALIDATION: DIOXINS & FURANS

A total of two peristaltic pump samples were analyzed for dioxin and furan compounds for the Portland Harbor Surface Water Low Flow sampling event. One rinsate blank was collected and analyzed to monitor the field collection process. Columbia Analytical Services, Houston, Texas, performed the dioxin and furan analyses.

The dioxin data for the surface water samples were acceptable. No data points were rejected or estimated.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the quality control (QC) procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the surface water dioxin analyses.

Holding Times and Sample Preservation

The extraction and analytical holding time requirements were met for all samples and associated field QC samples.

The sample preservation requirements (cooler temperature of $4^{\circ}\text{C} \pm 2^{\circ}$) were not met for most samples. The majority of the coolers were received at the laboratory at temperatures below the control limits. These temperature outliers did not impact data quality and no qualifiers were required.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. All initial and continuing calibration analyses met linearity and recovery acceptance criteria.

Method Blank Analyses

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all associated samples.

Octachlorodibenzo-p-dioxin (OCDD) was detected in the method blank. A total of two OCDD results (2.7% of all dioxin results) were qualified as not detected (U) based on method blank contamination.

Accuracy

The accuracy of the analytical results is evaluated in the following sections in terms of analytical bias (labeled compound, laboratory control sample [LCS] recoveries) and precision (duplicate LCS analyses).

Labeled Compound Recoveries

Surrogate (labeled) compounds were added to all field and QC samples. All reported recoveries met the criteria for acceptable performance.

Matrix Spike Recoveries

Matrix spike analyses were not performed for the dioxin analyses. Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses were used to assess accuracy and precision. All reported recoveries met the criteria for acceptable performance.

Laboratory Control Sample Recoveries

LCS/LCSD analyses met the criteria for frequency of analysis. The dioxin LCS is also known as an ongoing precision and recovery sample (OPR). All recoveries met the criteria for acceptable performance.

Precision

LCS/LCSD analyses were evaluated for laboratory precision. All of the relative percent difference (RPD) values were acceptable.

Method Detection Limits and Method Reporting Limits

The laboratory reporting limits are based on the method detection limit (MDL), adjusted for sample size and dilution. The laboratory reporting limits ranged from 0.0121 to 0.65 pg/L for the non-detected results. Target MRL for dioxin/furan compounds were not provided in *Round 2 QAPP, Addendum 1: Surface Water*.

Field Quality Control Samples

Field QC samples collected for the dioxin analysis included a field blank sample. The results for the field QC sample are discussed in the following section.

Field Blanks

One field blank (LW3-W2902) was associated with the samples. No target analytes were detected in the field blank.

Field Duplicate Samples

No field duplicate samples were analyzed with this sampling event.

SUMMARY OF DATA VALIDATION: METALS

A total of 14 peristaltic pump samples were analyzed for total and dissolved metals for the Portland Harbor Surface Water Low Flow sampling event. Two rinsate blanks were collected to monitor the field collection process and two system blanks (Lab Blank and Decon Blank) were also analyzed. Columbia Analytical Services, Kelso, Washington, performed all analyses. The following analytical methods were used:

| Parameter | Method |
|---------------|---------|
| ICP-MS Metals | SW6020 |
| Mercury | SW7470A |

The metals data for the surface water samples were acceptable. No data were rejected or estimated for any reason.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the surface water metals analyses.

Holding Times and Sample Preservation

The sample preservation requirements (cooler temperature of $4^{\circ}\text{C} \pm 2^{\circ}$) were not met for most samples. The majority of the coolers were received at the laboratory at temperatures below the control limits. These temperature outliers did not impact data quality and no qualifiers were required.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. All initial and continuing calibration analyses met linearity and recovery acceptance criteria.

Method Blank Analyses

Method and instrument blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all associated samples.

Method and instrument blanks were analyzed at the appropriate frequency. Various target analytes were detected in the method and/or instrument blanks. A total of 50 metals results (12% of all metals results) were qualified as not detected (U) based on method blank contamination. The qualifiers were applied to arsenic (3 results), chromium (19 results), lead (12 results), silver (12 results) and zinc (four results).

Accuracy

The accuracy of the analytical results is evaluated in the following sections in terms of analytical bias - matrix spike (MS), laboratory control sample (LCS), contract required detection limit (CRDL) standard recovery values, interference check samples (ICS), and serial dilution percent difference (%D) values - and precision (duplicate MS and laboratory duplicate analyses).

Matrix Spike Recoveries

MS analyses met the criteria for frequency of analysis. All recovery values met the criteria for acceptable performance.

Laboratory Control Sample Recoveries

LCS analyses met the criteria for frequency of analysis. All recovery values met the criteria for acceptable performance.

Contract Required Detection Limit Standard Analyses

CRDL standards were analyzed at the beginning of each analytical sequence. For recoveries greater than the 130% upper control limit, the associated positive results less than two times the CRDL are estimated (J) to indicate a potential high bias. For recoveries less than the 70% lower control limit, positive results less than twice the CRDL and non-detects are estimated (J/UJ) to indicate a potential low bias. CRDL standard outliers, with high biases for copper and silver, were reported. No positive results were reported so no qualifiers were required.

Interference Check Samples

ICP interference check samples were analyzed at the beginning of each analytical sequence. All ICP interference check sample results were within the acceptance criteria.

Serial Dilution Analyses

Serial dilution analyses were performed at the proper frequency. Serial dilution %D values greater exceeding 10% may indicate the presence of matrix interference, resulting in potential bias. All recovery values met the criteria for acceptable performance.

Precision

MS/MSD analyses were evaluated for laboratory precision. For mercury analyses, laboratory duplicate analyses were evaluated instead of MS/MSD analyses. All relative percent difference (RPD) values were acceptable.

Method Detection Limits and Method Reporting Limits

The laboratory reporting limits are based on the method detection limit (MDL), adjusted for sample size and dilution. The laboratory reporting limits ranged from 0.003 µg/L to 4 µg/L for the non-detected results. The laboratory reporting limits met the target MRL stated in *Round 2 QAPP, Addendum 1: Surface Water*, with the exception of several reporting limits for total aluminum, which exceeded the target MRL by a factor of 2.

Field Quality Control Samples

Field QC samples collected for the metals analysis included field blank and system blank samples. The results for the field QC samples are discussed in the following sections.

Field Blanks

Two field blanks (LW3-W2902 and LW3-W2903) were associated with the Low Flow samples. Numerous target elements were reported in these field blanks. A total of 24 dissolved results - 11 for aluminum and 13 for zinc - were qualified as not detected (U) based on field blank contamination (5.9% of all metals results).

System Blanks

Two system blanks (Decon Blank and Lab Blank) were generated and analyzed with the peristaltic pump samples. Positive results for copper, lead and zinc were detected in these blanks. There was no direct association between these blanks and other field samples. No data were qualified based on system blank contamination.

Field Duplicate Samples

No field duplicate samples were analyzed with this sampling event.

SUMMARY OF DATA VALIDATION: GENERAL CHEMISTRY

A total of 14 peristaltic pump samples were analyzed for some or all of the following general chemistry parameters for the Portland Harbor Surface Water Low Flow sampling event. Two rinsate blanks were collected to monitor the field collection process and two system blanks (Lab Blank and Decon Blank) were also analyzed. Note that system blank samples were analyzed for hardness and perchlorate only. Columbia Analytical Services, Kelso, Washington, performed all analyses. The following analytical methods were used:

| Parameter | Method |
|--------------------------------|-------------------|
| Total Dissolved Solids (TDS) | EPA 160.1 |
| Total Suspended Solids (TSS) | EPA 160.2 |
| Total Organic Carbon (TOC) | EPA 415.1 |
| Dissolved Organic Carbon (DOC) | EPA 415.1 |
| Hardness as CaCO ₃ | SW6010B / SM2340B |
| Perchlorate | EPA 314.0 |

Data for the general chemistry parameters analysis for the surface water samples were acceptable. No data were rejected or estimated.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the surface water general chemistry parameters analyses.

Holding Times and Sample Preservation

The sample preservation requirements (cooler temperature of 4°C ±2°) were not met for most samples. The majority of the coolers were received at the laboratory at temperatures below the control limits. These temperature outliers did not impact data quality and no qualifiers were required.

Instrument Performance

Initial and continuing calibrations were completed for the TOC, DOC, hardness, and perchlorate analyses and met the criteria for frequency of analysis. The initial calibrations met the linearity (percent relative standard deviation or correlation coefficient) control limits.

Method Blank Analyses

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all associated samples. No target analytes were detected in any method blank.

Accuracy

The accuracy of the analytical results is evaluated in the following sections in terms of analytical bias (matrix spike [MS] and laboratory control sample [LCS] recoveries) and precision (sample duplicate analyses).

Matrix Spike Recoveries

MS analyses were evaluated for accuracy of the TOC and DOC analyses. All MS recovery values were acceptable.

Laboratory Control Sample Recoveries

LCS analyses met the frequency criteria for all analyses. All of the LCS recovery values were acceptable.

Precision

Duplicate sample analyses were evaluated for laboratory precision. All precision measurements were acceptable.

Method Detection Limits and Method Reporting Limits

The laboratory reporting limits are based on the method detection limit (MDL), adjusted for sample size and dilution. The laboratory reporting limits met the target MRL for general chemistry parameters stated in *Round 2 QAPP, Addendum 1: Surface Water*.

Field Quality Control Samples

Field QC samples collected for the general chemistry analyses included field blank and system blank samples. The results for the field QC samples are discussed in the following sections.

Field Blanks

Two field blanks (LW3-W2902 and LW3-W2903) were associated with the Low Flow samples. Positive results for DOC, TDS, and TOC were reported in these field blanks. A total of 20 results – 14 each for DOC and TOC, plus six for TDS - were qualified as not detected (U) based on field blank contamination (12.5% of all general chemistry results).

System Blanks

Two system blanks (Decon Blank and Lab Blank) were generated and analyzed for hardness and perchlorate. No target analytes were detected in any system blank.

Field Duplicate Samples

No field duplicate samples were analyzed with this sampling event.

SUMMARY OF DATA VALIDATION: HEXAVALENT CHROMIUM

Two peristaltic pump samples were analyzed for hexavalent chromium for the Portland Harbor Surface Water Low Flow sampling event. One rinsate blank was collected to monitor the field collection process. Columbia Analytical Services, Kelso, Washington, performed the analyses.

Data for the hexavalent chromium analysis for the surface water samples were acceptable. No data were rejected or estimated.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the quality control (QC) procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the surface water hexavalent chromium analysis.

Holding Times and Sample Preservation

The sample preservation requirements (cooler temperature of $4^{\circ}\text{C} \pm 2^{\circ}$) were not met for most samples. The majority of the coolers were received at the laboratory at temperatures below the control limits. These temperature outliers did not impact data quality and no qualifiers were required.

Instrument Performance

Initial and continuing calibrations were completed and met the criteria for frequency of analysis. The initial calibrations met the linearity (percent relative standard deviation or correlation coefficient) control limits.

Method Blank Analyses

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all associated samples. No target analytes were detected in the method blank.

Accuracy

The accuracy of the analytical results is evaluated in the following sections in terms of analytical bias (matrix spike [MS] and laboratory control sample [LCS] recoveries) and precision (sample duplicate analyses).

Matrix Spike Recoveries

MS analyses were evaluated for accuracy. All MS recovery values were acceptable.

Laboratory Control Sample Recoveries

LCS analyses met the frequency criteria. All of the LCS recoveries were acceptable.

Precision

Duplicate sample analyses were evaluated for laboratory precision. All precision measurements were acceptable.

Method Detection Limits and Method Reporting Limits

The laboratory reporting limits are based on the method detection limit (MDL), adjusted for sample size and dilution. The laboratory reporting limit of 0.02 µg/L for the non-detected results exceeded, by a factor of 2, the target MRL stated in *Round 2 QAPP, Addendum 1: Surface Water*.

Field Quality Control Samples

Field QC samples collected for hexavalent chromium analysis included a field blank sample. The results for the field QC samples are discussed in the following sections.

Field Blanks

One field blank (LW3-W2902) was associated with the samples. No target analyte was detected in the field blank.

Field Duplicate Samples

No field duplicate samples were analyzed with this sampling event.



EcoChem, INC.
Environmental Data Quality

APPENDIX A

DATA QUALIFIER DEFINITIONS, REASON CODES, AND CRITERIA TABLES

DATA VALIDATION QUALIFIER CODES National Functional Guidelines

The following definitions provide brief explanations of the qualifiers assigned to results in the data review process.

| | |
|----|---|
| U | The analyte was analyzed for, but was not detected above the reported sample quantitation limit. |
| J | The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample. |
| N | The analysis indicates the presence of an analyte for which there is presumptive evidence to make a “tentative identification”. |
| NJ | The analysis indicates the presence of an analyte that has been “tentatively identified” and the associated numerical value represents the approximate concentration. |
| UJ | The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample. |
| R | The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified. |

The following is an EcoChem qualifier that may also be assigned during the data review process:

| | |
|-----|---|
| DNR | Do not report; a more appropriate result is reported from another analysis or dilution. |
|-----|---|

DATA QUALIFIER REASON CODES

| | |
|----|---|
| 1 | Holding Time/Sample Preservation |
| 2 | Chromatographic pattern in sample does not match pattern of calibration standard. |
| 3 | Compound Confirmation |
| 4 | Tentatively Identified Compound (TIC) (associated with NJ only) |
| 5A | Calibration (initial) |
| 5B | Calibration (continuing) |
| 6 | Field Blank Contamination |
| 7 | Lab Blank Contamination (e.g., method blank, instrument, etc.) |
| 8 | Matrix Spike(MS & MSD) Recoveries |
| 9 | Precision (all replicates) |
| 10 | Laboratory Control Sample Recoveries |
| 11 | A more appropriate result is reported (associated with "R" and "DNR" only) |
| 12 | Reference Material |
| 13 | Surrogate Spike Recoveries (a.k.a., labeled compounds & recovery standards) |
| 14 | Other (define in validation report) |
| 15 | GFAA Post Digestion Spike Recoveries |
| 16 | ICP Serial Dilution % Difference |
| 17 | ICP Interference Check Standard Recovery |
| 18 | Trip Blank Contamination |
| 19 | Internal Standard Performance (e.g., area, retention time, recovery) |
| 20 | Linear Range Exceeded |
| 21 | Potential False Positives |

Integral - Portland Harbor Site
 Semivolatile Compounds by GC/MS (Based on Organic NFG 1999)

| VALIDATION QC ELEMENT | ACCEPTANCE CRITERIA | ACTION | REASON CODE |
|--|---|---|-------------|
| Cooler Temperature | 4°C ±2° | J(+)/UJ(-) if greater than 6 deg. C (EcoChem PJ) | 1 |
| Holding Time | Water: 7 days from collection Soil: 14 days from collection Analysis: 40 days from extraction | <u>Water:</u> J(+)/UJ(-) if ext. > 7 and < 21 days J(+)/R(-) if ext > 21 days (EcoChem PJ) <u>Solids/Wastes:</u> J(+)/UJ(-) if ext. > 14 and < 42 days J(+)/R(-) if ext. > 42 days (EcoChem PJ) J(+)/UJ(-) if analysis >40 days | 1 |
| Tuning | DFTPP Beginning of each 12 hour period Method acceptance criteria | R(+/-) all analytes in all samples associated with the tune | 5A |
| Initial Calibration (Minimum 5 stds.) | RRF > 0.05 | (EcoChem PJ, see TM-06) If MDL= reporting limit: J(+)/R(-) if RRF < 0.05 If reporting limit > MDL: note in worksheet if RRF <0.05 | 5A |
| | %RSD < 30% | (EcoChem PJ, see TM-06) J(+) if %RSD > 30% | 5A |
| Continuing Calibration (Prior to each 12 hr. shift) | RRF > 0.05 | (EcoChem PJ, see TM-06) If MDL= reporting limit: J(+)/R(-) if RRF < 0.05 If reporting limit > MDL: note in worksheet if RRF <0.05 | 5B |
| | %D <25% | (EcoChem PJ, see TM-06) If > +/-90%: J+/R- If -90% to -26%: J+ (high bias) If 26% to 90%: J+/UJ- (low bias) | 5B |
| Method Blank | One per matrix per batch No results > QL | U(+) if sample (+) result is less than QL and less than appropriate 5X or 10X rule (raise sample value to QL) | 7 |
| | | U(+) if sample (+) result is greater than or equal to QL and less than appropriate 5X and 10X rule (at reported sample value) | 7 |
| | No TICs present | R(+) TICs using 10X rule | 7 |
| Field Blanks | No results > QL | Apply 5X/10X rule: U(+) < action level | 6 |

Integral - Portland Harbor Site
 Semivolatile Compounds by GC/MS (Based on Organic NFG 1999)

| VALIDATION QC ELEMENT | ACCEPTANCE CRITERIA | ACTION | REASON CODE |
|-----------------------------------|---|---|--------------------|
| MS/MSD (recovery) | One per matrix per batch Use method acceptance criteria | Qualify parent only unless other QC indicates systematic problems: J(+) if both %R > UCL J(+)/UJ(-) if both %R < LCL J(+)/R(-) if both %R < 10% PJ if only one %R outlier | 8 |
| MS/MSD (RPD) | One per matrix per batch Use method acceptance criteria | J(+) if RPD > CL | 9 |
| LCS low conc. H2O SVOA | One per lab batch Within method control limits | J(+) assoc. cmpd if > UCL J(+)/R(-) assoc. cmpd if < LCL J(+)/R(-) all cmpds if half are < LCL | 10 |
| LCS regular SVOA (H2O & solid) | One per lab batch Lab or method control limits | J(+) if %R > UCL J(+)/UJ(-) if %R < LCL J(+)/R(-) if %R < 10% (EcoChem PJ) | 10 |
| LCS/LCSD (if required) | One set per matrix and batch of 20 samples RPD < 35% | J(+) assoc. cmpd. in all samples | 9 |
| Surrogates | Minimum of 3 acid and 3 base/neutral compounds Use method acceptance criteria | Do not qualify if only 1 acid and/or 1 B/N surrogate is out unless <10% J(+) if %R > UCL J(+)/UJ(-) if %R < LCL J(+)/R(-) if %R < 10% | 13 |
| Internal Standards | Added to all samples Acceptable Range: IS area 50% to 200% of CCAL area RT within 30 seconds of CC RT | J(+) if > 200% J(+)/UJ(-) if < 50% J(+)/R(-) if < 25% R T>30 seconds, narrate and Notify PM | 19 |
| Field Duplicates | QAPP specified RPD < 50% (sediment & water) | Narrate; do not qualify. | na |
| TICs | Major ions (>10%) in reference must be present in sample; intensities agree within 20%; check identification | R(+) common laboratory contaminants R(+) target compounds from other fractions See Technical Director for ID issues | 4 |
| Quantitation/ Identification | RRT within 0.06 of standard RRT Ion relative intensity within 20% of standard All ions in std. at > 10% intensity must be present in sample | See Technical Director if outliers | 14 21 (false +) |

Integral - Portland Harbor Site
 Phthalates Analysis by GC/MS Method 525.2 (Based on Organic NFG 1999)

| VALIDATION QC ELEMENT | ACCEPTANCE CRITERIA | ACTION | REASON CODE |
|--|---|---|-------------|
| Cooler Temperature | 4°C ±2° | J(+)/UJ(-) if greater than 6 deg. C (EcoChem PJ) | 1 |
| Holding Time | Water: 7 days from collection Soil: 14 days from collection Analysis: 40 days from extraction | <u>Water:</u> J(+)/UJ(-) if ext. > 7 and < 21 days J(+)/R(-) if ext > 21 days (EcoChem PJ) <u>Solids/Wastes:</u> J(+)/UJ(-) if ext. > 14 and < 42 days J(+)/R(-) if ext. > 42 days (EcoChem PJ) J(+)/UJ(-) if analysis >40 days | 1 |
| Tuning | DFTPP Beginning of each 12 hour period Method acceptance criteria | R(+/-) all analytes in all samples associated with the tune | 5A |
| Initial Calibration (Minimum 5 stds.) | RRF > 0.05 | (EcoChem PJ, see TM-06) If MDL= reporting limit: J(+)/R(-) if RRF < 0.05 If reporting limit > MDL: note in worksheet if RRF <0.05 | 5A |
| | %RSD < 30% | (EcoChem PJ, see TM-06) J(+) if %RSD > 30% | 5A |
| Continuing Calibration (Prior to each 12 hr. shift) | RRF > 0.05 | (EcoChem PJ, see TM-06) If MDL= reporting limit: J(+)/R(-) if RRF < 0.05 If reporting limit > MDL: note in worksheet if RRF <0.05 | 5B |
| | %D <25% | (EcoChem PJ, see TM-06) If > +/-90%: J+/R- If -90% to -26%: J+ (high bias) If 26% to 90%: J+/UJ- (low bias) | 5B |
| Method Blank | One per matrix per batch No results > QL | U (+) if result is < adjusted blank concentration. Use 2X for bis(2-ethylhexyl)phthalate J (+) if result is < 5X adjusted blank concentration. Use < 10X for bis(2-ethylhexyl)phthalate | 7 |
| Field Blank | No results > QL | Same as Method Blank | 6 |

**Integral - Portland Harbor Site
Phthalates Analysis by GC/MS Method 525.2 (Based on Organic NFG 1999)**

| VALIDATION QC ELEMENT | ACCEPTANCE CRITERIA | ACTION | REASON CODE |
|-----------------------------------|---|---|--------------------|
| MS/MSD (recovery) | One per matrix per batch Use method acceptance criteria | Qualify parent only unless other QC indicates systematic problems: J(+) if both %R > UCL J(+)/UJ(-) if both %R < LCL J(+)/R(-) if both %R < 10% PJ if only one %R outlier | 8 |
| MS/MSD (RPD) | One per matrix per batch Use method acceptance criteria | J(+) if RPD > CL | 9 |
| LCS low conc. H2O SVOA | One per lab batch Within method control limits | J(+) assoc. cmpd if > UCL J(+)/R(-) assoc. cmpd if < LCL J(+)/R(-) all cmpds if half are < LCL | 10 |
| LCS regular SVOA (H2O & solid) | One per lab batch Lab or method control limits | J(+) if %R > UCL J(+)/UJ(-) if %R < LCL J(+)/R(-) if %R < 10% (EcoChem PJ) | 10 |
| LCS/LCSD (if required) | One set per matrix and batch of 20 samples RPD < 35% | J(+) assoc. cmpd. in all samples | 9 |
| Surrogates | Minimum of 3 acid and 3 base/neutral compounds Use method acceptance criteria | Do not qualify if only 1 acid and/or 1 B/N surrogate is out unless <10% J(+) if %R > UCL J(+)/UJ(-) if %R < LCL J(+)/R(-) if %R < 10% | 13 |
| Internal Standards | Added to all samples Acceptable Range: IS area 50% to 200% of CCAL area RT within 30 seconds of CC RT | J(+) if > 200% J(+)/UJ(-) if < 50% J(+)/R(-) if < 25% R T > 30 seconds, narrate and Notify PM | 19 |
| Field Duplicates | QAPP specified RPD < 50% (sediment & water) | Narrate; do not qualify. | na |
| TICs | Major ions (>10%) in reference must be present in sample; intensities agree within 20%; check identification | R(+) common laboratory contaminants R(+) target compounds from other fractions See Technical Director for ID issues | 4 |
| Quantitation/ Identification | RRT within 0.06 of standard RRT Ion relative intensity within 20% of standard All ions in std. at > 10% intensity must be present in sample | See Technical Director if outliers | 14 21 (false +) |

**Integral - Portland Harbor Site
 Pesticides/PCBs/Herbicides/Phenols by GC/ECD (Based on Organic NFG 1999)**

| VALIDATION QC ELEMENT | ACCEPTANCE CRITERIA | ACTION | REASON CODE |
|------------------------------------|--|--|-------------|
| Cooler Temperature | 4°C ±2° | J(+)/UJ(-) if greater than 6 deg. C (EcoChem PJ) | 1 |
| Holding Time | Water: 7 days from collection Soil: 14 days from collection Analysis: 40 days from extraction | J(+)/UJ(-) if ext/analyzed > HT J(+)/R(-) if ext/analyzed > 3X HT (EcoChem PJ) | 1 |
| Resolution Check | Beginning of ICAL Sequence Within RTW Resolution >90% | Narrate (Use Professional Judgement to qualify) | 14 |
| Instrument Performance (Breakdown) | DDT Breakdown: < 20% Endrin Breakdown: <20% Combined Breakdown: <30% Compounds within RTW | J(+) DDT NJ(+) DDD and/or DDE R(-) DDT - If (+) for either DDE or DDD J(+) Endrin NJ(+) EK and/or EA R(-) Endrin - If (+) for either EK or EA | 5A |
| Retention Times | Surrogates: TCX (+/- 0.05); DCB (+/- 0.10) Target compounds: elute before heptachlor epoxide (+/- 0.05) elute after heptachlor epoxide (+/- 0.07) | NJ(+)/R(-) results for analytes with RT shifts For full DV, use PJ based on examination of raw data | 5B |
| Initial Calibration | Pesticides: Low=CRQL, Mid=4X, High=16X Multiresponse - one point Calibration %RSD<20% %RSD<30% for surr; two comp. may exceed if <30% Resolution in Mix A and Mix B >90% | J(+)/UJ(-) | 5A |
| Continuing Calibration | Alternating PEM standard and INDA/INDB standards every 12 hours (each preceded by an inst. Blank) %D < 25% Resolution >90% in IND mixes; 100% for PEM | J(+)/UJ(-) J(+)/R(-) if %D > 90% PJ for resolution | 5B |
| Method Blank | One per matrix per batch No results > CRQL | U(+) if sample result is < CRQL and < 5X rule (raise sample value to CRQL) | 7 |
| | | U(+) if sample result is > or equal to CRQL and < 5X rule (at reported sample value) | 7 |
| Instrument Blanks | Analyzed at the beginning of every 12 hour sequence No analyte > 1/2 CRQL | Same as Method Blank | 7 |
| Field Blanks | No results > QL | Apply 5X rule; U(+) < action level | 6 |

**Integral - Portland Harbor Site
 Pesticides/PCBs/Herbicides/Phenols by GC/ECD (Based on Organic NFG 1999)**

| VALIDATION QC ELEMENT | ACCEPTANCE CRITERIA | ACTION | REASON CODE |
|----------------------------------|---|---|-------------|
| MS/MSD (recovery) | One set per matrix per batch Method Acceptance Criteria | Qualify parent only unless other QC indicates systematic problems: J(+) if both %R > UCL J(+)/UJ(-) if both %R < LCL J(+)/R(-) if both %R < 10% PJ if only one %R outlier | 8 |
| MS/MSD (RPD) | One set per matrix per batch Method Acceptance Criteria | J(+) if RPD > CL | 9 |
| LCS | One per SDG Method Acceptance Criteria | J(+) if %R > UCL J(+)/UJ(-) if %R < LCL J(+)/R(-) using PJ if %R <<LCL (< 10%) | 10 |
| LCS/LCSD <i>(if required)</i> | One set per matrix and batch of 20 samples RPD < 35% | J(+) assoc. compd. in all samples | 9 |
| Surrogates | TCX and DCB added to every sample %R = 30-150% | J(+)/UJ(-) if both %R = 10 - 60% J(+) if both >150% J(+)/R(-) if any %R <10% | 13 |
| Quantitation/ Identification | Analyte within RTW on both columns Quantitated using CCV or ICAL CF Lowest value from either column reported %D between columns (25%) | J(+) if RPD = 25-60% (Pest/Aroclor); 40-60% (Herb/Phenol) NJ(+) using PJ if RPD > 60% | 3 |
| Two analyses for one sample | Report only one result per analyte | "DNR" results that should not be used to avoid reporting two results for one sample | 11 |
| Sample Clean-up | GPC required for soil samples Florisil required for all samples Sulfur is optional Clean-up standard check %R within CLP limits | J(+)/UJ(-) if %R < LCL J(+) if %R > UCL | 14 |
| Field Duplicates | QAPP specified RPD < 50% (sediment & water) | Narrate; do not qualify. | na |

DATA VALIDATION CRITERIA

Table No.: Integral-TBT
 Revision No.: 1
 Last Rev. Date: 12/12/05
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Integral - Portland Harbor Site Butyltins by GC/FPD

| VALIDATION QC ELEMENT | ACCEPTANCE CRITERIA | ACTION | REASON CODE |
|---------------------------------|---|--|-------------|
| Cooler Temperature | 4°C ±2° | J(+)/UJ(-) if greater than 6 deg. C (EcoChem PJ) | 1 |
| Holding Time | Water: 7 days from collection Soil: 14 days from collection Analysis: 40 days from extraction | J(+)/UJ(-) if ext/analyzed > HT J(+)/R(-) if ext/analyzed > 3X HT (EcoChem PJ) | 1 |
| Initial Calibration | %RSD<30% or correlation co-efficient >0.99 | J(high bias), J/UJ(low bias) | 5A |
| Continuing Calibration | %D < 25% | J(high bias), J/UJ(low bias) | 5B |
| Method Blank | One per matrix per batch | U(+) if sample result is < CRQL and < 5X rule (raise sample value to CRQL) | 7 |
| | | U(+) if sample result is > or equal to CRQL and < 5X rule (at reported sample value) | 7 |
| Instrument Blanks | Analyzed at the beginning of every 12 hour sequence No analyte > MRL | Same as Method Blank | 7 |
| Field Blanks | No results > QL | Apply 5X rule; U(+) < action level | 6 |
| MS/MSD (recovery) | One set per matrix per batch Method Acceptance Criteria | Qualify parent only unless other QC indicates systematic problems: J(+) if both %R > UCL J(+)/UJ(-) if both %R < LCL J(+)/R(-) if both %R < 10% PJ if only one %R outlier | 8 |
| MS/MSD (RPD) | One set per matrix per batch Method Acceptance Criteria | J(+) if RPD > CL | 9 |
| LCS | One per SDG Method Acceptance Criteria | J(+) if %R > UCL J(+)/UJ(-) if %R < LCL J(+)/R(-) using PJ if %R <<LCL (< 10%) | 10 |
| LCS/LCSD (if required) | One set per matrix and batch of 20 samples RPD < 35% | J(+) assoc. cmpd. in all samples | 9 |
| Surrogates | tri-n-propyltin added to every sample %R = Laboratory control limits | J(+)/UJ(-) if both %R = 10 - 60% J(+) if both >150% J(+)/R(-) if any %R <10% | 13 |
| Quantitation/ Identification | Analyte within RTW on both columns Quantitated using ICAL CF Higher value from either column reported %D between columns (40%) | J(+) if RPD = 40 - 60% NJ(+) if RPD >60% EcoChem PJ - See TM-08 | 3 |

DATA VALIDATION CRITERIA

Table No.: Integral-TBT
Revision No.: 1
Last Rev. Date: 12/12/05
Page: 8 of 14

Integral - Portland Harbor Site Butyltins by GC/FPD

| VALIDATION QC ELEMENT | ACCEPTANCE CRITERIA | ACTION | REASON CODE |
|-----------------------------|---|---|-------------|
| Two analyses for one sample | Report only one result per analyte | "DNR" results that should not be used to avoid reporting two results for one sample | 11 |
| Field Duplicates | QAPP specified RPD < 50% (sediment & water) | Narrate; do not qualify. | na |

DATA VALIDATION CRITERIA

Table No.: Integral-ICP

Revision No.: 1

Last Rev. Date: 12/12/05

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Integral - Portland Harbor Site Metals by ICP (Based on Inorganic NFG 1994 & 2002)

| VALIDATION QC ELEMENT | ACCEPTANCE CRITERIA | ACTION | REASON CODE |
|---|--|--|-------------|
| Cooler Temperature and Preservation | 4°C ±2° Water Only: Nitric Acid to pH < 2 For Dissolved metals, 0.45 um filter preserve after filtration | Professional Judgment J(+)/UJ(-) if preservation requirements are not met | 1 |
| Holding Time | 180 days | Professional Judgment J(+)/UJ(-) | 1 |
| Initial Calibration | Blank + minimum 1 standard once every 24 hours if more than 1 standard r>0.995 | Professional Judgment J(+)/UJ(-) if r<0.995 (multi point cal) | 5A |
| Initial Calibration Verification (ICV) | Independent source analyzed immed. after cal. %R within +/- 10% of true value | Professional Judgment J(+)/UJ(-) if %R 75%-89% J(+) if %R = 111-125% R(+) if %R > 125% R(+/-) if %R < 75% | 5A |
| Continuing Cal Verification (CCV) | Every ten samples, immed. Before samples+ and end of run %R within +/- 10% of true value | Professional Judgment J(+)/UJ(-) if %R = 75%-89% J(+) if %R 111-125% R(+) if %R > 125% R(+/-) if %R < 75% | 5B |
| CRI Standard (to check CRDL) | 2X CRDL (or 2X IDL if greater) analyzed beginning and end of run (at least 8 hrs) Not required for Al, Ba, Ca, Fe, Mg, Na, K %R = 70%-130% (50%-150% Sb, Pb, Tl) | Professional Judgment R(-),(+) < 2XCRDL if %R < 50% (< 30% Sb, Pb, Tl) J(+)<2XCRDL, UJ(-) if %R 50-69% (30%-49% Sb, Pb, Tl) J(+) < 2X CRDL if %R 130%-180% (150%-200% Sb, Pb, Tl) R(+)<2X CRDL if %R>180%(200% Sb, Pb, Tl) | 14 |
| Initial and Continuing Cal Blanks (ICB/CCB) | after each ICV and CCV every ten samples and end of run blank < +/- IDL | Action level is 5x abs. value of blk conc. For (+) blk value, U(+) values < action level For (-) blk value, J(+)/UJ(-) values < action level | 7 |
| Prep Blank | One per matrix per batch (not to exceed 20 samples) | Action level is 5x abs. value of blk conc. For (+) blk value, U(+) values < action level For (-) blk value, J(+)/UJ(-) values < action level | 7 |
| Interference Check Samples ICSA/ICSAB | Beginning and end of each run or every eight hours ICSAB +/- 20% ICSA < +/- IDL | For samp with Al,Ca,Fe,Mg > ICS levels R(+/-) if %R<50% J(+) if %R >120% J(+)/UJ(-) if %R= 50% to 79% Professional Judgment ICSA | 17 |
| Post Digestion Spike | If ICP Matrix Spike is outside 75-125%, spike at twice the sample conc. | No Qualls assigned based on this element | |

DATA VALIDATION CRITERIA

Table No.: Integral-ICP

Revision No.: 1

Last Rev. Date: 12/12/05

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Integral - Portland Harbor Site Metals by ICP (Based on Inorganic NFG 1994 & 2002)

| VALIDATION QC ELEMENT | ACCEPTANCE CRITERIA | ACTION | REASON CODE |
|----------------------------|--|---|-------------|
| Matrix Spike | One per matrix per batch 75-125% for samples less than 4 x spike level | J(+) if %R>125% J(+)/UJ(-) if %R <75% J(+)/R(-) if %R<30% | 8 |
| Laboratory Duplicate | One per matrix per batch RPD <20% for samples > 5x CRDL Diff <CRDL for samples >CRDL and <5 x CRDL (may use RPD < 35%, Diff < 2X CRDL for solids) | J(+)/UJ(-) if RPD > 20% or diff > CRDL | 9 |
| Serial Dilution | 5x dilution one per matrix %D <10% for values > 50x IDL | J(+)/UJ(-) if %D >10% | 16 |
| Laboratory Control Sample | Waters: One per matrix per batch %R (80-120%) | R(+/-) if %R < 50% J(+)/UJ(-) if %R = 50-79% J(+) if %R >120% | 10 |
| | Soils: One per matrix per batch Result within manufacturer's certified acceptance range | J(+)/UJ(-) if < LCL, J(+) if > UCL | 10 |
| Field Blanks | No results > QL | Apply 5X rule; U(+) < action level | 6 |
| Field Duplicates | QAPP specified RPD < 50% (sediment & water) | Narrate; do not qualify. | na |
| Instrument Detection Limit | determined every 3 months | Professional Judgment | 14 |
| Linear Range | determined yearly samples diluted to fall within range | J(+) values over range | 20 |

DATA VALIDATION CRITERIA

Table No.: Integral-ICPMS

Revision No.: 1

Last Rev. Date: 12/12/05

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Integral - Portland Harbor Site Metals by ICP-MS (Based on Inorganic NFG 1994 & 2002)

| VALIDATION QC ELEMENT | ACCEPTANCE CRITERIA | ACTION | REASON CODE |
|---|---|---|-------------|
| Cooler Temperature and Preservation | 4°C ±2° Water Only: Nitric Acid to pH < 2 For Dissolved metals, 0.45 um filter preserve after filtration | Professional Judgment J(+)/UJ(-) if preservation requirements are not met | 1 |
| Holding Time | 180 days | Professional Judgment J(+)/UJ(-) if holding time exceeded J(+)/R(-) if HT exceeded by 3x | 1 |
| Tune | Prior to ICAL Analyzed 5 times wih Std Dev. ≤ 5% mass calibration <0.1 amu from True Value Resolution < 0.9 AMU @ 10% peak height or <0.75 amu @ 5% peak height | Professional Judgment No Tune - R all results criteria not met - J(+)/UJ(-) | 5A |
| Initial Calibration | Mininum Blank+1 Standard every 24 hours | Professional Judgment J(+)/UJ(-) >24 hours J(+)/UJ(-) if r<0.995 (for multi point cal) | 5A |
| Initial Calibration Verification (ICV) | Independent source; analyzed post ICAL and prior to samples +/-10% of the True value | Professional Judgment J(+)/UJ(-) if %R 75%-89% J(+) if %R = 111-125% R(+) if %R > 125% R(+/-) if %R < 75% | 5A |
| Continuing Cal Verification (CCV) | Every 10 samples, post ICV/ICB and end of run +/- 10% of True value | professional judgment J(+)/UJ(-) if %R 75%-89% J(+) if %R = 111-125% R(+) if %R > 125% R(+/-) if %R < 75% | 5B |
| CRDL Standard (CRI) | 2X CRDL (or 2X IDL if greater) analyzed beginning and end of run (at least 8 hrs) Not required for Al, Ba, Ca, Fe, Mg, Na, K %R = 70%-130% (50%-150% Co,Mn, Zn) | Professional judgment R(-),(+) < 2XCRDL if %R < 50% (< 30% Co, Mn, Zn) J(+)<2XCRDL, UJ(-) if %R 50-69% (30%-49% Co, Mn, Zn) J(+)<2X CRDL if %R 130%-180% (150%-200% Co, Mn, Zn) R(+)<2X CRDL if %R>180%(200% Co, Mn, Zn) | 14 |
| Initial and Continuing Cal Blanks (ICB/CCB) | after each ICV and CCV every ten samples and end of run blank < +/- IDL | Action level is 5x abs. value of blk conc. For (+) blk value, U(+) values < AL For (-) blk value, J(+)/UJ(-) values < AL | 7 |
| Prep Blank | One per matrix per batch (not to exceed 20 samples) | Action level is 5x abs. value of blk conc. For (+) blk value, U(+) values < AL For (-) blk value, J(+)/UJ(-) values < AL | 7 |
| Field Blanks | No results > QL | Apply 5X rule; U(+) < action level | 6 |

DATA VALIDATION CRITERIA

Table No.: Integral-ICPMS

Revision No.: 1

Last Rev. Date: 12/12/05

Page: 12 of 14

Integral - Portland Harbor Site Metals by ICP-MS (Based on Inorganic NFG 1994 & 2002)

| VALIDATION QC ELEMENT | ACCEPTANCE CRITERIA | ACTION | REASON CODE |
|--|---|---|-------------|
| Interference Check Samples ICSA/ICSAB | ICSAB +/- 20% of true value ICSA < +/- IDL | Where Al,Ca,Fe,Mg = ICS levels J(+) if %R >120% J(+)/UJ(-) if %R = 50% to 79% R(+/-) if %R<50% Professional Judgment for ICSA > +/- IDL | 17 |
| Post Digestion Spike | If ICP Matrix Spike is outside 75-125% Spike parent sample at 2X the sample conc. | Use Professional Judgment - usually no action | 14 |
| Matrix Spike | One per matrix, batch and SDG 75-125% for samples where results do not exceed 4x spike level | J (+) if %R > 125% J(+)/UJ(-) if %R < 75% J(+)/R(-) if %R < 30% UJ(-) if %R = 30-74% | 8 |
| Laboratory Duplicate | One per matrix per batch RPD <20% for samples > 5x CRDL Diff<CRDL for samples >CRDL and <5 x CRDL (may use RPD < 35%, Diff < 2X CRDL for solids) | J(+)/UJ(-) associated samples if RPD > 20% or diff > CRDL | 9 |
| Laboratory Control Sample | Waters: One per matrix per batch %R (80-120%) | R(+/-) if %R < 50% J(+)/UJ(-) if %R = 50-79% J(+) if %R >120% | 10 |
| | Soils: One per matrix per batch result within manufacturer's certified acceptance range | J(+)/UJ(-) if < LCL, J(+) if > UCL | 10 |
| Serial Dilution | 5x dilution one per matrix (or SDG) %D <10% of the undiluted value for values > 50x IDL | J(+)/UJ(-) if %D >10% | 16 |
| Field Duplicates | QAPP specified RPD < 50% (sediment & water) | Narrate; do not qualify. | na |
| Internal Standards | Every Sample 60%-125% of ICAL IS | J (+)/UJ (-) analytes associated with IS outlier | 19 |
| Instrument Detection Limit | Determined every 3 months | Professional Judgment | 14 |
| Linear Range | determined yearly samples diluted to fall within range | J(+) values over range | 20 |

DATA VALIDATION CRITERIA

Table No.: Integral-HG
 Revision No.: 1
 Last Rev. Date: 12/12/05
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Integral - Portland Harbor Site Mercury by CVAA (Based on Inorganic NFG 1994 & 2002)

| VALIDATION QC ELEMENT | ACCEPTANCE CRITERIA | ACTION | REASON CODE |
|---|--|--|-------------|
| Cooler Temperature and Preservation | 4°C ±2° Water Only: Nitric Acid to pH < 2 For Dissolved metals, 0.45 um filter preserve after filtration | Professional Judgment J(+)/UJ(-) if preservation requirements are not met | 1 |
| Holding Time | 28 days from date sampled | Professional Judgment J(+)/UJ(-) if holding time exceeded | 1 |
| Initial Calibration | Blank + 4 standards r > 0.995 once every 24 hours | Professional Judgment J(+)/UJ(-) if r<0.995 | 5A |
| Initial Calibration Verification (ICV) | Independent source analyzed immediately after cal. %R within +/- 20% of true value | Professional Judgment R(+/-) if %R < 65% R(+) if %R > 135% J(+)/UJ(-) if %R = 65%-79% J(+) if %R = 121-135% | 5A |
| Continuing Cal Verification (CCV) | Every ten samples, immed. following ICV/ICB and end of run %R within +/- 20% of true value | R(+/-) if %R < 65% R(+) if %R > 135% J(+)/UJ(-) if %R = 65%-79% J(+) if %R = 121-135% | 5B |
| CRDL Standard (CRA) | Beginning of run after ICV/ICB CCV/CCB Conc = CRDL 70% - 130% | Professional Judgment R(-),(+) < 2XCRDL if %R < 50% J(+)<2XCRDL, UJ(-) if %R 50-69% J(+) < 2X CRDL if %R 130%-180% R(+)<2X CRDL if %R>180% | 14 |
| Initial and Continuing Cal Blanks (ICB/CCB) | After each ICV and CCV every ten samples and end of run blank < +/- IDL | Action level is 5x abs. value of blk conc. For (+) blk value, U(+) sample values < AL For (-) blk value, J(+)/UJ(-) sample values < AL | 7 |
| Prep Blank | One per matrix per batch (not to exceed 20 samples) | Action level is 5x abs. value of blk conc. For (+) blk value, U(+) sample values < AL For (-) blk value, J(+)/UJ(-) sample values < AL | 7 |
| Matrix Spike | One per matrix per batch 5% frequency 75-125% for samples less than 4x spike level | J(+) if %R > 125% J(+)/UJ(-) if %R < 75% J(+)/R(-) if %R < 30% | 8 |
| Laboratory Duplicate | One per matrix per batch RPD < 20% for samples > 5x CRDL (+/-)CRDL for samples > CRDL and < 5 x CRDL (may use RPD < 35%, Diff < 2X CRDL for solids) | J(+)/UJ(-) if RPD > 20% or diff > CRDL | 9 |

DATA VALIDATION CRITERIA

Table No.: Integral-HG
 Revision No.: 1
 Last Rev. Date: 12/12/05
 Page: 14 of 14

Integral - Portland Harbor Site Mercury by CVAA (Based on Inorganic NFG 1994 & 2002)

| VALIDATION QC ELEMENT | ACCEPTANCE CRITERIA | ACTION | REASON CODE |
|---------------------------|---|---|-------------|
| Laboratory Control Sample | Waters: One per matrix per batch %R (80-120%) | R(+/-) if %R < 50%; J(+) if %R > 120% J(+)/UJ(-) if %R = 50-79% | 10 |
| | Soils: One per matrix per batch Result within manufacturer's certified acceptance range | J(+)/UJ(-) if < LCL, J(+) if > UCL | 10 |
| Field Duplicates | No specific QAPP limits Use RPD < 35% (water) or < 50% (soil) | Narrate; do not qualify. | na |
| Field Duplicates | QAPP specified RPD < 50% (sediment & water) | J(+)/UJ(-) in parent samples only | 9 |

DATA VALIDATION CRITERIA

Table No.: Eco-Conv
 Revision No.: draft
 Last Rev. Date: draft
 Page: 1 of 2

EcoChem Validation Guidelines for Conventional Chemistry Analysis (Based on EPA Standard Methods)

| VALIDATION QC ELEMENT | ACCEPTANCE CRITERIA | ACTION | REASON CODE |
|---|---|---|-------------|
| Cooler Temperature and Preservation | 4°C ±2° Water: NaOH to pH > 12 (for CN) | J(+)/UJ(-) if preservation requirements not met EcoChem PJ | 1 |
| Holding Time | Method Specific | Professional Judgment J(+)/UJ(-) if holding time exceeded J(+)/R(-) if HT exceeded by > 3X | 1 |
| Initial Calibration | Method specific once every 24 hours One at CRDL $r > 0.995$ | Professional judgment J(+)/UJ(-) for $r < 0.995$ | 5A |
| Initial Calibration Verification (ICV) | Independent source analyzed immediately after cal. %R method specific | R(+/-) if %R sig < LCL J(+)/UJ(-) if %R < LCL J(+) if %R > UCL R(+) if %R sig > UCL | 5A |
| Continuing Cal Verification (CCV) | Every ten samples, immed. following ICV/ICB and end of run %R method specific | R(+/-) if %R sig < LCL J(+)/UJ(-) if %R < LCL J(+) if %R > UCL R(+) if %R sig > UCL | 5B |
| Initial and Continuing Cal Blanks (ICB/CCB) | After each ICV and CCV every ten samples and end of run blank < +/- IDL | For positive blk results: UJ(+) < 5X blk contamination For negative blk results: J(+)/UJ(-) < abs. value of 5X blk contamination | 7 |
| Prep Blank | One per matrix per batch (not to exceed 20 samples) | For positive blk results: UJ(+) < 5X blk contamination For negative blk results: J(+)/UJ(-) < abs. value of 5X blk contamination | 7 |
| Matrix Spike | One per matrix per batch; 5% frequency 75-125% for samples less than 4 x spike level | J(+) if %R > 125% or < 75% UJ(-) if %R = 30-74% R(+/-) results < IDL if %R < 30% | 8 |
| Laboratory Duplicate | One per matrix per batch RPD < 20% for samples > 5x CRDL Diff < CRDL for samples > CRDL and < 5 x CRDL (may use RPD < 35%, Diff < 2X CRDL for solids) | J(+)/UJ(-) in assoc samples if RPD > 20% or diff > CRDL | 9 |
| Laboratory Control Sample | Waters: One per matrix per batch %R (80-120%) | R(+/-) if MS/MSD & LCS %R outside limits J(+)/UJ(-) if %R = 50-79% J(+) if %R > 120% R(+/-) if %R < 50% | 10 |
| | Soils: One per matrix per batch Result within manufacturer's certified acceptance range | J(+)/UJ(-) if < LCL, J(+) if > UCL | 10 |

DATA VALIDATION CRITERIA

Table No.: Eco-Conv

Revision No.: draft

Last Rev. Date: draft

Page: 2 of 2

EcoChem Validation Guidelines for Conventional Chemistry Analysis (Based on EPA Standard Methods)

| VALIDATION QC ELEMENT | ACCEPTANCE CRITERIA | ACTION | REASON CODE |
|-----------------------|--|---|-------------|
| Field Blanks | taken on same day as samples | Action level is 5x blk conc. U(+) sample values < AL | 6 |
| Field Duplicates | Waters RPD < 35% Soils RPD < 50% for values > 5 x CRDL Diff < CRDL for samples >CRDL and <5 x CRDL (may use Diff < 2X CRDL for solids) | J(+)/UJ(-) in parent samples only | 9 |



EcoChem, INC.
Environmental Data Quality

APPENDIX B

DATA VALIDATION REPORTS

DATA VALIDATION REPORT
Portland Harbor RI/FS
Surface Water – Low Flow Sampling – Fall 2006
Semivolatile Organic Compounds (SVOC) by EPA 8270C
Columbia Analytical Services - Kelso

This report documents the review of analytical data from the analyses of surface water samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Columbia Analytical Services, Inc., Kelso, Washington.

| SDG | No. Samples | Validation Level |
|----------|---------------------------------|------------------|
| K0606983 | 2 System Blanks | Screening |
| K0607559 | 4 Surface Water | Full |
| K0607697 | 2 Surface Water | Summary |
| K0607702 | 2 Surface Water | Summary |
| K0607736 | 2 Surface Water | Summary |
| K0607821 | 2 Surface Water & 1 Field Blank | Summary |
| K0607925 | 2 Surface Water & 1 Field Blank | Summary |

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%). No errors were found.

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

- | | | | |
|---|------------------------------------|---|---|
| 1 | Holding Times & Sample Receipt | 2 | Matrix Spikes/Matrix Spike Duplicates (MS/MSD) |
| | GC/MS Instrument Performance Check | 2 | Laboratory Control Samples (LCS) |
| | Initial Calibration (ICAL) | | Internal Standards |
| 2 | Continuing Calibration (CCAL) | 1 | Target Analyte List |
| 2 | Laboratory Blanks | 1 | Reporting Limits (MDL and MRL) |
| 2 | Field Blanks | 1 | Compound Identification |
| 1 | Surrogate Compounds | 1 | Calculation Verification (Full validation only) |

¹ Quality control results are discussed below, but no data were qualified

² Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.

Holding Times and Sample Receipt

Some coolers were received at temperatures less than the recommended range of $4^{\circ}\text{C} \pm 2^{\circ}$. It was determined that these temperature outliers did not impact data quality and no qualifiers were required.

Continuing Calibration

All relative response factor (RRF) values were greater than the 0.05 minimum control limit. All percent difference (%D) values were within the $\pm 25\%$ control limit for all continuing calibrations (CCAL), with the exceptions noted below. When the %D outlier indicates a potential high bias, and there were no positive results for these compounds, no qualifiers were required. When the %D outlier indicates a potential low bias positive results and reporting limits were estimated (J/UJ-5B).

SDG K0607702: CCAL 9/20/06: 2,4-dinitrophenol (low bias)

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times (5X) the concentration reported in the blank (10X for common laboratory contaminants). If a contaminant is reported in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks were analyzed at the appropriate frequency. For the analytical batches noted below, one or more target analytes were reported in the method blank. Contaminant levels, associated samples, and action levels are documented in the data validation worksheets.

SDG K0607821: phenol (1 result)

SDG K0607925: phenol (2 results)

Field Blanks

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all samples. If a contaminant is reported in any field sample and the concentration is less than the action level, the result is qualified as not detected (U-6).

SDG K0606983: One decontamination blank (Decon Blank) and one laboratory blank (Lab Blank) were reported with this SDG. There were no positive results detected in the Decon Blank. There were 19 positive results in the Lab Blank.

SDG K0607821: One field blank (LW3-W2902) was reported with this SDG. A positive result for 1,4-dichlorobenzene was reported. No qualifiers were required since this analyte was not detected in any associated samples.

SDG K0607925: One field blank (LW3-W2903) was reported with this SDG. Positive results for azobenzene and phenol were reported. One phenol result from SDG K0607697 was qualified as not detected.

Surrogates

The percent recovery (%R) values for the surrogates were within the specified control limits of with the exceptions noted below. Qualifiers were only assigned when more than one %R value per fraction (acid or base-neutral) is outside the control limits. If the outliers indicated a potential high bias, only the associated positive results were estimated (J-13). If the outliers indicated a potential low bias, positive results and reporting limits were estimated (J/UJ-13).

SDG K0607736: The %R values for 2-fluorophenol (37%) and 2,4,6-tribromophenol (31%) were less than the lower control limits in Method Blank. No qualifiers are required to a QC sample.

Matrix Spike/Matrix Spike Duplicates

SDG K0606983, K0607559, K0607697, K0607702, and K0607736: Matrix spike/matrix spike duplicate (MS/MSD) analyses were not performed. Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses were used to assess accuracy and precision.

SDG K0607821: A Batch QC sample was used for the MS/MSD analyses. There were many %R and relative percent difference (RPD) values outside control limits. All %R and RPD outliers are documented in the data validation worksheets. No qualifiers were required as the parent sample was not from this SDG.

SDG K0607925: Sample LW3-W2024-NB was used for the MS/MSD analyses. The %R values for n-nitrosodimethylamine and aniline were outside control limits. The %R values for 3,3'-dichlorobenzidine were less than 10% and the RPD value exceeded control limits. Reporting limits for aniline and n-nitrosodimethylamine were qualified as estimated (UJ-8) and reporting limits for 3,3'-dichlorobenzidine were rejected in Sample LW3-W2024-NB. In addition there were numerous %R and RPD outliers, but no qualifiers were required since only one of the MS or MSD %R values was outside control limits (>10%), the LCS %R values were within control limits and there were no positive results reported. All %R and RPD outliers are documented in the data validation worksheets.

Laboratory Control Sample/Laboratory Control Sample Duplicate

SDG K0606983: The LCSD %R for 2,3,4,6-tetrachlorophenol was less than the lower control limit. No qualifiers were required since the LCS %R and RPD values were within limits. The RPD values for benzoic acid and 2,4-dinitrophenol exceeded the control limits; no positive results for these analytes were reported therefore, no qualifiers were required.

SDG K0607697 & K0607702: The %R values for 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, and 1,2,4-trichlorobenzene were below the lower control limits. Also, one %R value for 3,3'-dichlorobenzidine and one %R value for 4-chloroaniline were less than 10%. All

reporting limits for these compounds were estimated (UJ-10) in the associated samples. The LCS %R for hexachloroethane was less than the lower control limit but greater than 10%. No qualifiers were required since the LCSD %R and RPD values were within limits. The RPDs for aniline, 4-chloroaniline, 3-nitroaniline, and 3,3'-dichlorobenzidine exceeded control limits. No positive results for these analytes were reported, so no qualifiers were required.

SDG K0607559: The %R values for benzoic acid exceeded the upper control limit. Again, no qualifiers were required, since there were no positive results. The %R values for 4-chloroaniline were less than the lower control limits. All reporting limits were qualified as estimated (UJ-10) for this compound in the associated samples. The %R values for 3,3'-dichlorobenzidine were less than 10%. All reporting limits for this compound were rejected (R-10) in the associated samples. The RPD for hexachlorobutadiene, hexachloroethane, and 3,3'-dichlorobenzidine exceeded the control limits. No positive results for these analytes were reported and no qualifiers were required.

SDG K0607736: The RPD for benzoic acid exceeded the control limit. No positive results were detected for this analyte and no qualifiers were required.

Target Analyte List

Dibenzofuran was reported from a separate analysis (EPA 8270C-SIM) with the PAH compounds.

Reporting Limits (Method Detection Limit and Method Reporting Limit)

The target MRL for n-nitrosodimethylamine is 0.002 µg/L; the laboratory reporting limit was 2.0 µg/L in the water samples.

Compound Identification

It was noted by the laboratory that 3-methylphenol could not be separated from 4-methylphenol. Also, 1,2-diphenylhydrazine was reported as azobenzene.

Calculation Verification

SDG K0607559: Calculation verifications were performed on this SDG. No calculation errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD %R values, with the exceptions noted above. Precision was also acceptable as demonstrated by the LCS/LCSD and MS/MSD RPD values with the exceptions noted above.

Data were qualified as estimated because of CCAL %D, LCS and MS/MSD %R outliers. Data were qualified as not detected because of method and field blank contamination.

Data were also rejected because of very low LCS and MS/MSD %R outliers. Rejected data may not be used for any purpose.

All other data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Surface Water – Low Flow Sampling – Fall 2006
Polyaromatic Hydrocarbons (PAHs) by EPA 8270-SIM
Columbia Analytical Services - Kelso

This report documents the review of analytical data from the analyses of surface water samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Columbia Analytical Services, Inc., Kelso, Washington.

| SDG | No. Samples | Validation Level |
|----------|---------------------------------|------------------|
| K0606983 | 2 System Blanks | Screening |
| K0607559 | 4 Surface Water | Full |
| K0607697 | 2 Surface Water | Summary |
| K0607702 | 2 Surface Water | Summary |
| K0607736 | 2 Surface Water | Summary |
| K0607821 | 2 Surface Water & 1 Field Blank | Summary |
| K0607925 | 2 Surface Water & 1 Field Blank | Summary |

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%). No errors were found.

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

- | | | | |
|---|------------------------------------|---|---|
| 1 | Holding Times & Sample Receipt | 1 | Matrix Spikes/Matrix Spike Duplicates (MS/MSD) |
| | GC/MS Instrument Performance Check | | Laboratory Control Samples (LCS) |
| | Initial Calibration (ICAL) | | Internal Standards |
| | Continuing Calibration (CCAL) | 1 | Target Analyte List |
| | Laboratory Blanks | | Reporting Limits (MDL and MRL) |
| 1 | Field Blanks | | Compound Identification |
| | Surrogate Compounds | 1 | Calculation Verification (Full validation only) |

¹ *Quality control results are discussed below, but no data were qualified.*

² *Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.*

Holding Times and Sample Receipt

Some coolers were received at temperatures less than the recommended temperature range of $4^{\circ}\text{C} \pm 2^{\circ}$. It was determined that these temperature outliers did not impact data quality and no qualifiers were required.

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times (5x) the concentration reported in the blank. If a contaminant is reported in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks were analyzed at the appropriate frequency. No target analytes were detected in the method blanks.

Field Blanks

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all samples. If a contaminant is reported in any field sample and the concentration is less than the action level, the result is qualified as not detected (U-6).

SDG K0606983: One decontamination blank (Decon Blank) and one laboratory blank (Lab Blank) were reported. There were no positive results detected in the Decon Blank. There were positive results for all 18 analytes detected in the Lab Blank.

SDG K0607821: One field blank (LW3-W2902) was reported. Positive results for naphthalene and 2-methylnaphthalene were reported. No qualifiers were required since these analytes were not detected in any associated samples.

SDG K0607925: One field blank (LW3-W2903) was reported. A positive result for naphthalene was reported. No qualifiers were required; this analyte was not detected in any associated samples.

Matrix Spike/Matrix Spike Duplicates

SDG K0606983, K0607559, K0607697, K0607702, K0607736: Matrix spike/matrix spike duplicate (MS/MSD) analyses were not performed. Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses were used to assess accuracy and precision.

SDG K0607821: A Batch QC sample was used for the MS/MSD analysis. The relative percent difference (RPD) value for naphthalene was outside control limits. No qualifiers were required as the parent sample was not from this SDG.

SDG K0607925: Sample LW3-W2024-NB was used for the MS/MSD analyses. The RPD value for naphthalene was outside control limits. Naphthalene was not detected in the parent sample so no qualifiers were required.

Target Analyte List

Dibenzofuran, listed in the QAPP as a semi-volatile compound, was instead reported with the PAH target analyte list.

Calculation Verification

SDG K0607559: Calculation verifications were performed on this SDG. No calculation errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD and MS/MSD percent recovery values. Precision was also acceptable as demonstrated by the field duplicate and LCS/LCSD RPD values.

All data are acceptable for use

DATA VALIDATION REPORT
Portland Harbor RI/FS
Surface Water – Low Flow Sampling – Fall 2006
Phthalate Compounds by EPA Method 525.2
Columbia Analytical Services - Kelso

This report documents the review of analytical data from the analyses of surface water samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Columbia Analytical Services, Inc., Kelso, Washington.

| SDG | No. Samples | Validation Level |
|----------|---------------------------------|------------------|
| K0606983 | 2 System Blanks | Screening |
| K0607559 | 4 Surface Water | Full |
| K0607697 | 2 Surface Water | Summary |
| K0607702 | 2 Surface Water | Summary |
| K0607736 | 2 Surface Water | Summary |
| K0607821 | 2 Surface Water & 1 Field Blank | Summary |
| K0607925 | 2 Surface Water & 1 Field Blank | Summary |

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%). No errors were found.

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

- | | | | |
|---|------------------------------------|---|---|
| 1 | Holding Times & Sample Receipt | 1 | Matrix Spikes/Matrix Spike Duplicates (MS/MSD) |
| | GC/MS Instrument Performance Check | 2 | Laboratory Control Samples (LCS) |
| | Initial Calibration (ICAL) | | Internal Standards |
| 1 | Continuing Calibration (CCAL) | | Target Analyte List |
| 2 | Laboratory Blanks | | Reporting Limits (MDL and MRL) |
| 1 | Field Blanks | | Compound Identification |
| | Surrogate Compounds | 1 | Calculation Verification (Full validation only) |

¹ *Quality control results are discussed below, but no data were qualified*

² *Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.*

Holding Times and Sample Receipt

Some coolers were received at temperatures less than the recommended temperature range of 4°C ±2°. Results were judged to be unaffected by the temperature outliers and no action was taken.

Continuing Calibration

All relative response factor (RRF) values were greater than the 0.05 minimum control limit. All percent difference (%D) values were within the ±25% control limit for all continuing calibrations (CCAL), with the exceptions noted below. When the %D outlier indicates a potential high bias, and there were no positive results for these compounds, no qualifiers were required. When the %D outlier indicates a potential low bias positive results and reporting limits were estimated (J/UJ-5B).

SDGs K0607821 & K0607925: CCAL 9/26/06 & 9/27/06: di-n-octyl phthalate (high bias)

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at the phthalate concentration reported in the blank [2x the concentration for bis(2-ethylhexyl)phthalate]. If a contaminant is reported in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. If the sample result is greater than the action level but less than five times the action level [10x the level for bis(2-ethylhexyl)phthalate], the result is qualified as estimated (J-7). No action is taken for non-detected results.

Method blanks were analyzed at the appropriate frequency. For the analytical batches noted below, one or more target analytes were reported in the method blank. Contaminant levels, associated samples, and action levels are documented in the data validation worksheets.

SDG K0606983: di-n-butyl phthalate (2 results not detected), diethyl phthalate and bis(2-ethylhexyl) phthalate (1 result each estimated)

SDG K0607697: di-n-butyl phthalate (2 results estimated)

SDG K0607702: di-n-butyl phthalate (2 results estimated)

SDG K0607736: di-n-butyl phthalate (2 results estimated)

SDG K0607821: di-n-butyl phthalate (2 results not detected), butyl benzyl phthalate (2 results estimated, 1 result not detected), bis (2-ethylhexyl) phthalate (2 results not detected)

SDG K0607925: diethyl phthalate (2 results estimated), di-n-butyl phthalate (1 result estimated, 2 results not detected), butyl benzyl phthalate (3 results not detected), bis (2-ethylhexyl) phthalate (2 results estimated, 1 not detected)

Field Blanks

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all samples. If a contaminant is reported in

any field sample and the concentration is less than the action level, the result is qualified as not detected (U-6).

SDG K0606983: One decontamination blank (Decon Blank) and one laboratory blank (Lab Blank) were reported. After qualification for method blank contamination, estimated results for diethyl phthalate and bis (2-ethylhexyl) phthalate remained in Decon Blank.

SDG K0607821: One field blank (LW3-W2902) was reported. Positive results for dimethyl phthalate, diethyl phthalate, dibutyl phthalate, butylbenzyl phthalate, di-n-octyl phthalate, and bis(2-ethylhexyl) phthalate were detected. Two results for diethyl phthalate were qualified as not detected (U-6) in this SDG.

SDG K0607925: One field blank (LW3-W2903) was reported. Positive results for dimethyl phthalate, diethyl phthalate, dibutyl phthalate and bis (2-ethylhexyl) phthalate were detected. Two results for bis (2-ethylhexyl) phthalate and one result for diethyl phthalate were qualified as not detected (U-6).

In addition, the following results from other SDGs were qualified as not detected:

| SDG | Compound | Number of Results Qualified |
|----------|-----------------------------|-----------------------------|
| K0607559 | Bis (2-ethylhexyl)phthalate | 2 |
| | Butylbenzyl phthalate | 2 |
| | Dibutyl phthalate | 4 |
| | Diethyl phthalate | 4 |
| | Dimethyl phthalate | 2 |
| K0607697 | Bis (2-ethylhexyl)phthalate | 2 |
| | Butylbenzyl phthalate | 2 |
| | Dibutyl phthalate | 2 |
| | Diethyl phthalate | 2 |
| K0607702 | Bis (2-ethylhexyl)phthalate | 1 |
| | Butylbenzyl phthalate | 2 |
| | Dibutyl phthalate | 2 |
| | Diethyl phthalate | 2 |
| K0607736 | Bis (2-ethylhexyl)phthalate | 1 |
| | Butylbenzyl phthalate | 1 |
| | Dibutyl phthalate | 2 |
| | Diethyl phthalate | 2 |

Matrix Spike/Matrix Spike Duplicates

SDG K0606983, K0607697, K0607702, K0607736, K0607821, K0607925: Only a matrix spike (MS) was analyzed, there was no measure of precision for these SDGs.

SDG K0607559: MS/MSD analyses were not performed with this data set. Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses were used to assess accuracy and precision for this SDG.

Laboratory Control Sample

SDG K0606983, K0607697, K0607702, K0607736, K0607821, K0607925: Only a LCS was analyzed, there is no measure of precision for these SDG.

Reporting Limits (Method Detection Limit and Method Reporting Limit)

SDG K0606983: The laboratory erroneously double-spiked the samples with internal standards and surrogates. Samples were diluted by a factor of two to bring recovery values into calibration range. The method reporting limits (MRL) were elevated to reflect this dilution.

Calculation Verification

SDG K0607559: Calculation verifications were performed on this SDG. No calculation errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD percent recovery values, with the exceptions noted above. Precision, when assessed, was also acceptable as demonstrated by the LCS/LCSD relative percent difference values.

Data were qualified as estimated or not detected based on contamination in the associated method and field blanks.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Surface Water – Low Flow Sampling – Fall 2006
Chlorinated Herbicides by EPA Method 8151A
Columbia Analytical Services - Kelso

This report documents the review of analytical data from the analyses of surface water samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Columbia Analytical Services, Inc., Kelso, Washington.

| SDG | No. Samples | Validation Level |
|----------|---------------------------------|------------------|
| K0606983 | 2 System Blanks | Screening |
| K0607559 | 4 Surface Water | Full |
| K0607697 | 2 Surface Water | Summary |
| K0607702 | 2 Surface Water | Summary |
| K0607736 | 2 Surface Water | Summary |
| K0607821 | 2 Surface Water & 1 Field Blank | Summary |
| K0607925 | 2 Surface Water & 1 Field Blank | Summary |

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables with the following exception. Summary forms for retention times were not submitted - retention time data were verified using the raw data. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

- | | |
|---|---|
| <ul style="list-style-type: none"> 1 Holding Times and Sample Receipt <li style="padding-left: 20px;">Initial Calibration (ICAL) <li style="padding-left: 20px;">Continuing Calibration (CCAL) 2 Laboratory Blanks 1 Field Blanks <li style="padding-left: 20px;">Surrogate Compounds | <ul style="list-style-type: none"> 1 Matrix Spikes/Matrix Spike Duplicates <li style="padding-left: 20px;">Laboratory Control Samples 1 Reporting Limits (MDL and MRL) 2 Compound Identification 1 Calculation Verification (full validation only) |
|---|---|

¹ *Quality control results are discussed below, but no data were qualified.*

² *Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.*

Holding Times and Sample Receipt

Some coolers were received at temperatures less than the recommended temperature range of 4°C ±2°. These temperature outliers did not impact data quality and no qualifiers were required.

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times (5x) the concentration reported in the blank. If a contaminant is reported in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks were analyzed at the appropriate frequency. No target analytes were detected in the method blanks with the following exceptions.

SDG K0607821: Dalapon (3 results)

SDG K0607925: Dalapon (2 results)

Field Blanks

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all samples. If a contaminant is reported in any field sample and the concentration is less than the action level, the result is qualified as not detected (U-6).

SDG K0606983: One decontamination blank (Decon Blank) and one laboratory blank (Lab Blank) were reported. There were no positive results in the Decon Blank or Lab Blank.

SDG K0607821: One field blank was reported. After qualification for method blank contamination, no positive results remained in field blank LW3-W2902.

SDG K0607925: One field blank was reported. No positive results were reported in field blank LW3-W2903.

Matrix Spike/Matrix Spike Duplicates

SDGs K0606983, K0607559, K0607697: Matrix spike/matrix spike duplicate (MS/MSD) analyses were not performed. Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses were used to assess accuracy and precision.

SDG K0607821: MS/MSD analyses were performed using a batch QC sample. The percent recovery (%R) value for dinoseb in the MS exceeded the upper control limit. No action was taken since the parent sample was not from this SDG.

SDG K0607925: MS/MSD analyses were performed using Sample LW3-W2024-NB. The %R value for dinoseb in the MS exceeded the upper control limit. No action was taken since the MSD and relative percent difference (RPD) values were within control limits.

Compound Identification

The laboratory applies a “P” qualifier to values when the RPD value between the two analytical columns is greater than 40%. When the RPD value was greater than 40% the reported value was qualified as estimated (J-3) for poor column confirmation agreement. When the RPD value was greater than 60% the reported value was qualified as tentatively identified and estimated (NJ-3).

SDG K0607559: In Sample LW3-W2025-E the result for 2,4-DB was qualified as tentatively identified and estimated (NJ-3).

SDG K0607702: In Samples LW3-W2027-INS and LW3-W2027-INB, the MCPPE results were qualified as estimated (J-3).

SDG K0607736: In Sample LW3-W2005-NS, the result for MCPPE was qualified as estimated (J-3).

Calculation Verification

SDG K0607559: Calculation verifications were performed on this SDG. No calculation errors were found.

Reporting Limits (Method Detection Limit and Method Reporting Limit)

SDG K0606983: The reporting limits were elevated for dalapon, MCPPE, and 2,4-DB due to the presence of non-target background components.

SDG K0607559, K0607697, K0607821: The reporting limits were elevated for several analytes in all samples due to the presence of non-target background components.

SDG K0607736: The reporting limits were elevated for dalapon and 2,4-DB in both samples due to the presence of non-target background components.

SDG K0607925: The detection limits were elevated for MCPPE and 2,4-DB in Sample LW3-W2903 due to the presence of non-target background components.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory performed an appropriate analytical method. Accuracy was acceptable, as demonstrated by the surrogate and LCS/LCSD %R values. Precision was acceptable as demonstrated by the RPD values for the LCS/LCSD analyses.

Data were qualified as not detected based on method blank contamination. Data were qualified as estimated due to poor column agreement.

All other data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Surface Water - Low Flow Sampling – Fall 2006
Butyltins by Krone Method
Columbia Analytical Services - Kelso

This report documents the review of analytical data from the analyses of surface water samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Columbia Analytical Services, Inc., Kelso, Washington.

| SDG | No. Samples | Validation Level |
|----------|-----------------|------------------|
| K0606983 | 2 System Blanks | Screening |
| K0607559 | 4 Surface Water | Full |
| K0607697 | 2 Surface Water | Summary |
| K0607702 | 2 Surface Water | Summary |
| K0607736 | 2 Surface Water | Summary |
| K0607821 | 3 Surface Water | Summary |
| K0607925 | 3 Surface Water | Summary |

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%). The following errors were found:

SDG K0607702: Field sample identifications for Samples LW3-W2027-INS and LW3-W2027-INB contained typos (“1” instead of “I”).

SDG K0607821: Field sample identifications for Samples LW3-W2011-INS and LW3-W2011-INB contained typos (“1” instead of “I”).

Typos were corrected in the EDD files during validation.

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

- | | | | |
|---|----------------------------------|---|---|
| 1 | Holding Times and Sample Receipt | 1 | Matrix Spike/Matrix Spike Duplicates |
| | Initial Calibration (ICAL) | | Laboratory Control Samples |
| | Continuing Calibration (CCAL) | 1 | Reporting Limits (MDL and MRL) |
| 2 | Laboratory Method Blanks | | Compound Identification |
| 1 | Field Blanks | 1 | Calculation Verification (full validation only) |
| 2 | Surrogate Compounds | | |

¹ *Quality control results are discussed below, but no data were qualified*

² *Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.*

Holding Times and Sample Receipt

Some coolers were received at temperatures below the recommended range of 4°C ±2°. These temperature outliers did not impact data quality and no qualifiers were required.

Laboratory Method Blanks

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all associated samples.

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times the concentration detected in the blank. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks were analyzed at the appropriate frequency. Contaminant levels, associated samples, and action levels are documented in the data validation worksheets.

SDG K0606983: Di-n-butyl tin (2 results qualified)

SDG K0607559: Di-n-butyl tin (2 results qualified)

SDG K0607697: Di-n-butyl tin (2 results qualified)

SDG K0607702: Di-n-butyl tin (2 results qualified)

SDG K0607736: Di-n-butyl tin (2 results qualified)

SDG K0607821: Di-n-butyl tin (3 results qualified)

SDG K0607925: Di-n-butyl tin (2 results qualified)

Field Blanks

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all samples. If a contaminant is reported in any field sample and the concentration is less than the action level, the result is qualified as not detected (U-6).

SDG K0606983: One decontamination blank (Decon Blank) and one laboratory blank (Lab Blank) were included with this SDG. After qualification for method blank contamination, no positive results remained.

SDG K0607821: One field blank, LW3-W2902, was included with this SDG. After qualification for method blank contamination, no positive results remained.

SDG K0607925: One field blank, LW3-W2903, was included with this SDG. No positive results were detected.

Surrogate Compounds

SDGs K0607559, K0607697 & K0607702: The percent recovery (%R) value for tri-n-propyltin was less than the lower control limit in the laboratory control sample duplicate (LCSD). No qualifiers were required for a QC sample.

SDG K0607736: The %R value for tri-n-propyltin was less than the lower control limit in Sample LW3-W2005-NS. All results and reporting limits for this sample were qualified as estimated (J/UJ-13) for potential low bias.

Matrix Spike/Matrix Spike Duplicates

SDGs K0606983, K0607559, K0607697, K0607702, K0607736, & K0607821: Matrix spike/matrix spike duplicate (MS/MSD) analyses were not performed with these SDGs. Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses were used to assess accuracy and precision.

Reporting Limits (Method Detection Limit and Method Reporting Limit)

SDG K0607559: The detection limits for di-n-butyltin were elevated in two samples due to the presence of non-target background compounds.

SDG K0607821: The detection limit for n-butyltin was elevated in Sample LW3-W2011-INB due to the presence of non-target background compounds.

SDG K0607925: The detection limits for n-butyltin in Sample LW3-W2024-NB and for di-n-butyltin in Sample LW3-W2903 were elevated due to the presence of non-target background compounds.

Compound Identification

The results from the two analytical columns were compared for agreement. In cases where the RPD value between the two columns was greater than 40% the reported result was "P" flagged by the laboratory. As the elevated RPD value may indicate the presence of an interferent that may result in a high bias, when the RPD value was greater than 40% but less than 60% the reported value was estimated (J-3). If the RPD value was greater than 60%, the result was qualified as a tentative identification (NJ-3). There were no outliers in these SDGs.

Calculation Verification

SDG K0607559: Calculation verifications were performed on this SDG. No calculation errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD, and MS/MSD %R values, with the exceptions noted above. Precision was acceptable, as demonstrated by the RPD values for the LCS/LCSD and MS/MSD analyses.

Data were qualified as not detected based on contamination in the associated laboratory blanks. Data were also qualified as estimated because of a surrogate recovery outlier.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Surface Water – Low Flow Sampling – Fall 2006
Dioxin & Furan Compounds by EPA 1613B
Columbia Analytical Services - Houston

This report documents the review of analytical data from the analyses of surface water samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Columbia Analytical Services, Houston, Texas.

| SDG | No. Samples | Validation Level |
|----------|---------------------------------|------------------|
| K0607821 | 2 Surface Wates & 1 Field Blank | Summary |

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

| | | |
|----------------------------------|---|---|
| Holding Times and Sample Receipt | 1 | Matrix Spikes/Matrix Spike Duplicates (MS/MSD) |
| Initial Calibration (ICAL) | | Ongoing Precision and Recovery (OPR) |
| Continuing Calibration (CCAL) | | Compound Identification |
| 2 Laboratory Blanks | | Reporting Limits (MDL and MRL) |
| 1 Field Blanks | | Calculation Verification (full validation only) |
| Labeled Compounds | | |

¹ *Quality control results are discussed below, but no data were qualified.*

² *Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.*

Laboratory Blanks

SDG K0607821: A positive result for OCDD was reported in the method blank. Action levels of five times the blank concentrations were established and the sample results were compared to these action levels. Two sample results below the action levels were qualified as not detected (U-7) at the reported concentrations.

Field Blanks

Method blanks are used to evaluate all associated samples, including the field blank. Any remaining positive results in the field blank are used to evaluate all samples. If a contaminant is reported in any field sample and the concentration is less than the action level, the result is qualified as not detected (U-6).

SDG K0607821: One field blank was submitted. No positive results were reported in Sample LW3-W2902.

Matrix Spikes/Matrix Spike Duplicates

No matrix spike/matrix spike duplicate (MS/MSD) sets were performed with this analysis. Accuracy and precision were assessed using labeled compound recoveries, ongoing precision and recovery (OPR) samples.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the labeled compound and OPR percent recovery values. Precision was acceptable, as demonstrated by the OPR and OPR duplicate relative percent difference values.

Data were qualified as not detected due to contamination from the associated blanks.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Surface Water – Low Flow Sampling – Fall 2006
Metals by EPA 6020 and 7470A
Columbia Analytical Services - Kelso

This report documents the review of analytical data from the analyses of surface water samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Columbia Analytical Services, Inc., Kelso, Washington.

| SDG | No. Samples | Validation Level |
|----------|---------------------------------|------------------|
| K0606983 | 2 System Blanks | Screening |
| K0607559 | 4 Surface Water | Full |
| K0607697 | 2 Surface Water | Summary |
| K0607702 | 2 Surface Water | Summary |
| K0607736 | 2 Surface Water | Summary |
| K0607821 | 2 Surface Water & 1 Field Blank | Summary |
| K0607925 | 2 Surface Water & 1 Field Blank | Summary |

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables, with the exceptions noted below. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

SDG K0607697: The raw data for the dilutions performed for total aluminum were not included in the data packages. The laboratory was contacted and submitted this data on 12/8/2006.

SDG K0607702: The raw data for the dilution performed for total aluminum on Sample LW3-W2027-1NS was not included in the data packages. The laboratory was contacted and submitted this data on 12/8/2006.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%). No errors were found.

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

| | | |
|---|---|---|
| 1 | Holding Times and Sample Preservation | Laboratory Duplicates |
| | Initial Calibration | ICP Interference Check Samples |
| | Continuing Calibration Verification | ICP Serial Dilution |
| 1 | CRDL Standards | ICP-MS Internal Standards |
| 2 | Laboratory Blanks | 1 Reporting Limits (MDL and MRL) |
| 2 | Field Blanks | Calculation Verification (Full validation only) |
| | Laboratory Control Samples | |
| | Matrix Spikes & Matrix Spike Duplicates | |

¹ *Quality control results are discussed below, but no data were qualified*

² *Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.*

Holding Times and Sample Receipt

The laboratory received many of the sample coolers with temperatures outside the advisory control limits of 2° to 6°C. The temperature outliers ranged from -0.1° to 1.1°C. These temperature outliers did not impact data quality and no qualifiers were required.

CRDL Standard

Contract required detection limit (CRDL) standards were analyzed at the beginning of each analytical sequence. Recoveries were within the control limits of 70%-130%, with the following exception:

SDG K0606983: The percent recovery (%R) value for silver (171%) exceeded the upper control limit. After qualification for laboratory blank contamination, there were no positive results. No action was necessary based on the potential high bias.

SDG K0607559: The %R values for silver (150%) and copper (134%) exceeded the upper control limit. After qualification for laboratory blank contamination, there were no positive results for silver. The results for copper were greater than the action level of two times the CRDL. No action was necessary based on the potential high bias.

SDGs K0607697, K0607702, & K0607736: The %R values for silver (150%) and copper (134%) exceeded the upper control limit. After qualification for laboratory blank contamination, there were no positive results for silver. The results for copper were greater than the action level of two times the CRDL. No action was necessary based on the potential high bias.

Laboratory Blanks

Various analytes were detected in the method and instrument blanks at levels greater than the method detection limits (MDL). To evaluate the effect on the sample data, action levels of five times (5x) the blank concentrations were established. Positive results less than the action levels in the associated samples were qualified as not detected (U) at the reported concentration. No action was taken for non-detects.

In addition, some analytes were found at levels less than the negative MDL in some instrument blanks. For negative blanks, action levels of 5X the absolute value of the blank concentrations were established. Results less than the action levels in the associated samples were qualified as estimated (J/UJ) to indicate a potential low bias.

SDG K0606983: Antimony, chromium and silver were detected in some instrument blanks at levels greater than the MDL. Some results for chromium and silver were less than the action levels and were qualified as not detected (U-7).

SDG K0607559: Aluminum, chromium, copper, lead, nickel, silver and zinc were detected in some instrument blanks at levels greater than the MDL. Some results for chromium, lead and silver were less than the action levels and were qualified as not detected (U-7).

SDG K0607697: Aluminum, copper, chromium, lead, nickel, silver, and zinc were detected in the preparation blank and/or instrument blanks at levels greater than the MDL. Some results for chromium, silver, and lead were less than the action levels and were qualified as not detected (U-7).

SDG K0607702: Chromium, copper, lead, nickel, silver, and zinc were detected in the preparation blank and/or instrument blanks at levels greater than the MDL. Some results for chromium and lead were less than the action levels and were qualified as not detected (U-7).

SDG K0607736: Arsenic, copper, chromium, lead, nickel, silver, and zinc were detected in the preparation blank and/or some instrument blanks at levels greater than the MDL. Some results for arsenic, chromium, lead, and zinc were less than the action levels and were qualified as not detected (U-7).

SDG K0607821: Arsenic, chromium, lead, silver and zinc were detected in some instrument blanks at levels greater than the MDL. Some results for arsenic, chromium and zinc were less than the action levels and were qualified as not detected (U-7).

SDG K0607925: Chromium, lead, silver and zinc were detected in some instrument blanks at levels greater than the MDL. Some results for chromium, lead, silver, and zinc were less than the action levels and were qualified as not detected (U-7).

Field Blanks

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all samples. If a contaminant is reported in any field sample and the concentration is less than the action level, the result is qualified as not detected (U-6).

SDG K0606983: Two system blanks, Lab Blank and Decon Water, were submitted with this SDG. After qualification for laboratory blank contamination, the following positive results remained:

Lab Blank – total and dissolved copper, dissolved lead, total and dissolved zinc
Decon Blank – total and dissolved copper, lead, and zinc

SDG K0607821: Sample LW2-W2902 was submitted as a field blank. After qualification for laboratory blank contamination, positive results for total and dissolved aluminum and copper and

dissolved zinc remained in this sample. Two results each for dissolved aluminum and zinc were qualified as not detected (U-6) in the associated samples.

SDG K0607925: Sample LW2-W2903 was submitted as a field blank. After qualification for laboratory blank contamination positive results for total aluminum and copper and dissolved aluminum, copper, nickel, and zinc remained in this sample. Two results each for dissolved aluminum and zinc were qualified as not detected (U-6) in the associated samples.

In addition, the following dissolved results from other SDG were qualified as not detected:

| SDG | Compound | Number of Results Qualified |
|----------|----------|-----------------------------|
| K0607559 | Aluminum | 2 |
| | Zinc | 4 |
| K0607697 | Aluminum | 1 |
| | Zinc | 2 |
| K0607702 | Aluminum | 2 |
| | Zinc | 2 |
| K0607736 | Aluminum | 2 |
| | Zinc | 1 |

Reporting Limits (Method Detection Limit and Method Reporting Limit)

The Quality Assurance Project Plan (QAPP) calls for a method reporting limit (MRL) of 0.002 mg/L for aluminum. The laboratory MRL was 0.0004 mg/L for this element in several water samples.

IV. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical methods. The laboratory duplicate relative percent difference values indicated acceptable precision. Accuracy was also acceptable, as demonstrated by matrix spike and laboratory control sample recoveries.

Data were qualified as not detected based on laboratory and field blank contamination.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Surface Water – Low Flow Sampling – Fall 2006
General Chemistry Parameters
Columbia Analytical Services - Kelso

This report documents the review of analytical data from the analyses of surface water samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Columbia Analytical Services, Inc., Kelso, Washington.

| SDG | No. Samples | Validation Level |
|----------|---------------------------------|------------------|
| K0606983 | 2 System Blanks | Screening |
| K0607559 | 4 Surface Water | Full |
| K0607697 | 2 Surface Water | Summary |
| K0607702 | 2 Surface Water | Summary |
| K0607736 | 2 Surface Water | Summary |
| K0607821 | 2 Surface Water & 1 Field Blank | Summary |
| K0607925 | 2 Surface Water & 1 Field Blank | Summary |

The analytical tests that were performed are summarized below:

| Parameter | Method |
|--------------------------------|----------------|
| Hardness as CaCO ₃ | 6010B/SM 2340B |
| Perchlorate | 314.0 |
| Total Dissolved Solids (TDS) | 160.1 |
| Total Suspended Solids (TSS) | 160.2 |
| Total Organic Carbon (TOC) | 415.1 |
| Dissolved Organic Carbon (DOC) | 415.1 |

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%). No errors were found.

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

| | | |
|---|---------------------------------------|---|
| 1 | Holding Times and Sample Preservation | Laboratory Control Samples |
| | Initial Calibration | Matrix Spike (MS) |
| | Calibration Verification | Laboratory Duplicates |
| | Laboratory Blanks | Reporting Limits (MDL and MRL) |
| 2 | Field Blanks | Calculation Verification (Full validation only) |

¹ *Quality control results are discussed below, but no data were qualified*

² *Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.*

Holding Times and Sample Receipt

The laboratory received many of the sample coolers with temperatures outside the advisory control limits of 2° to 6°C. The temperature outliers ranged from -0.1° to 1.1°C. These temperature outliers did not impact data quality and no qualifiers were required.

Field Blanks

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all samples. If a contaminant is reported in any field sample and the concentration is less than the action level, the result is qualified as not detected (U-6).

SDG K0606983: Two system blanks, Decon Blank and Lab Blank, were submitted with this SDG. No positive results for perchlorate or hardness were reported in these samples.

SDG K0607821: Sample LW3-2902 was submitted as a field blank. Positive values for TOC, DOC, and TDS were detected in this sample. Action levels at five times the field blank concentrations were established. Both sample results for TOC and DOC were less than these action levels and were qualified as not detected (U-6).

SDG K0607925: Sample LW3-2903 was submitted as a field blank. Positive values for TOC and DOC were detected in this sample. Action levels at five times the field blank concentrations were established. Both sample results for TOC and DOC were less than these action levels and were qualified as not detected (U-6).

In addition, the following results from other SDG were qualified as not detected:

| SDG | Compound | Number of Results Qualified |
|----------|--------------------------|-----------------------------|
| K0607559 | Total Organic Carbon | 4 |
| | Dissolved Organic Carbon | 4 |
| | Total Dissolved Solids | 3 |
| K0607697 | Total Organic Carbon | 2 |
| | Dissolved Organic Carbon | 2 |
| | Total Dissolved Solids | 2 |
| K0607702 | Total Organic Carbon | 2 |
| | Dissolved Organic Carbon | 2 |
| | Total Dissolved Solids | 1 |
| K0607736 | Total Organic Carbon | 2 |
| | Dissolved Organic Carbon | 2 |

IV. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical methods. The laboratory duplicate relative percent difference values indicated acceptable precision. Accuracy was also acceptable, as demonstrated by the matrix spike and laboratory control sample percent recovery values.

Data were qualified as not detected based on field blank contamination.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Surface Water – Low Flow Sampling – Fall 2006
Hexavalent Chromium by EPA 7196A
Columbia Analytical Laboratories - Kelso

This report documents the review of analytical data from the analyses of sediment samples and the associated laboratory and field quality control (QC) samples. Columbia Analytical Laboratories, Inc., Kelso, Washington, analyzed the samples.

| SDG | No. Samples | Validation Level |
|----------|---------------------------------|------------------|
| K0607821 | 2 Surface Water & 1 Field Blank | Summary |

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%). No errors were found.

III. TECHNICAL DATA VALIDATION

The QC requirements for review are listed below.

| | | |
|---|---------------------------------------|---|
| 1 | Holding Times and Sample Preservation | Laboratory Control Samples |
| | Initial Calibration | Matrix Spike/Matrix Spike Duplicates (MS/MSD) |
| | Calibration Verification | Laboratory Duplicates |
| | Laboratory Blanks | 1 Reporting Limits (MDL and MRL) |
| 1 | Field Blanks | Calculation Verification (Full validation only) |

¹ *Quality control results are discussed below, but no data were qualified*

² *Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.*

Holding Times and Sample Receipt

The laboratory received many of the sample coolers with temperatures outside the advisory control limits of 2° to 6°C. The temperature outliers ranged from 0.7° to 1.1°C. These outliers did not impact data quality and no qualifiers were required.

Field Blanks

Method blanks are used to evaluate all associated samples, including the field blank. Any remaining positive results in the field blank are used to evaluate all samples. If a contaminant is reported in any field sample and the concentration is less than the action level, the result is qualified as not detected (U-6).

SDG K0607821: One field blank was submitted. No positive results were reported in Sample LW3-W2902.

Reporting Limits (Method Detection Limit and Method Reporting Limit)

SDG K0607821: The laboratory reporting limit of 0.02 mg/L for all samples exceeded the QAPP target MRL of 0.01 mg/L.

IV. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical methods. The laboratory duplicate relative percent difference values indicated acceptable precision. Accuracy was also acceptable, as demonstrated by the matrix spike and/or laboratory control sample percent recovery values.

All data, as reported, are acceptable for use.