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6/6/2000

FINAL

ROUND 1B DATA REPORT

-Volume II-

for

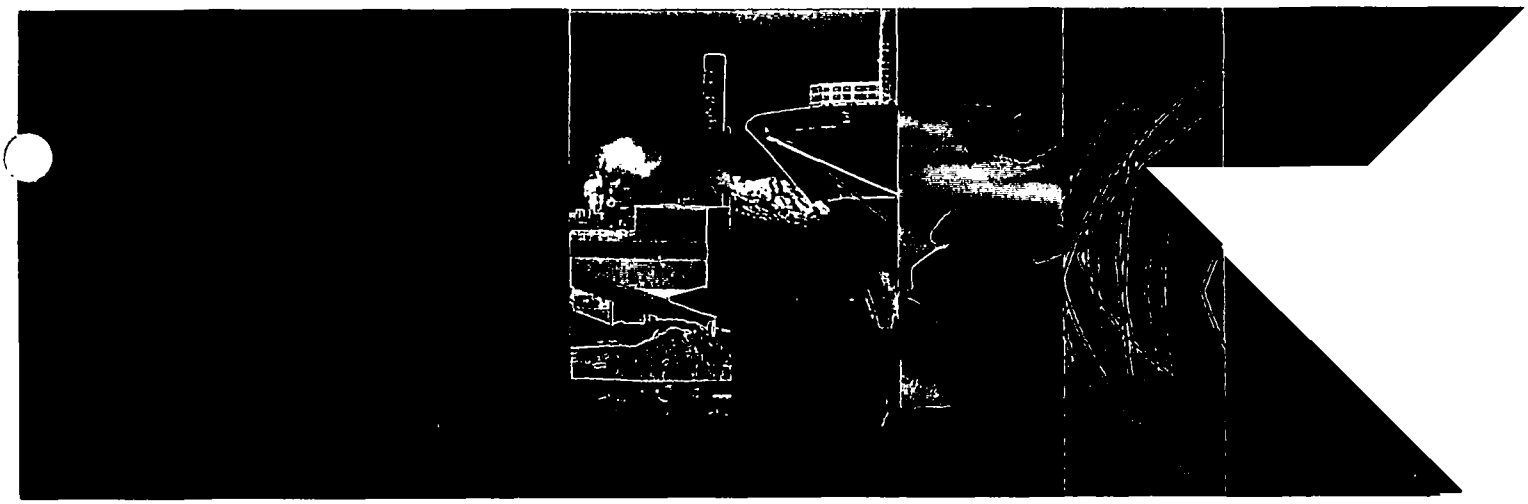
Middle Waterway Problem Area

of the

Commencement Bay Nearshore/Tideflats

Superfund Site

Tacoma, Washington



prepared for the:

Middle Waterway Action Committee

MIDDLE WATERWAY

Protecting the Environment, Promoting the Economy

June 6, 2000

150728
USEPA SF
1095772

ANCHOR ENVIRONMENTAL, L.L.C.

FOSTER WHEELER ENVIRONMENTAL CORPORATION

Middle Waterway Problem
Area
of the
Commencement Bay
Nearshore/Tideflats
Superfund Site
Tacoma, Washington

FINAL
ROUND 1B DATA REPORT VOLUME II

prepared for the:
Middle Waterway Action
Committee

June 6, 2000

DRAFT

ROUND 1B DATA REPORT

VOLUME II (APPENDICES D TO F)

for

MIDDLE WATERWAY PROBLEM AREA

COMMENCEMENT BAY

NEARSHORE/TIDEFLATS SUPERFUND SITE

TACOMA, WASHINGTON

MIDDLE WATERWAY

Protecting the Environment,
Promoting the Economy

Prepared for

Middle Waterway Action Committee

Prepared by

Anchor Environmental, L.L.C.
1411 Fourth Avenue, Suite 1210
Seattle, WA 98101
and
Foster Wheeler Environmental Corporation
10900 NE 8th Street
Bellevue, WA 98004-4405

February 17, 2000

Appendix D

APPENDIX D

DATA VALIDATION

Quality By Design

Laboratory Quality Assurance Consulting

29 Shipman Street
Suite 101
Hilo, Hawaii 96720

Phone: (808) 969-9424
Fax: (808) 969-9094
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Executive Summary

Laboratory Data Validation
Middle Waterway Problem Area
Sediment Samples

September, 1999 Sampling Event

Fifteen data validation reports were provided to Foster Wheeler Environmental Corporation on January 19, 2000. Each report consists of a narrative, which describes the criteria used by Quality by Design for each analysis that was reviewed, a summary table, a statistical summary of data qualifier flags, copies of the laboratory reports with any corrections marked in red ink, and copies of any communications with the laboratory that occurred during the validation process.

We recommend that a copy of each report, in its entirety, be attached to each set of laboratory reports. The summary table is helpful in updating any databases or spreadsheets into which laboratory data is already entered. We suggest that the modified laboratory reports, i.e., those that are marked in red ink or which were resubmitted by the laboratory, be used to replace the same pages in the original laboratory report from which any future copies will be made.

Validation Criteria

The validation was performed using the reporting format and criteria for recommending data qualifying flags for the data sets as described in USEPA's *"Functional Guidelines for Evaluating Inorganics Analyses"*, ~~December,~~ February 1994; *"Functional Guidelines for Evaluating Organics Analysis"*, ~~December~~ February, 1994; the *"Recommended Quality Assurance and Quality Control Guidelines for the Collection of Environmental Data in Puget Sound"*, April, 1997; or using criteria listed in the method referenced. Validated data may have been qualified for any of several reasons:

1. Because of laboratory deviation from the designated method;
2. Because the data may not meet the criteria in the references above; or
3. By the professional judgment of the reviewer.

Observations

Relatively few significant problems arose in the data validation review of the results from MultiChem Analytical Services. The test results were generally within the requirements of the referenced method and with Puget Sound Estuary Program guidance and the laboratory data, as qualified, are acceptable for use. Two discrepancies (one each with sulfides and grain size) were observed between raw data and reported data results, and these were resolved by the laboratory.

MultiChem Analytical Services rendered equivalent or better analytical services than most other laboratories with which our firm has dealings. The laboratory project manager was somewhat slow in response to our inquiries, telephone calls, and faxes. However, it was obvious in the documentation that the laboratory identified most instances of quality control exceedences and performed corrective actions that resulted in improved data quality. Often, laboratories do not take corrective action and report the values to the customer. In most cases, MultiChem performed re-analyses and re-extractions to bring the quality control checks into compliance.

Issues

A relatively high portion (955 analytes out of 3577 total analytes, or 26.7 %) of the data was flagged with data qualifiers. The overwhelming majority of quality control issues were consistently related to six issues. Sixty percent of the data qualifier flags were assigned because of surrogate, continuing calibration, and matrix spike/blank spike issues in the analysis of semivolatile organics and/or PAHs. An additional 29.6 percent were assigned because of matrix spike, duplicate analysis, and serial dilution issues in the analysis of metals. The balance of 10 percent of the flags are spread over 12 different issues, with no obvious pattern.

Given the matrix (harbor sediments) and the analytes which had QC exceedences, the reviewers are not seriously concerned that these issues affect the usability of the data. However, the reviewers noted four repeating and/or significant issues:

- The laboratory consistently reported data that was generated with continuing calibration verification checks that were out of criteria.

- The serial dilution of samples for analysis by ICP, which is a test for matrix interferences, consistently had a few results that were 2-15% out of criteria. The reviewers do not expect that this quality control exceedence was caused by matrix interferences because the effect was randomly distributed across samples and analytes. In addition, the matrix spikes and post-digestion spikes were overall acceptable and any spikes that were out of criteria did not correlate with serial dilution exceedences. The laboratory may wish to investigate possible sources of contamination and/or the operator's technique.

- The reporting limits for lead failed to meet the CRDL of 0.5 mg/kg listed in the QAPP. However, most field samples had positive results. For samples that were non-detect, the laboratory's reporting limit of 1.5 mg/kg was less than the Sediment Quality Standard Criteria of 450 mg/kg and the Sediment Impact Zone and Clean-up criteria of 530 mg/kg, and no data qualifier flags are recommended.

- Dates and times are automatically recorded on the raw data provided with the laboratory test results. One instance was noted in which the times recorded were irregular. The laboratory's quality assurance officer was contacted and he investigated the issue. After checking computer workstations in the laboratory and by providing a copy of an automatic recording security file that tracks changes entered into the data, the officer satisfactorily documented that some of the laboratory workstations' computer clocks were incorrectly set and that the raw data files had been handled appropriately.

Field Duplicates

Field duplicates were reviewed and, where appropriate, the relative percent difference was calculated. Because the person who performed the sampling has information that is unavailable to the data validator, such as sampling conditions or problems with equipment, the client typically performs any flagging and data qualification based upon field duplicates. There are two issues, however, that should be considered when reviewing field duplicates:

- If samples were collected as two individual, co-located, grab samples, then the differences may be greater than if the samples were collected as a true split sample (i.e., a large amount sampled, homogenized, and then split into separate aliquots). This is particularly evident when analyzing for some metals (such as lead) and non-polar organic compounds (such as PCBs, some chlorinated pesticides, and some semivolatile organics) that are not soluble in water and therefore are typically not mobile. It is not uncommon for a few inches difference in sampling location or depth to result in large differences in the analyte's concentration.

- Because the laboratory's detection limit is actually a measure of variability and statistical confidence limits, test results near the laboratory's detection limit often result in a higher RPD. For this reason, when evaluating field duplicates absolute criteria should not be applied.

  When the data result is near the detection limit, then Quality by Design usually applies the "5X" rule in evaluating the RPD. The "5X" rule is defined in *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*, Page 10, under the heading of Duplicate Sample Analysis:

a. "A control limit of ± 20 % (± 35% for soil) for the RPD shall be used for sample values >5X the CRDL."

b. "A control limit of ± CRDL (± 2X CRDL for soil) shall be used for sample values <5X CRDL, including the case when only one of the duplicate samples values is <5X CRDL."

Utilizing these criteria, the validation process is determined as in the following example:

Sample Result	10 ppm
Duplicate Result	19 ppm
CRDL	10 ppm

Step 1. Determine the RPD, which is 62.1.

Step 2. Determine if the sample results are less than 5X the CRDL. In this example, the sample and duplicate results are below 50 (5x10) and further evaluation is warranted.

Step 3. Determine the control limit of ± CRDL, which in this case is 0-20 ppm (10 ppm ±10 ppm).

Step 4. Determine if one or both of the results fall within 0-20 ppm. In this example, both of the results fall within the control limits.

Conclusion: The RPD is acceptable.

Since there is often no set criteria for field duplicates, QBD recommends that this guideline, plus the data user's professional judgment, be used to determine if low level data should be accepted or qualified. A similar rule may be used for organics.

Data Qualifier Flags of "R"

Although no data was sufficiently deficient enough to warrant rejection, data flags of "R", to indicate that the data is unusable, were assigned to those test results that the laboratory reported re-extractions and/or re-analysis. For some (but not all) re-extracted samples, the laboratory reported two sets of results – the original and the re-run. For whatever reason (e.g., dilution, better quality control), one of these results is better than the other. Since data qualifier flags are used to indicate that there was a quality control, regulatory, documentation, or other

problem with a sample result, then the results that should not be used are flagged "R" for unusable. The results that are acceptable for use are not flagged. In essence, the "R" flag is saying, don't use these results -- use the other set.

Antimony was low and out of criteria for accuracy (percent recovery) for all of the matrix spikes analyzed. Normally, the sample that was spiked would be flagged "G" or "R", depending upon whether the percent recovery was more or less than 30%. In addition, because the LCS was acceptable, the other samples would not be flagged. However, because all of the matrix spikes in all of the SDGs for this project were out of criteria, some of which have been above 30% and some of which have been less than 30%, it was decided to flag all antimony results. In a telephone conversation with Foster Wheeler regarding those results that were less than 30%, it was noted that some of the analyte was recovered from the spike (i.e., the percent recovery was not zero) and that a low percent recovery may imply a higher detection limit. It was agreed to define three decision-making rules for flagging only the antimony results for this project:

1. All samples that were associated with matrix spikes that had greater than 30 % recovery were flagged "G".

2. Samples that had positive results and that were associated with matrix spikes that had less than 30 % recovery were flagged "G".

3. Samples that were non-detect and that were associated with matrix spikes that had less than 30 % recovery had the reporting limit raise by a factor proportional to the spike recovery (e.g., if the spike recovery was 20%, the reporting limit was raised by a factor of five) and were flagged "E".

Conclusion

The laboratory data, as qualified, are acceptable for use. No discrepancies were observed between raw data and reported data results.

DATA ASSESSMENT SUMMARY

Case/SAS No.: Middle Waterway Problem Area

SDG No.: Summary of All SDGs

Method: PSEP

No. of Tests: 617

Laboratory: MultiChem Analytical Services

Data User: Foster Wheeler Environ. Corp.

Review Completion Data: January 19, 2000

Reviewer: Quality by Design

QC ITEM	VOA	BNA	Pest	PCB	Metals	Conven.
Holding Times	NA	X	O	X	O	X
GC/MS Performance	NA	O	NA	NA	NA	NA
Initial & Continuing Calibration	NA	M	O	X	O	O
Field Blanks (F=N/A)	NA	O	O	O	O	O
Laboratory Blanks	NA	O	O	O	O	O
Surrogates	NA	M	O	O	NA	NA
Accuracy (MS, LCS)	NA	X	O	O	M	X
Precision (Duplicate Analysis)	NA	O	O	O	M	O
Internal Standards	NA	X	O	O	O	O
Compound Identification	NA	O	O	O	O	O
Compound Quantification	NA	O	O	O	O	O
System Performance	NA	X	O	O	M	O
Overall Assessment	NA	X	O	O	X	O

O = No problems or minor problems that do not affect data usability.
X = No more than about 5% of the data points are qualified as either estimated or unusable.
M = More than about 5% of the data points are qualified as either estimated or unusable.
Z = More than about 5% of the data points are qualified as unusable.
NA = Not Applicable

Areas of Concern: Ninety percent of qualifier flags were assigned because of surrogate, continuing calibration, or percent recovery issues with semivolatiles, or because of percent recovery, duplicate analysis, or serial dilution issues with metals.

DATA EVALUATION SUMMARY

Summary of All Sample Delivery Groups

Date: January 19, 2000

Site Name: Middle Waterway Problem Area

Lab Name: MultiChem Analytical Svcs.

Type of Review: PSEP

Number of Tests: 617

Analytes Flagged as Estimated Due to Exceeding Review Criteria For:

	Surrogates	Holding Time	Calibration	Contamination	Accuracy (MS, LCS)	Precision (Dups.)	Internal Standards	Other	Total # of Analytes *	Total # Estimated/Total # in all Samples
VOA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA NA
SVOA	219	33	232	4	101		15	16 **	620	620 / 1981 = 31.3 %
PEST			1		2				3	3 / 198 = 1.5 %
PCB		7	10						17	17 / 377 = 4.5 %
METALS		8			84	99		81 ***	272	272 / 747 = 36.4 %
CONVEN.		6				18			24	24 / 274 = 8.8 %

* Total may add to a number greater than the actual samples flagged because of multiple flags on some samples.

** Four are due to spectral or instrument performance issues and 13 due to calculation errors.

*** Due to serial dilution deficiencies.

Analytes Flagged as Rejected Due to Exceeding Review Criteria For:

	Surrogates	Holding Time	Calibration	Contamination	Accuracy (MS, LCS)	Precision (Dups.)	Internal Standards	Other	Total # of Analytes *	Total # Rejected/Total # in all Samples
VOA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA NA
SVOA	29 **							15 **	44	44 / 1981 = 2.2%
PEST									0	0 / 198 = 0%
PCB									0	0 / 377 = 0%
METALS									0	0 / 747 = 0%
INORG									0	0 / 274 = 0%

* Total may add to a number greater than the actual samples flagged because of multiple flags on some samples.

** Due to having a more technically sound value available

Quality By Design

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January 20, 2000

Sherri Wunderlich
Foster Wheeler-Environmental
10900 NE 8th St.
Bellevue, WA 98004

Dear Sherri:

Enclosed, please find hard copies of all the SDG data validation reports for Middle Waterway. I have incorporated all the changes we discussed on the telephone yesterday.

You will also find a rather thick set of communications with the laboratory. The example we used in the fax to the lab was for Accession Number 909056, but generally applied to all SDGs. The lab response was satisfactory and I am including a copy of the communications for your files.

If you have any questions or comments, please don't hesitate to call me.

Sincerely,

Lorraine Davis

Lorraine L. Davis,
Owner

Encl.: SDG data validation reports for Middle Waterway

Quality By Design

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e-mail: qbdhilo@gte.net

EPA Level 2
DATA VALIDATION REPORT

Project Name: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 12, 1999
SDG: 909044

Prepared for

Foster Wheeler Environmental
10900 NE 8th St.
Bellevue, WA 98004

Purchase Order No. 022828
QBD Job No. 270A

Reviewed and approved,

Lorraine Davis 1/19/00

Lorraine L. Davis, Owner Date

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A. Introduction 1
B. Chain-of-Custody 3
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A. Introduction

Laboratory Sciences, Inc., d.b.a. *Quality by Design* (QBD), has completed an EPA Level 2 Data Validation on the submitted data packages in accordance with P.O. Number 022828.

The reporting format and criteria for recommending data qualifying flags for this data set are described in the EPA *"Functional Guidelines for Evaluating Organics Analyses"* and *"Functional Guidelines for Evaluating Inorganics Analyses,"* as revised, 1994; and *"Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound"* ("PSEP Protocols"), May, 1997, or using criteria listed in the method referenced. Data may be qualified for any of the following reasons:

1. By the laboratory prior to receipt by the reviewer
2. Because of laboratory deviation from the designated method
3. Because the data may not meet the criteria listed in the reference above
4. By the professional judgment of the reviewer.

The data set consists of one data package from Multichem Analytical Services in Renton, Washington, and contains data for the samples shown in Table 1. The data reviewers and senior reviewers are shown in Table 2.

Each data set includes an analytical data package for each sample, copies of the completed chain-of-custody (COC) forms, and a quality control (QC) data package. The analytical data package includes analytical results, blank sample results, both laboratory and client sample identifications, appropriate dates but not times, method reporting limits, method references, surrogate recoveries as appropriate, the laboratory's name and address, and the initials of the person releasing the data. The custody forms include the receipt of the sample but not the laboratory's internal tracking. The QC data package includes a tabular list of the laboratory's sample identification, spiking concentrations, recoveries, percentage calculations, and acceptance windows.

Raw data were provided which includes chromatograms, instrument print outs, injection logs, digestion/preparation logs.

This data validation report consists of several sections, each of which are formatted to follow Functional Guidelines, but which also include subsections discussing QBD contacts with the laboratory, other comments, and a summary table of data qualifiers.

Table 1. Sample Identification and Analysis

Sample Identification	Laboratory Identification	Methods 8081/8082	Method 8270	Method 6010/7000	Method 9060	Grain Size	Conventionals
MWAT042R1	909044-1				X	X	X
MWAT045R1	909044-2				X	X	X

Key:
Method 8270 = Semivolatile organic compounds by gas chromatography/mass spectroscopy
Method 8081/8082 = Pesticides and polychlorinated biphenyls (PCB) by gas chromatography
Method 6010 & 7000 = Metals by inductively coupled plasma (ICP) and cold vapor atomic absorption (CVAA)
Method 9060 = Total organic carbon (TOC)
Conventionals = Sulfide, ammonia, and percent moisture

Table 2. Data Package, Reviewer, and Senior Reviewer

Analysis	Number of Pages	Reviewer	Senior Reviewer
Grain size and Conventionals	76	Lorraine L. Davis	Thomas S. Davis

B. Chain-of-Custody

The analytical data package was reviewed and compared against the chain-of-custody (COC) form. No data are missing from the COC forms and no transcription errors in accuracy were found. All tests requested on the COC were performed.

Discussion: The grain size analysis was subcontracted to Rosa Environmental and Geotechnical Laboratory in Seattle, Washington. The sulfide analysis was subcontracted to Columbia Analytical Services, Inc. in Kelso, Washington.

C Review of Conventional Analyses

EPA Method 9060, Grain Size, Percent Moisture, and PSEP Sulfides

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. Initial and Continuing Calibration

All initial and continuing calibration Quality Control criteria were met. No target compound list (TCL) analytes had correlation coefficients greater than allowed by the method, and all percent differences for the continuing calibration verifications were acceptable.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Laboratory Control Standards

A second source laboratory control standard (LCS) was analyzed at a frequency required by the referenced method and all percent recoveries were within laboratory or method criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and relative percent differences (RPD) were within laboratory or method criteria.

6. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all relative percent differences (RPD) were within laboratory or method criteria.

7. Field Duplicates

No field duplicates were identified with this group of samples.

8. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

9. Laboratory Contact

There was no verbal or written communication with the laboratory.

10. Other Comments

None.

11. Data Use and Overall Assessment

The data are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results.

Quality By Design

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EPA Level 2
DATA VALIDATION REPORT

Project Name: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 22, 1999
SDG: 909052

Prepared for

Foster Wheeler Environmental
10900 NE 8th St.
Bellevue, WA 98004

Purchase Order No. 022828
QBD Job No. 270B

Reviewed and approved,

Lorraine Davis 1/19/00

Lorraine L. Davis, Owner — Date

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Attachments

Attachment 1 Data Flag Definitions
Attachment 2 Summary Table of Data Qualifier Flags
Attachment 3 Revised Laboratory Forms

A. Introduction

Laboratory Sciences, Inc., d.b.a. *Quality by Design* (QBD), has completed an EPA Level 2 Data Validation on the submitted data packages in accordance with P.O. Number 022828.

The reporting format and criteria for recommending data qualifying flags for this data set are described in the EPA *"Functional Guidelines for Evaluating Organics Analyses"* and *"Functional Guidelines for Evaluating Inorganics Analyses,"* as revised, 1994; and "*Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound*" ("PSEP Protocols"), May, 1997, or using criteria listed in the method referenced. Data may be qualified for any of the following reasons:

1. By the laboratory prior to receipt by the reviewer
2. Because of laboratory deviation from the designated method
3. Because the data may not meet the criteria listed in the reference above
4. By the professional judgment of the reviewer.

The data set consists of several data packages from Multichem Analytical Services in Renton, Washington, and contains data for the samples shown in Table 1. The data reviewers and senior reviewers are shown in Table 2.

Each data set includes an analytical data package for each sample, copies of the completed chain-of-custody (COC) forms, and a quality control (QC) data package. The analytical data package includes analytical results, blank sample results, both laboratory and client sample identifications, appropriate dates but not times, method reporting limits, method references, surrogate recoveries as appropriate, the laboratory's name and address, and the initials of the person releasing the data. The custody forms include the receipt of the sample but not the laboratory's internal tracking. The QC data package includes a tabular list of the laboratory's sample identification, spiking concentrations, recoveries, percentage calculations, and acceptance windows.

Raw data were provided which includes chromatograms, instrument print outs, injection logs, digestion/preparation logs.

This data validation report consists of several sections, each of which are formatted to follow Functional Guidelines, but which also include subsections discussing QBD contacts with the laboratory, other comments, and a summary table of data qualifiers.

Table 1. Sample Identification and Analysis

Sample Identification	Laboratory Identification	Methods 8081/8082	Method 8270	Method 6010/7000	Method 9060	Grain Size	Conventionals
MWST 132R1	990952-1	X	X	X	X	X	
MWAT 153R1	990952-2	X	X	X	X	X	X
MWAT 047R1	990952-4				X	X	X
MWAT 044R1	990952-5				X	X	X
MWST 139R1	990952-6	X	X	X	X	X	
MWCT 135R2	990952-7				X	X	
MWST 135R1	990952-8	X	X	X	X	X	
MWCT 135R3	990952-9		X	X			
MWCT 135R4	990952-10		X	X			

Key:
Method 8270 = Semivolatile organic compounds by gas chromatography/mass spectroscopy
Method 8081/8082 = Pesticides and polychlorinated biphenyls (PCB) by gas chromatography
Method 6010 & 7000 = Metals by inductively coupled plasma (ICP) and cold vapor atomic absorption (CVAA)
Method 9060 = Total organic carbon (TOC)
Conventionals = Sulfide, ammonia, and percent moisture

Table 2. Data Package, Reviewer, and Senior Reviewer

Analysis	Number of Pages	Reviewer	Senior Reviewer
Pest/PCB	404	Randi Schneider	Lorraine L. Davis
SVOC	468	Debbie Copsey	Lorraine L. Davis
Metals	172	Lorraine L. Davis	Thomas S. Davis
Conventionals	81	Lorraine L. Davis	Thomas S. Davis

B. Chain-of-Custody

The analytical data package was reviewed and compared against the chain-of-custody (COC) form. No data are missing from the COC forms and no transcription errors in accuracy were found. All tests requested on the COC were performed.

Discussion: The grain size analysis was subcontracted to Rosa Environmental and Geotechnical Laboratory in Seattle, Washington. The sulfide analysis was subcontracted to Columbia Analytical Services, Inc. in Kelso, Washington.

C. Review of GC/MS Semivolatiles Analyses

EPA Method 8270

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The base neutral fraction analyses were added to the work order after the samples had been logged into the laboratory system, and the extraction for this analyses occurred after the 14-day holding time. As stated in the case narrative, the samples were frozen upon receipt and then thawed and extracted. PSDDA recognizes a holding time of one year for sediments which have been frozen. When the samples are thawed, Method 8270 recognizes a 14-day holding time to extraction. Since the request for analysis occurred during the analytical process for the SDG and since the samples were frozen until extraction, no data qualifier flags are recommended.

2. GC/MS Tuning

All decafluorotriphenylphosphine (DFTPP) tune criteria were met for the initial and continuing calibration for all dates of sample analysis.

3. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No target compound list (TCL) analytes had percent relative standard deviations (%RSD) greater than allowed by the method for the initial calibration or percent difference for the continuing calibration checks. All system performance check compound (SPCC) and calibration check compound (CCC) criteria were met, except as noted below.

Table 3. SVOC Data Qualifiers Due to Calibration Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT135R3	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	69 UG
MWCT135R3	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	69 UG

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT135R3	Benzo(g,h,i)perylene	Continuing Calibration % D >20	69 UG
MWCT135R4	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	74 UG
MWCT135R4	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	74 UG
MWCT135R4	Benzo(g,h,i)perylene	Continuing Calibration % D >20	74 UG

Discussion: The continuing calibration for the target compounds indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene had percent differences of 52.5, 38.9 and 55.2, respectively, which is out of the criteria of 20 percent. The associated results in Samples MWCT135R3 and MWCT135R4 have been flagged with "UG" to indicate the reporting limit is greater than the minimum shown.

4. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

5. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria, except as noted below.

Table 4. SVOC Data Qualifiers Due to Surrogate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWAT153R1	Phenol	Surrogate	70 E
MWAT153R1	Benzyl alcohol	Surrogate	36 UE
MWAT153R1	2-Methylphenol	Surrogate	18 UE
MWAT153R1	4-Methylphenol	Surrogate	180 E
MWAT153R1	2,4-Dimethylphenol	Surrogate	9.2 UE
MWAT153R1	Benzoic acid	Surrogate	220 UE
MWAT153R1	Pentachlorophenol	Surrogate	18 UE
MWAT139R1	Phenol	Surrogate	140 E
MWAT139R1	Benzyl alcohol	Surrogate	46 UE
MWAT139R1	2-Methylphenol	Surrogate	23 UE
MWAT139R1	4-Methylphenol	Surrogate	120 E
MWAT139R1	2,4-Dimethylphenol	Surrogate	12 UE
MWAT139R1	Benzoic acid	Surrogate	280 UE
MWAT139R1	Pentachlorophenol	Surrogate	28 E

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWST135R1	Phenol	Surrogate	180 E
MWST135R1	Benzyl alcohol	Surrogate	50 UE
MWST135R1	2-Methylphenol	Surrogate	25 UE
MWST135R1	4-Methylphenol	Surrogate	160 E
MWST135R1	2,4-Dimethylphenol	Surrogate	13 UE
MWST135R1	Benzoic acid	Surrogate	300 UE
MWST135R1	Pentachlorophenol	Surrogate	31 E

Discussion: The surrogate percent recoveries for 2-fluorophenol and 2,4,6-tribromophenol were out of the acceptance criteria of 41 to 103 and 46 to 136, respectively in Samples MWAT153R1, MWST139R1, and MWST135R1. Because one surrogate recovery was high and one surrogate recovery was low, the associated results have been flagged with "E" to indicate an estimated value or "UE" to indicate an estimated reporting limit.

6. Laboratory Control Standards

The laboratory analyzed a second source sample with the analytical batch. The laboratory referred to this sample as a blank spike/blank spike duplicate (BS/BSD) rather than a laboratory control standard (LCS). Any anomalies or comments regarding the second source results are addressed in the next section.

7. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

Matrix spike (MS) and matrix spike duplicates (MSD) were analyzed as required by the referenced method and all percent recoveries and relative percent differences (RPDs) were within the quality assurance project plan (QAPP) criteria, except as noted below.

Table 5. SVOC Data Qualifiers Due to MS/MSD Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWST132R1	Phenol	Accuracy	270 E
MWST132R1	Benzoic acid	Accuracy	1300 E
MWAT153R1	Phenol	Accuracy	70 E
MWAT153R1	Benzoic acid	Accuracy	220 UE
MWST139R1	Phenol	Accuracy	140 E
MWST139R1	Benzoic acid	Accuracy	280 UE
MWST135R1	Phenol	Accuracy	180 E
MWST135R1	Benzoic acid	Accuracy	300 UE
MWST132R1	Di-n-octylphthalate	Precision and Accuracy	71 UE
MWAT153R1	Di-n-octylphthalate	Precision and Accuracy	55 UE

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWST139R1	Di-n-octylphthalate	Precision and Accuracy	69 UE
MWST135R1	Di-n-octylphthalate	Precision and Accuracy	75 UE

Discussion: Phenol was high and out of criteria for accuracy (percent recovery) for the MS/MSD and/or BS/BSD pair. The associated results in Samples MWST132R1, MWAT153R1, MWST139R1, MWST135R1, and MWSB119R1 have been flagged with "E" and "UE". "G" and "L" flags could not be assigned because the MS?MSD results indicated a high bias and the CCV results indicated a low bias.

Benzyl alcohol was out of criteria for accuracy (percent recovery) for the MS/MSD and/or BS/BSD pair. Because the recovery was high in the MS/MSD pair and low in the BS/BSD pair, the associated results in Samples MWST132R1, MWAT153R1, MWST139R1, MWST135R1, and MWSB119R1 have been flagged "E" to indicate an estimated value or "UE" to indicate an estimated reporting limit.

Several MS and MSD recoveries were out of criteria due to high concentrations of analytes in the original sample. Since all other QC checks were in criteria, no data qualifier flags are recommended.

Di-n-octylphthalate was out of criteria for both precision and accuracy in the MS/MSD and BS/BSD pair. Because the recovery was high in the MS/MSD pair and low in the BS/BSD pair, the associated results for Samples MWST132R1, MWAT153R1, MWST139R1, and MWST135R1 have been flagged with "UE" to indicate an estimated reporting limit.

Pentachlorophenol was out of criteria in the BS/BSD pair. Since the recovery for this compound was acceptable in the MS/MSD pair, no data qualifier flags are recommended.

2-Methylphenol was out of criteria in a single BS. Since all other QC checks were in criteria, no data qualifier flags are recommended.

The percent recovery for 2,4-dimethylphenol was out of criteria at zero percent in the BS/BSD. The laboratory had previously noted this problem and found the root cause to be the medium used for the blank spike (Ottawa sand). Given that this as been identified as a historical issue, the reviewer concurs with the laboratory's action to use the MS/MSD results as their QC check for precision and accuracy. Since the MS/MSD results were in criteria, no data qualifier flags are recommended.

8. Internal Standards Performance for Samples

All internal standard areas were within the required control limits, except as noted below.

Discussion: The internal standard perylene-d_{12} was out of the acceptance criteria of –50 to +100 percent at 108 percent. Since the associated sample was a QC sample, no data qualifier flags are recommended.

9. Field Duplicates

No field duplicates were identified with this group of samples.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

11. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

12. TCL Compound Identification

All target compound identifications met the criteria for retention times and peak identification of the referenced method.

13. Tentatively Identified Compounds

No TICs were reported with this data set.

14. Laboratory Contact

There was no verbal or written communication with the laboratory.

15. Other Comments

None.

16. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

D. Review of Pesticides/PCBs Analyses

EPA Method 8081/8082

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The analysis of the target compounds hexachlorobenzene and hexachlorobutadiene was performed using Method 8081 instead of the requested Method 8270. No data qualifier flags are recommended since the method utilized is an approved method by PSEP.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No TCL analytes had %RSD greater than that allowed for the initial calibration or percent difference for the continuing calibration checks, except as noted below.

Discussion: The continuing calibration for the target compounds Aroclor 1016, Aroclor 1260 had an average percent difference of 16.4, which is out of the criteria of 15 percent. Since all results were non-detect, no data qualifier flags are recommended.

The continuing calibration for the target compounds 4,4'-DDD and 4,4'-DDT had percent differences of 22.8 and 31.8; and 62.5 and 63.5, respectively, which are out of the criteria of 15 percent. Since all results were non-detect, no data qualifier flags are recommended.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria, except as noted below.

Table 6. Pesticide/PCB Data Qualifiers Due to MS/MSD Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWST132R1	Hexachlorobutadiene	MS/MSD	3.0 UG

Discussion: Hexachlorobutadiene was out of criteria for accuracy (percent recovery) for the MS/MSD pair. Only the results for this compound in the sample spiked has been flagged with a "UG" to indicate that the reporting limit is greater than the minimum shown.

6. Field Duplicates

No field duplicates were identified with this group of samples.

7. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

8. TCL Compound Identification

No target compounds were detected.

9. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards or external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

10. Laboratory Contact

There was no verbal or written communication with the laboratory.

11. Other Comments

None.

12. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

E. Review of Metals Analyses

EPA Method 6010/7000

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. Initial and Continuing Calibration

All initial and continuing calibration Quality Control criteria were met. No TCL analytes had correlation coefficients greater than allowed by the method, and all percent differences for the continuing calibration verifications were acceptable.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. ICP Interference Check Standard

An interference check sample (ICS) was analyzed at a frequency required by the referenced method and was within established criteria.

5. Laboratory Control Standards

A second source laboratory control standard (LCS) was analyzed at a frequency required by the referenced method and all percent recoveries were within QAPP criteria.

Discussion: Antimony, cadmium, lead and nickel were out of the method criteria of 90 to 110 percent recovery for the LCS. However, PSDDA allows 80 to 120 percent recovery of a second source check sample. All four analytes were within PSDDA acceptance criteria. Therefore, no data qualifier flags are recommended.

6. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MSs were analyzed as required by the referenced method and all percent recoveries and RPDs were within QAPP criteria, except as noted below.

Table 7. Metal Data Qualifiers Due to MS/MSD Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWAT153R1	Antimony	Accuracy	3.8 UG

Discussion: Antimony was low and out of criteria for accuracy (percent recovery) for the MS/MSD pair. Normally, because the LCS was acceptable, only the results for this analyte in the sample that was spiked would be flagged. However, because all of the matrix spikes in all of the SDGs for this project have been out of criteria, all samples which were analyzed for antimony have been flagged "G" or "UG" to indicate that the value was greater than the minimum shown.

7. Field Duplicates

No field duplicates were identified with this group of samples.

8. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPDs were within QAPP criteria, except as noted below.

Table 8. Metal Data Qualifiers Due to Duplicate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWAT153R1	Mercury	Precision	0.40 E
MWST132R1	Mercury	Precision	0.61 E
MWST135R1	Mercury	Precision	0.68 E

Discussion: Mercury was out of the criteria of less than 20 percent at 58.1 percent in the sample duplicate set. The associated positive results for Samples MWAT153R1, MWST132R1, and MWST135R1 have been flagged "E" to indicate an estimated value.

9. ICP Serial Dilution

Samples that were a factor of 50 above the instrument detection limit (IDL) for the analyte were diluted five-fold and were within criteria required by the referenced method, except as noted below.

Table 9. Metal Data Qualifiers Due to ICP Serial Dilution Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWAT153R1	Nickel	Serial Dilution	7.1 E

Discussion: A serial dilution of nickel has a percent difference greater than the acceptance criteria of ±10 percent. The associated results for Sample MWAT153R1 have been flagged "E" to indicate an estimated value.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract, except as noted below.

Discussion: The reporting limit for lead failed to meet the requirement of 0.5 mg/kg that was listed in the QAPP. However, most field samples had positive results. For samples that were non-detect, the laboratory's reporting limit of 1.5 mg/kg was less than the Sediment Quality Standard Criteria of 450 mg/kg and the Sediment Impact Zone and Clean-up Criteria of 530 mg/kg, and no data qualifier flags are recommended.

11. Graphite Furnace Atomic Absorption Analysis

All special criteria for graphite furnace atomic absorption (GFAA) analysis were performed at a frequency required by the referenced method and was within established criteria.

12. Laboratory Contact

There was no verbal or written communication with the laboratory.

13. Other Comments

None.

14. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

F. Review of Conventional Analyses

EPA Method 9060, Grain Size, Percent Moisture, and PSEP Sulfides

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met, including the number of standards used and the correlation coefficients. All continuing calibration criteria, including frequency of analysis and percent recovery were met, except as noted below.

Discussion: The laboratory ran 12 samples in between two continuing calibration verifications instead of the required ten samples during the ammonia analysis. No data qualifier flags are recommended since all the associated QC checks were in criteria and since there was no indication that the analytical process was out of control.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within laboratory or method criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MSs were analyzed as required by the referenced method and all percent recoveries RPDs were within laboratory or method criteria.

6. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and RPDs were within laboratory or method criteria, except as noted below.

Table 10. Inorganic Data Qualifiers Due to Duplicate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWAT153R1	Sulfide	Precision	95.7 E
MWAT047R1	Sulfide	Precision	3.8 E
MWAT044R1	Sulfide	Precision	841 E
MWAT044R1	Total Organic Carbon	Precision	32800 E
MWAT047R1	Total Organic Carbon	Precision	29900 E
MWAT153R1	Total Organic Carbon	Precision	16800 E
MWCT135R1	Total Organic Carbon	Precision	80100 E
MWSB123R1	Total Organic Carbon	Precision	4140 E
MWST132R1	Total Organic Carbon	Precision	54800 E
MWST135R1	Total Organic Carbon	Precision	67800 E
MWST139R1	Total Organic Carbon	Precision	24500 E

Discussion: Sulfide and total organic carbon was out of the criteria of <20 RPD at 59 and 43.6, respectively, in the sample duplicate set. The associated results in Samples MWAT153R1, MWAT047R1, MWAT044R1, MWCT135R2, MWSB123R1, MWST132R1, MWST135R1, and MWST139R1 have been flagged "E" to indicate an estimated value.

7. Field Duplicates

No field duplicates were identified with this group of samples.

8. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

9. Laboratory Contact

There was no verbal or written communication with the laboratory.

10. Other Comments

None.

11. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

Attachment 1 Puget Sound Estuary Program Data Qualifier Definitions

Used for both organics and inorganic analyses

B = Analyte detected in samples and in method blank

C = Combined with unresolved substances

E = Estimated

G = Value greater than minimum shown

K = Detected at less than the maximum shown

L = Value less than the maximum shown

M = Value is a mean

Q = Questionable value

R = Rejected or unusable value

T = Detected below the quantification limit shown

U = Undetected at the detection limit shown

Z = Blank corrected

Attachment 2 Summary Table of Data Qualifier Flags

Foster Wheeler Environmental
Project: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 24, 1999

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCT135R3	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	69 UG
MWCT135R3	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	69 UG
MWCT135R3	Benzo(g,h,i)perylene	Continuing Calibration % D >20	69 UG
MWCT135R4	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	74 UG
MWCT135R4	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	74 UG
MWCT135R4	Benzo(g,h,i)perylene	Continuing Calibration % D >20	74 UG
MWAT153R1	Phenol	Surrogate	70 E
MWAT153R1	Benzyl alcohol	Surrogate	36 UE
MWAT153R1	2-Methylphenol	Surrogate	18 UE
MWAT153R1	4-Methylphenol	Surrogate	180 E
MWAT153R1	2,4-Dimethylphenol	Surrogate	9.2 UE
MWAT153R1	Benzoic acid	Surrogate	220 UE
MWAT153R1	Pentachlorophenol	Surrogate	18 UE
MWAT139R1	Phenol	Surrogate	140 E
MWAT139R1	Benzyl alcohol	Surrogate	46 UE
MWAT139R1	2-Methylphenol	Surrogate	23 UE
MWAT139R1	4-Methylphenol	Surrogate	120 E
MWAT139R1	2,4-Dimethylphenol	Surrogate	12 UE
MWAT139R1	Benzoic acid	Surrogate	280 UE
MWAT139R1	Pentachlorophenol	Surrogate	28 E
MWST135R1	Phenol	Surrogate	180 E
MWST135R1	Benzyl alcohol	Surrogate	50 UE
MWST135R1	2-Methylphenol	Surrogate	25 UE
MWST135R1	4-Methylphenol	Surrogate	160 E
MWST135R1	2,4-Dimethylphenol	Surrogate	13 UE
MWST135R1	Benzoic acid	Surrogate	300 UE
MWST135R1	Pentachlorophenol	Surrogate	31 E
MWST132R1	Phenol	Accuracy	270 L
MWST132R1	Benzoic acid	Accuracy	1300 E

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWAT153R1	Phenol	Accuracy	70 L
MWAT153R1	Benzoic acid	Accuracy	220 UE
MWST139R1	Phenol	Accuracy	140 L
MWST139R1	Benzoic acid	Accuracy	280 UE
MWST135R1	Phenol	Accuracy	180 L
MWST135R1	Benzoic acid	Accuracy	300 UE
MWST132R1	Di-n-octylphthalate	Precision and Accuracy	71 UE
MWAT153R1	Di-n-octylphthalate	Precision and Accuracy	55 UE
MWST139R1	Di-n-octylphthalate	Precision and Accuracy	69 UE
MWST135R1	Di-n-octylphthalate	Precision and Accuracy	75 UE
MWST132R1	Hexachlorobutadiene	MS/MSD	3.0 UG
MWAT153R1	Antimony	Accuracy	3.8 UG
MWAT153R1	Mercury	Precision	0.40 E
MWST132R1	Mercury	Precision	0.61 E
MWST135R1	Mercury	Precision	0.68 E
MWAT153R1	Nickel	Serial Dilution	7.1 E
MWAT153R1	Sulfide	Precision	95.7 E
MWAT047R1	Sulfide	Precision	3.8 E
MWAT044R1	Sulfide	Precision	841 E
MWAT044R1	Total Organic Carbon	Precision	32800 E
MWAT047R1	Total Organic Carbon	Precision	29900 E
MWAT153R1	Total Organic Carbon	Precision	16800 E
MWCT135R1	Total Organic Carbon	Precision	80100 E
MWSB123R1	Total Organic Carbon	Precision	4140 E
MWST132R1	Total Organic Carbon	Precision	54800 E
MWST135R1	Total Organic Carbon	Precision	67800 E
MWST139R1	Total Organic Carbon	Precision	24500 E

Attachment 3 Revised Laboratory Forms

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 8016

MWCT135R3

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909052

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909052-9

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1564

Level: (low/med) LOW Date Collected: 09/22/99

% Moisture: 23 decanted: (Y/N) Y Date Extracted: 10/25/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/11/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
91-20-3	Naphthalene	69	U	
91-57-6	2-Methylnaphthalene	69	U	
208-96-8	Acenaphthylene	69	U	
83-32-9	Acenaphthene	69	U	
86-73-7	Fluorene	69	U	
85-01-8	Phenanthrene	69	U	
120-12-7	Anthracene	69	U	
206-44-0	Fluoranthene	69	U	
129-00-0	Pyrene	69	U	
56-55-3	Benzo(a)anthracene	69	U	
218-01-9	Chrysene	69	U	
205-99-2	Benzo(b)fluoranthene	69	U	
207-08-9	Benzo(k)fluoranthene	69	U	
50-32-8	Benzo(a)pyrene	69	U	
193-39-5	Indeno(1,2,3-cd)pyrene	69	U	Q
53-70-3	Dibenzo(a,h)anthracene	69	U	Q
191-24-2	Benzo(g,h,i)perylene	69	U	Q

12/6/99

12/QBD
1/6/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCT135R4

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909052

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909052-10

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1565

Level: (low/med) LOW Date Collected: 09/22/99

% Moisture: 28 decanted: (Y/N) Y Date Extracted: 10/25/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/11/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
91-20-3	Naphthalene	74	U	
91-57-6	2-Methylnaphthalene	74	U	
208-96-8	Acenaphthylene	74	U	
83-32-9	Acenaphthene	74	U	
86-73-7	Fluorene	74	U	
85-01-8	Phenanthrene	74	U	
120-12-7	Anthracene	74	U	
206-44-0	Fluoranthene	74	U	
129-00-0	Pyrene	74	U	
56-55-3	Benzo(a)anthracene	74	U	
218-01-9	Chrysene	74	U	
205-99-2	Benzo(b)fluoranthene	74	U	
207-08-9	Benzo(k)fluoranthene	74	U	
50-32-8	Benzo(a)pyrene	74	U	
193-39-5	Indeno(1,2,3-cd)pyrene	74	U	G
53-70-3	Dibenzo(a,h)anthracene	74	U	G
191-24-2	Benzo(g,h,i)perylene	74	U	G

12/14/99
1/26/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWAT153R1

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909052

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909052-2

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5614

Level: (low/med) LOW Date Collected: 09/22/99

% Moisture: 27 decanted: (Y/N) Y Date Extracted: 09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/09/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	70	
100-51-6	Benzyl alcohol	36	U
95-48-7	2-Methylphenol	18	U
106-44-5	4-Methylphenol	180	
105-67-9	2,4-Dimethylphenol	9.2	U
65-85-0	Benzoic acid	220	U
87-86-5	Pentachlorophenol	18	U

E
E

RA/QBD
1/16/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWST139R1

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909052

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909052-6

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5615

Level: (low/med) LOW Date Collected: 09/22/99

% Moisture: 42 decanted: (Y/N) Y Date Extracted: 09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/09/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
108-95-2	Phenol	140		E
100-51-6	Benzyl alcohol	46	U	
95-48-7	2-Methylphenol	23	U	
106-44-5	4-Methylphenol	120		
105-67-9	2,4-Dimethylphenol	12	U	
65-85-0	Benzoic acid	280	U	
87-86-5	Pentachlorophenol	28		

ll/QBD
1/16/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWST135R1

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909052

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909052-8

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5616

Level: (low/med) LOW Date Collected: 09/22/99

% Moisture: 47 decanted: (Y/N) Y Date Extracted: 09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/09/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
108-95-2	Phenol	180		E
100-51-6	Benzyl alcohol	50	U	E
95-48-7	2-Methylphenol	25	U	
106-44-5	4-Methylphenol	160		
105-67-9	2,4-Dimethylphenol	13	U	
65-85-0	Benzoic acid	300	U	
87-86-5	Pentachlorophenol	31		

ld/QBD
1/16/00

C015

CLIENT SAMPLE NO.

MWST132R1

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909052

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909052-1

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5619

Level: (low/med) LOW Date Collected: 09/22/99

% Moisture: 44 decanted: (Y/N) Y Date Extracted:09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/09/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
108-95-2	Phenol	270		E
100-51-6	Benzyl alcohol	48	U	
95-48-7	2-Methylphenol	24	U	
106-44-5	4-Methylphenol	180		
105-67-9	2,4-Dimethylphenol	12	U	
65-85-0	Benzoic acid	1300		E
87-86-5	Pentachlorophenol	72		

LL/QBD
1/16/00

0021

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.: MWST132R1 ✓

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909052

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909052-1 ✓

Sample wt/vol: 75.0 (g/mL) G ✓ Lab File ID: P1205 ✓

Level: (low/med) LOW Date Collected: 09/22/99

% Moisture: 44 ✓ decanted: (Y/N) Y Date Extracted: 09/27/99 ✓

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/06/99 ✓

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y ✓ pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG ✓	Q	
541-73-1	1,3-Dichlorobenzene	23	U	
106-46-7	1,4-Dichlorobenzene	23	U	
95-50-1	1,2-Dichlorobenzene	23	U	
120-82-1	1,2,4-Trichlorobenzene	23	U	
91-20-3	Naphthalene	380		✓
91-57-6	2-Methylnaphthalene	130		
131-11-3	Dimethylphthalate	71	U	
208-96-8	Acenaphthylene	210		
83-32-9	Acenaphthene	120		✓
132-64-9	Dibenzofuran	240	U	✓
84-66-2	Diethylphthalate	71	U	
86-73-7	Fluorene	120		
86-30-6	N-Nitrosodiphenylamine (1)	23	U	
85-01-8	Phenanthrene	580		✓
120-12-7	Anthracene	250		
84-74-2	Di-n-butylphthalate	71	U	
206-44-0	Fluoranthene	1200		✓
129-00-0	Pyrene	860		
85-68-7	Butylbenzylphthalate	71	U	
56-55-3	Benzo(a)anthracene	480		✓
218-01-9	Chrysene	600		
117-81-7	bis(2-Ethylhexyl)phthalate	720		
117-84-0	Di-n-octylphthalate	71	U	E
205-99-2	Benzo(b)fluoranthene	810		
207-08-9	Benzo(k)fluoranthene	610		
50-32-8	Benzo(a)pyrene	520		
193-39-5	Indeno(1,2,3-cd)pyrene	190		
53-70-3	Dibenzo(a,h)anthracene	95	U	✓
191-24-2	Benzo(g,h,i)perylene	210		

(1) - Cannot be separated from Diphenylamine

PL 10/14/99

10/14/99

1/16/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWAT153R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909052

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909052-2

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1222

Level: (low/med) LOW Date Collected: 09/22/99

% Moisture: 27 decanted: (Y/N) Y Date Extracted: 09/27/99 OK

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/06/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	18	U	
106-46-7	1,4-Dichlorobenzene	18	U	
95-50-1	1,2-Dichlorobenzene	18	U	
120-82-1	1,2,4-Trichlorobenzene	18	U	
91-20-3	Naphthalene	390		
91-57-6	2-Methylnaphthalene	120		
131-11-3	Dimethylphthalate	55	U	
208-96-8	Acenaphthylene	350		
83-32-9	Acenaphthene	130		
132-64-9	Dibenzofuran	180	U	
84-66-2	Diethylphthalate	55	U	
86-73-7	Fluorene	160		
86-30-6	N-Nitrosodiphenylamine (1)	18	U	
85-01-8	Phenanthrene	640		
120-12-7	Anthracene	300		
84-74-2	Di-n-butylphthalate	55	U	
206-44-0	Fluoranthene	1100		
129-00-0	Pyrene	970		
85-68-7	Butylbenzylphthalate	55	U	
56-55-3	Benzo(a)anthracene	540		
218-01-9	Chrysene	600		
117-81-7	bis(2-Ethylhexyl)phthalate	340		
117-84-0	Di-n-octylphthalate	55	U	E
205-99-2	Benzo(b)fluoranthene	470		
207-08-9	Benzo(k)fluoranthene	380		
50-32-8	Benzo(a)pyrene	540		
193-39-5	Indeno(1,2,3-cd)pyrene	160		
53-70-3	Dibenzo(a,h)anthracene	73	U	
191-24-2	Benzo(g,h,i)perylene	160		

(1) - Cannot be separated from Diphenylamine

PL 10/29/99
PES 11/01/99
QBD 1/16/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWST139R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909052

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909052-6

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1206

Level: (low/med) LOW Date Collected: 09/22/99

% Moisture: 42 decanted: (Y/N) Y Date Extracted: 09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/06/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
541-73-1	1,3-Dichlorobenzene	22	U
106-46-7	1,4-Dichlorobenzene	22	U
95-50-1	1,2-Dichlorobenzene	22	U
120-82-1	1,2,4-Trichlorobenzene	22	U
91-20-3	Naphthalene	710	
91-57-6	2-Methylnaphthalene	230	
131-11-3	Dimethylphthalate	69	U
208-96-8	Acenaphthylene	440	
83-32-9	Acenaphthene	200	
132-64-9	Dibenzofuran	230	U
84-66-2	Diethylphthalate	69	U
86-73-7	Fluorene	190	
86-30-6	N-Nitrosodiphenylamine (1)	22	U
85-01-8	Phenanthrene	890	
120-12-7	Anthracene	480	
84-74-2	Di-n-butylphthalate	69	U
206-44-0	Fluoranthene	1600	
129-00-0	Pyrene	1600	
85-68-7	Butylbenzylphthalate	69	U
56-55-3	Benzo(a)anthracene	1000	
218-01-9	Chrysene	1200	
117-81-7	bis(2-Ethylhexyl)phthalate	420	
117-84-0	Di-n-octylphthalate	69	U E
205-99-2	Benzo(b)fluoranthene	1200	
207-08-9	Benzo(k)fluoranthene	980	
50-32-8	Benzo(a)pyrene	940	
193-39-5	Indeno(1,2,3-cd)pyrene	310	
53-70-3	Dibenzo(a,h)anthracene	100	
191-24-2	Benzo(g,h,i)perylene	330	

(1) - Cannot be separated from Diphenylamine

RA/QBO 1/16/00
PL 10/14/99
DMS 10/14/99

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 0076

MWST135R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909052

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909052-8

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1225

Level: (low/med) LOW Date Collected: 09/22/99

% Moisture: 47 decanted: (Y/N) Y Date Extracted: 09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/07/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG		
541-73-1	1,3-Dichlorobenzene	24	U	
106-46-7	1,4-Dichlorobenzene	24	U	
95-50-1	1,2-Dichlorobenzene	24	U	
120-82-1	1,2,4-Trichlorobenzene	24	U	
91-20-3	Naphthalene	510		
91-57-6	2-Methylnaphthalene	130		
131-11-3	Dimethylphthalate	75	U	
208-96-8	Acenaphthylene	440		
83-32-9	Acenaphthene	470		
132-64-9	Dibenzofuran	250	U	
84-66-2	Diethylphthalate	75	U	
86-73-7	Fluorene	230		
86-30-6	N-Nitrosodiphenylamine (1)	24	U	
85-01-8	Phenanthrene	1100		
120-12-7	Anthracene	1000		
84-74-2	Di-n-butylphthalate	75	U	
206-44-0	Fluoranthene	6000	D3	
129-00-0	Pyrene	4100	D3	
85-68-7	Butylbenzylphthalate	75	U	
56-55-3	Benzo(a)anthracene	1300		
218-01-9	Chrysene	1300		
117-81-7	bis(2-Ethylhexyl)phthalate	850		
117-84-0	Di-n-octylphthalate	75	U	E
205-99-2	Benzo(b)fluoranthene	1500		
207-08-9	Benzo(k)fluoranthene	730		
50-32-8	Benzo(a)pyrene	910		
193-39-5	Indeno(1,2,3-cd)pyrene	240		
53-70-3	Dibenzo(a,h)anthracene	100	U	
191-24-2	Benzo(g,h,i)perylene	220		

(1) - Cannot be separated from Diphenylamine

D3 - Result reported from a 5 fold dilution (P1243.D)

ld/QBD 1/10/00 RML 11/10/99

FORM 1
PEST ORGANICS ANALYSIS DATA SHEET

Client SAMPLE NO. MWST132R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909052

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909052-1

Sample wt/vol: 30.0 (g/mL) G Lab File ID: RA101S10

% Moisture: 44 decanted: (Y/N) Y Date Collected: 09/22/99

Extraction: (SepF/Cont/Sonc) Date Extracted: 09/27/99

Concentrated Extract Volume: 10(mL) Date Analyzed: 10/10/99

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
72-55-9	4,4'-DDE	2.0	U	
72-54-8	4,4'-DDD	2.0	U	
50-29-3	4,4'-DDT	2.0	U	
12674-11-2	Aroclor 1016	60	U	
11104-28-2	Aroclor 1221	60	U	
11141-16-5	Aroclor 1232	60	U	
53469-21-9	Aroclor 1242	60	U	
12672-29-6	Aroclor 1248	60	U	
11097-69-1	Aroclor 1254	60	U	
11096-82-5	Aroclor 1260	60	U	
118-74-1	Hexachlorobenzene	3.0	U	
87-68-3	Hexachlorobutadiene	3.0	U	G

RL/QBD
1/16/00

INORGANICS SW-846

00001

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWAT153R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909052

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909052-2

% Solids: 63.9

Date Received: 09/22/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	3.8	U		P	G
7440-38-2	Arsenic	7.8			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.38	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	73.9			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	48.2			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.40		*	CV	E
7440-02-0	Nickel	7.1			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.75	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	63.4			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: FINE

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

RL/QBD
1/16/00

1
INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWST132R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909052

Matrix (soil/water): SEDIMENT Lab Sample ID: 909052-1

% Solids: 52.0 Date Received: 09/22/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic				NR	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.61		*	CV	E
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: FINE

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

RL/QBD
12/24/99

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWST135R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909052

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909052-8

% Solids: 45.0

Date Received: 09/22/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic				NR	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.68		*	CV	E
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: FINE

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

_____

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FORM I - IN

ed/QBD
12/24/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	MultiChem Analytical Services	**Service Request:**	K9906740
Project:	Middle Waterway/909052	**Date Collected:**	9/22/99
Sample Matrix:	Sediment	**Date Received:**	9/28/99

Sulfide, Total

Prep Method:	NONE	Units:	mg/Kg (ppm)
Analysis Method:	PSEP	Basis:	Dry
Test Notes:			

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
MWAT153RI	K9906740-001	0.8	0.8	1	NA	9/29/99	95.7	E
MWAT047RI	K9906740-002	0.8	0.8	1	NA	9/29/99	3.8	E
MWAT044RI	K9906740-003	0.8	0.8	1	NA	9/29/99	841	E
Method Blank	K9906740-MB	0.8	0.8	1	NA	9/29/99	ND	

Approved By: _____ Date: 10/12/99

Le 10BD
12/25/99

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

02

EPA SAMPLE NO.

MWAT044R1

Lab Name: MULTICHEM Contract: _____

Lab Code: MAS-RENTON Case No.: _____ SAS No.: _____ SDG No.: 909052

Matrix (soil/water): SEDIMENT Lab Sample ID: 909052-5

Level (low/med): LOW Date Received: _____

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
	Carbon	32800		*	TC	E
	Ammonia	5.6			IS	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

12/1/99
12/25/99

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MWAT047R1

Lab Name: MULTICHEM Contract: _____

Lab Code: MAS-RENTON Case No.: _____ SAS No.: _____ SDG No.: 909052

Matrix (soil/water): SEDIMENT Lab Sample ID: 909052-4

Level (low/med): LOW Date Received: _____

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
	Carbon	29900		*	TC	E
	Ammonia	5.8			IS	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

ll/QBD
12/25/99

U.S. EPA - CLP

04

1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MWAT153R1

Lab Name: MULTICHEM_____ Contract:_____

Lab Code: MAS-RENTON Case No.:_____ SAS No.: _____ SDG No.: 909052

Matrix (soil/water): SEDIMENT Lab Sample ID: 909052-2___

Level (low/med): LOW___ Date Received: _____

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
	Carbon	16800		*	TC E
	Ammonia	5.7			IS

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

_____

_____

_____

_____

LL/QBD
12/25/99

U.S. EPA - CLP

05

1

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MWCT135R2

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909052

Matrix (soil/water): SEDIMENT Lab Sample ID: 909052-7

Level (low/med): LOW Date Received:

% Solids:

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
	Carbon	80100		*	TC E
	Ammonia				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

QA/QBD
12/25/99

U.S. EPA - CLP

06

1

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MWSB123R1

Lab Name: MULTICHEM_____ Contract: _____

Lab Code: MAS-RENTON Case No.:_____ SAS No.: _____ SDG No.: 909052

Matrix (soil/water): SEDIMENT Lab Sample ID: 909053-12_

Level (low/med): LOW___ Date Received: _____

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
	Carbon	4140		*	TC
	Ammonia				NR

E

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

_____

_____

_____

_____

QL/QBD
12/24/99

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MWST132R1

Lab Name: MULTICHEM Contract: _____

Lab Code: MAS-RENTON Case No.: _____ SAS No.: _____ SDG No.: 909052

Matrix (soil/water): SEDIMENT Lab Sample ID: 909052-1

Level (low/med): LOW Date Received: _____

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
	Carbon	54800		*	TC	E
	Ammonia				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

RL/QBD
12/25/99

U.S. EPA - CLP

08

1

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MWST135R1

Lab Name: MULTICHEM_____ Contract:_____

Lab Code: MAS-RENTON Case No.:_____ SAS No.: _____ SDG No.: 909052

Matrix (soil/water): SEDIMENT Lab Sample ID: 909052-8___

Level (low/med): LOW___ Date Received: _____

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
	Carbon	67800		*	TC	E
	Ammonia				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

RL/QBD
12/25/99

U.S. EPA - CLP

09

1

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MWST139R1

Lab Name: MULTICHEM Contract: _____

Lab Code: MAS-RENTON Case No.: _____ SAS No.: _____ SDG No.: 909052

Matrix (soil/water): SEDIMENT Lab Sample ID: 909052-6__

Level (low/med): LOW___ Date Received: _____

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
	Carbon	24500		*	TC
	Ammonia				NR

E

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

_____

_____

_____

_____

12/10BD
12/25/99

Quality By Design

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EPA Level 2
DATA VALIDATION REPORT

Project Name: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 22 - 27, 1999
SDG: 909053

Prepared for

Foster Wheeler Environmental
10900 NE 8th St.
Bellevue, WA 98004

Purchase Order No. 022828
QBD Job No. 270L

Reviewed and approved,

Lorraine Davis 1/19/00

Lorraine L. Davis. Owner — Date

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Attachment 1 Data Flag Definitions
Attachment 2 Summary Table of Data Qualifier Flags
Attachment 3 Revised Laboratory Forms

A. Introduction

Laboratory Sciences, Inc., d.b.a. *Quality by Design* (QBD), has completed an EPA Level 2 Data Validation on the submitted data packages in accordance with P.O. Number 022828.

The reporting format and criteria for recommending data qualifying flags for this data set are described in the EPA *"Functional Guidelines for Evaluating Organics Analyses"* and *"Functional Guidelines for Evaluating Inorganics Analyses,"* as revised, 1994; and *"Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound"* ("PSEP Protocols"), May, 1997, or using criteria listed in the method referenced. Data may be qualified for any of the following reasons:

1. By the laboratory prior to receipt by the reviewer
2. Because of laboratory deviation from the designated method
3. Because the data may not meet the criteria listed in the reference above
4. By the professional judgment of the reviewer.

The data set consists of several data packages from Multichem Analytical Services in Renton, Washington, and contains data for the samples shown in Table 1. The data reviewers and senior reviewers are shown in Table 2.

Each data set includes an analytical data package for each sample, copies of the completed chain-of-custody (COC) forms, and a quality control (QC) data package. The analytical data package includes analytical results, blank sample results, both laboratory and client sample identifications, appropriate dates but not times, method reporting limits, method references, surrogate recoveries as appropriate, the laboratory's name and address, and the initials of the person releasing the data. The custody forms include the receipt of the sample but not the laboratory's internal tracking. The QC data package includes a tabular list of the laboratory's sample identification, spiking concentrations, recoveries, percentage calculations, and acceptance windows.

Raw data were provided which includes chromatograms, instrument print outs, injection logs, digestion/preparation logs.

This data validation report consists of several sections, each of which are formatted to follow Functional Guidelines, but which also include subsections discussing QBD contacts with the laboratory, other comments, and a summary table of data qualifiers.

Table 1. Sample Identification and Analysis

Sample Identification	Laboratory Identification	Methods 8081/8082	Method 8270	Method 6010/7000	Method 9060	Grain Size	Conventional
MWCS135R2	909053-1	X	X	X			
MWCT141R2B	909053-2	X	X	X			
MWCT144R3A	909053-3	X	X	X			
MWCT139R2A	909053-4	X	X	X			
MWSB121R1	909053-5			X			
MWSB119R1	909053-6			X			
MWSB120R1	909053-7			X			
MWSB118R1	909053-8			X			
MWCT142R2A	909053-9	X	X	X	X	X	
MWCT138R2A	909053-10	X	X	X	X	X	
MWCT122R1	909053-11			X	X	X	
MWSB123R1	909053-12			X	X	X	
MWSB124R1	909053-13			X	X	X	
MWSB125R1	909053-14			X	X	X	
MWSB160R1	909053-15			X	X	X	
MWSS128R1	909053-16		X	X	X	X	

Key:
Method 8270 = Semivolatile organic compounds by gas chromatography/mass spectroscopy
Method 8081/8082 = Pesticides and polychlorinated biphenyls (PCB) by gas chromatography
Method 6010 & 7000 = Metals by inductively coupled plasma (ICP) and cold vapor atomic absorption (CVAA)
Method 9060 = Total organic carbon (TOC)
Conventionals = Sulfide, ammonia, and percent moisture

Table 2. Data Package, Reviewer, and Senior Reviewer

Analysis	Number of Pages	Reviewer	Senior Reviewer
Pest/PCB	360	Randi Schneider	Lorraine L. Davis
SVOC	321	Debbie Copsey Randi Schneider	Thomas S. Davis
Metals	388	Lorraine L. Davis	Thomas S. Davis
Conventionals	52	Lorraine L. Davis	Thomas S. Davis

B. Chain-of-Custody

The analytical data package was reviewed and compared against the chain-of-custody (COC) form. No data are missing from the COC forms and no transcription errors in accuracy were found. All tests requested on the COC were performed.

Discussion: The grain size analysis was subcontracted to Rosa Environmental and Geotechnical Laboratory in Seattle, Washington.

These samples were collected and archived on September 27, 1999 as SDG 909053. A change order was made on October 19, 1999 authorizing the analyses.

C. Review of GC/MS Semivolatiles Analyses

EPA Method 8270

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The analyses were added to the work order after the samples had been logged into the laboratory system, and the extraction for this analyses occurred after the 14-day holding time. As stated in the case narrative, the samples were frozen upon receipt, then thawed, and extracted. PSDDA recognizes a holding time of one year for sediments which have been frozen. When the samples are thawed, Method 8270 recognizes a 14-day holding time to extraction. Since the request for analysis occurred during the analytical process for the SDG and since the samples were frozen until extraction, no data qualifier flags are recommended.

2. GC/MS Tuning

All decafluorotriphenylphosphine (DFTPP) tune criteria were met for the initial and continuing calibration for all dates of sample analysis.

3. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No target compound list (TCL) analytes had percent relative standard deviations (%RSD) greater than allowed by the method for the initial calibration or percent difference for the continuing calibration checks. All system performance check compound (SPCC) and calibration check compound (CCC) criteria were met, except as noted below.

Table 3. SVOC Data Qualifiers Due to Calibration Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT141R2B	di-n-Butylphthalate	Continuing Calibration % D >20	70 UG
MWCT141R2B	Butylbenzylphthalate	Continuing Calibration % D >20	70 UG

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT141R2B	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	130 E
MWCT141R2B	di-n-Octylphthalate	Continuing Calibration % D >20	70 UG
MWCT135R2	di-n-Butylphthalate	Continuing Calibration % D >20	56 UG
MWCT135R2	Butylbenzylphthalate	Continuing Calibration % D >20	56 UG
MWCT135R2	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	140 G
MWCT135R2	di-n-Octylphthalate	Continuing Calibration % D >20	56 UG
MWCT139R2A	di-n-Butylphthalate	Continuing Calibration % D >20	63 UG
MWCT139R2A	Butylbenzylphthalate	Continuing Calibration % D >20	63 UG
MWCT139R2A	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	300 G
MWCT139R2A	di-n-Octylphthalate	Continuing Calibration % D >20	63 UG
MWCT138R2A	di-n-Butylphthalate	Continuing Calibration % D >20	61 UG
MWCT138R2A	Butylbenzylphthalate	Continuing Calibration % D >20	61 UG
MWCT138R2A	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	260 G
MWCT138R2A	di-n-Octylphthalate	Continuing Calibration % D >20	61 UG
MWCT142R2A	Acenaphthylene	Continuing Calibration % D >20	98 G
MWCT142R2A	di-n-Butylphthalate	Continuing Calibration % D >20	56 UG
MWCT142R2A	Butylbenzylphthalate	Continuing Calibration % D >20	56 UG
MWCT142R2A	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	74 G
MWCT142R2A	di-n-Octylphthalate	Continuing Calibration % D >20	56 UG
MWCT144R3A	Acenaphthylene	Continuing Calibration % D >20	75 UG
MWCT144R3A	di-n-Butylphthalate	Continuing Calibration % D >20	56 UG
MWCT144R3A	Butylbenzylphthalate	Continuing Calibration % D >20	56 UG
MWCT144R3A	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	56 UG

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT144R3A	di-n-Octylphthalate	Continuing Calibration % D >20	56 UG
MWSS128R1	Pyrene	Continuing Calibration % D >20	3700 L
MWSS128R1	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	690 G
MWSS128R1	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	200 G
MWSS128R1	Benzo(g,h,i)perylene	Continuing Calibration % D >20	830 G

Discussion: The continuing calibration for several target compounds had percent differences out of the criteria of <20 percent. The associated results in Samples MWCT141R2B, MWCT135R2, MWCT139R2A, MWCT138R2A, MWCT142R2A, MWCT144R3A, and MWSS128R1 have been flagged appropriately. If the results indicated a high bias, the results were flagged with "L" or "UL" to indicate that the value is less than the maximum shown and if the results indicated a low bias, the results were flagged with "G" and "UG" to indicate the reporting limit is greater than the minimum shown.

4. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

5. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria, except as noted below.

Table 4. SVOC Data Qualifiers Due to Surrogate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT141R2B	Phenol	Surrogate	140 E
MWCT141R2B	Benzyl alcohol	Surrogate	47 UE
MWCT141R2B	2-Methylphenol	Surrogate	23 UE
MWCT141R2B	4-Methylphenol	Surrogate	440 E
MWCT141R2B	2,4-Methylphenol	Surrogate	45 E
MWCT141R2B	Benzoic acid	Surrogate	280 E
MWCT141R2B	Pentachlorophenol	Surrogate	23 UE
MWCT139R2A	Phenol	Surrogate	190 E
MWCT139R2A	Benzyl alcohol	Surrogate	42 UE

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT139R2A	2-Methylphenol	Surrogate	21 UE
MWCT139R2A	4-Methylphenol	Surrogate	420 E
MWCT139R2A	2,4-Methylphenol	Surrogate	32 E
MWCT139R2A	Benzoic acid	Surrogate	250 UE
MWCT139R2A	Pentachlorophenol	Surrogate	55 E

Discussion: In Samples MWCT144R3A, MWCT142R2A, MWCT135R2, and MWCT138R2A, a single surrogate was out of criteria. No data qualifier flags are recommended because all other surrogates were in criteria.

In Samples MWCT141R2B and MWCT139R2A, two surrogates were out of criteria. The associated results have been flagged with "E" and "UE" to indicate an estimated value. "G" and "L" flags could not be applied because the exceedances were a mixture of high and low values.

6. Laboratory Control Standards

The laboratory analyzed a second source sample with the analytical batch. The laboratory referred to this sample as a blank spike/blank spike duplicate (BS/BSD) rather than a laboratory control standard (LCS). Any anomalies or comments regarding the second source results are addressed in the next section.

7. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

Matrix spike (MS) and matrix spike duplicates (MSD) were analyzed as required by the referenced method and all percent recoveries and relative percent differences (RPD) were within QAPP criteria, except as noted below.

Discussion: Pentachlorophenol was out of criteria for precision for the MS/MSD pair. Since all other QC checks, including percent recoveries, were acceptable, no data qualifier flags are recommended.

A single blank spike for three phthalates was out of criteria but all other accuracy measurements (e.g., the BSD, MS, surrogates and calibration verifications) are acceptable and no data qualifying flags are recommended.

MS and MSD recoveries were out of criteria due to high concentrations of analytes in the original sample. Since all other QC checks were in criteria, no data qualifier flags are recommended.

8. Internal Standards Performance for Samples

All internal standard areas were within the required control limits, except as noted below.

Discussion: The internal standard perylene-d_{12} was out of the acceptance criteria of –50 to +100 percent for the MSD. Since this was a QC sample, no data qualifier flags are recommended.

The internal standard chrysene was out of acceptance criteria in Sample MWCT138R2A. The sample was reanalyzed and the compounds associated with this internal standard were reported from the reanalysis where the internal standard was within acceptance criteria. The reviewer concurs that reporting the diluted values was appropriate and no data qualifier flags are recommended.

The internal standard perylene-d_{12} was out of the acceptance criteria of –50 to +100 percent for Sample MWSS128R1. The sample was reanalyzed and the compounds associated with this internal standard were reported from the reanalysis where the internal standard was within acceptance criteria. The reviewer concurs that reporting the diluted values was appropriate and no data qualifier flags are recommended.

9. Field Duplicates

No field duplicates were identified with this group of samples.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract, except as noted below.

Discussion: The laboratory failed to obtain the reporting limits of 66 µg/kg listed in the QAPP for dibenzo(a,h)anthracene. Undiluted samples with no matrix interference were reported at 75 µg/kg and were not adjusted for the percent moisture. No follow-up is recommended because this reporting limit is significantly below the "Low Soil/Solid" EQL of 660 µg/kg listed in Table 2 of the QAPP.

11. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

12. TCL Compound Identification

All target compound identifications met the criteria for retention times and peak identification of the referenced method.

13. Tentatively Identified Compounds

No TICs were reported with this data set.

14. *Laboratory Contact*

There was no verbal or written communication with the laboratory.

15. Other Comments

None.

16. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

D. Review of Pesticides/PCBs Analyses

EPA Method 8081/8082

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The analysis of the target compounds hexachlorobenzene and hexachlorobutadiene was performed using Method 8081 instead of the requested Method 8270. No data qualifier flags are recommended since the method utilized is an approved method by PSEP.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No TCL analytes had percent %RSD greater than that allowed for the initial calibration or percent difference for the continuing calibration checks, except as noted below.

Table 5. Pesticide/PCB Data Qualifiers Due to Calibration Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT135R2	4,4'-DDT	Continuing Calibration %D >15	1.5 UG

Discussion: The continuing calibration for the target compound 4,4'-DDT had percent difference of 34.7, which is out of the criteria of 15 percent. The associated results in Sample MWCT135R2 has been flagged with "UG" to indicate the value is greater than the minimum shown.

The continuing calibration for the target compound for hexachlorobutadiene (HCBD) and 4,4'-DDD was out of criteria. Since the analyte recoveries exceeded the acceptance criteria, indicating a high bias, and since the associated samples were non-detect, no data qualifier flags are recommended.

The continuing calibration for the target compound Aroclor 1016 was out of criteria. The continuing calibration verification for the second column was acceptable, and no data qualifier flags are recommended.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria.

6. Field Duplicates

No field duplicates were identified with this group of samples.

7. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

8. TCL Compound Identification

No target compounds were detected.

9. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards or external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

10. Laboratory Contact

There was no verbal or written communication with the laboratory.

11. Other Comments

None.

12. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

E. Review of Metals Analyses

EPA Method 6010/7000

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. Initial and Continuing Calibration

All initial and continuing calibration Quality Control criteria were met. No TCL analytes had correlation coefficients greater than allowed by the method, and all percent differences for the continuing calibration verifications were acceptable.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. ICP Interference Check Standard

An interference check sample (ICS) was analyzed at a frequency required by the referenced method and was within established criteria.

5. Laboratory Control Standards

A second source laboratory control standard (LCS) was analyzed at a frequency required by the referenced method and all percent recoveries were within QAPP criteria.

Discussion: Antimony, cadmium, lead, nickel, and zinc were out of the method criteria of 90 to 110 percent recovery for the LCS. However, PSDDA allows 80 to 120 percent recovery of a second source check sample. All analytes were within PSDDA acceptance criteria. Therefore, no data qualifier flags are recommended.

6. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MSs were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria, except as noted below.

Table 6. Metals Data Qualifiers Due to Matrix Spike Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT142R2A	Antimony	MS	4.0 UG
MWSB118R1	Antimony	MS	137 G
MWSB119R1	Antimony	MS	18.8 G
MWSB120R1	Antimony	MS	30.9 G
MWSB121R1	Antimony	MS	40.4 G
MWSB122R1	Antimony	MS	30.2 G
MWSB123R1	Antimony	MS	50.0 G
MWSB124R1	Antimony	MS	65.2 G
MWSB125R1	Antimony	MS	19.0 G
MWSB160R1	Antimony	MS	12.5 G
MWSS128R1	Antimony	MS	4.2 UG
MWCT144R3A	Antimony	MS	19.5 UE

Discussion: The post digestion spike recovery for lead was out of the criteria of 75 to 125 percent at 130 percent. Since the MS was in criteria, no data qualifier flags are recommended.

Arsenic was out of the criteria of 75 to 125 percent at 72.9 for the matrix spike. Since the sample spiked was not in this SDG and the BS was acceptable, no data qualifier flags are recommended.

Two matrix spikes were performed for antimony and were associated with different samples. The first was low and out of criteria for accuracy (percent recovery) for the MS/MSD pair at 51.8 %. Normally, because the LCS was acceptable, only the results for this analyte in the sample that was spiked would be flagged. However, because all of the matrix spikes in all of the SDGs for this project have been out of criteria, all samples which were analyzed for antimony have been flagged "G" or "UG" to indicate that the value was greater than the minimum shown.

The second matrix spike for antimony was low and out of criteria for accuracy (percent recovery) for the MS at 19.5 %. Normally, the associated samples would be flagged "R" because the percent recovery was less than 30%, but because the LCS was acceptable, the only sample that would be associated with this MS is the sample that had been spiked. However, all of the matrix spikes in all of the SDGs for this project have been out of criteria, some of which have been above 30% and some of which have been less than 30%. In a telephone conversation with Foster Wheeler, it was noted that some of the analyte was recovered from the spike (i.e, the percent recovery was not zero) and that a low percent recovery may imply a higher detection limit. In keeping with the recommendations in *Functional Guidelines*, it was agreed that samples with positive results would be flagged "G" to indicate that the value was greater than the minimum shown. It was also agreed

that the detection limit for non-detect samples would be increased proportional to the spike recovery and flagged "UE", to indicate that the detection limit is estimated.

7. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWSB124R1 and MWSB124S1 were identified as field duplicates. Test results were reviewed, and where positive results were found, the relative percent difference (RPD) was calculated. Since MWSB124S1 is from SDG 909059, the results are discussed in that report.

8. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPD were within QAPP criteria, except as noted below.

Table 7. Metals Data Qualifiers Due to Duplicate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT142R2A	Arsenic	Precision	4.8 E
MWCT144R3A	Arsenic	Precision	3.4 E
MWSB118R1	Arsenic	Precision	330 E
MWSB119R1	Arsenic	Precision	54.3 E
MWSB120R1	Arsenic	Precision	142 E
MWSB121R1	Arsenic	Precision	137 E
MWSB122R1	Arsenic	Precision	198 E
MWSB123R1	Arsenic	Precision	163 E
MWSB124R1	Arsenic	Precision	148 E
MWSB125R1	Arsenic	Precision	40.6E
MWSB160R1	Arsenic	Precision	85.8 E
MWSS128R1	Arsenic	Precision	8.9 E

Discussion: Arsenic was out of the criteria of less than 20 percent at 25.5, respectively, in the sample duplicate set. The associated positive results for Samples MWCT142R2A, MWCT144R3A, MWSB118R1, MWSB120R1, MWSB121R1, MWSB122R1, MWSB123R1, MWSB124R1, MWSB125R1, MWSB150R1, and MWSS128R1 have been flagged "E" to indicate an estimated value.

9. ICP Serial Dilution

Samples that were a factor of 50 above the instrument detection limit (IDL) for the analyte were diluted five-fold and were within criteria required by the referenced method, except as noted below.

Table 8. Metal Data Qualifiers Due to ICP Serial Dilution Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT144R3A	Lead	Serial Dilution	3.6 E
MWCT142R2A	Nickel	Serial Dilution	11.1 E
MWSB118R1	Nickel	Serial Dilution	30.2 E
MWSB119R1	Nickel	Serial Dilution	25.9 E
MWSB120R1	Nickel	Serial Dilution	18.9 E
MWSB121R1	Nickel	Serial Dilution	17.5 E
MWSB122R1	Nickel	Serial Dilution	17.2 E
MWSB123R1	Nickel	Serial Dilution	22.0 E
MWSB124R1	Nickel	Serial Dilution	84.0 E
MWSB125R1	Nickel	Serial Dilution	22.0 E
MWSB160R1	Nickel	Serial Dilution	16.8 E
MWSS128R1	Nickel	Serial Dilution	7.8 E

Discussion: The samples were analyzed in two batches. The serial dilution for the first batch was out of criteria of ±10 for nickel at 24 percent and the second batch was out of criteria for lead at 23.2 percent. The positive results for nickel and lead in each respective batch have been flagged "E" to indicate an estimated value.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract, except as noted below.

Discussion: The reporting limit for lead failed to meet the requirement of 0.5 mg/kg that was listed in the QAPP. However, most field samples had positive results. For samples that were non-detect, the laboratory's reporting limit of 1.5 mg/kg was less than the Sediment Quality Standard Criteria of 450 mg/kg and the Sediment Impact Zone and Clean-up Criteria of 530 mg/kg, and no data qualifier flags are recommended.

11. Graphite Furnace Atomic Absorption Analysis

All special criteria for graphite furnace atomic absorption (GFAA) analysis were performed at a frequency required by the referenced method and was within established criteria.

12. Laboratory Contact

There was no verbal or written communication with the laboratory.

13. Other Comments

None.

14. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

F. Review of Conventional Analyses

EPA Method 9060

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met, including the number of standards used and the correlation coefficients. All continuing calibration criteria, including frequency of analysis and percent recovery were met.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within laboratory or method criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MSs were analyzed as required by the referenced method and all percent recoveries and RPD were within laboratory or method criteria.

6. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPD were within laboratory or method criteria, except as noted below.

Table 9. Inorganic Data Qualifiers Due to Duplicate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT138R2A	Total Organic Carbon	Precision	17300 E

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSB122R1	Total Organic Carbon	Precision	17400 E
MWSB123R1	Total Organic Carbon	Precision	4140 E
MWSB124R1	Total Organic Carbon	Precision	22000 E
MWSB125R1	Total Organic Carbon	Precision	20300 E
MWSB160R1	Total Organic Carbon	Precision	20800 E
MWSS128R1	Total Organic Carbon	Precision	29800 E

Discussion: Total organic carbon was out of criteria in the sample duplicate set. The associated results for Samples MWCT138R2A, MWSB122R1, MWSB123R1, MWSB124R1, MWSB125R1, MWSB150R1, and MWSB128R1 have been flagged "E" to indicate an estimated value.

7. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWSB124R1 and MWSB124S1 were identified as field duplicates. Test results were reviewed, and where positive results were found, the relative percent difference (RPD) was calculated. All analytes, except those listed in the table below, were reported as non-detect.

Table 10. Inorganic Field Duplicates and RPD

Compound	MWSB124R1 Result	MWSB124S1 Result	RPD
Total Organic Carbon	22000	24100	9.1

8. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

9. Laboratory Contact

There was no verbal or written communication with the laboratory.

10. Other Comments

None.

11. Data Use and Overall Assessment

The data are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

Attachment 1 Puget Sound Estuary Program Data Qualifier Definitions

Used for both organics and inorganic analyses

B = Analyte detected in samples and in method blank

C = Combined with unresolved substances

E = Estimated

G = Value greater than minimum shown

K = Detected at less than the maximum shown

L = Value less than the maximum shown

M = Value is a mean

Q = Questionable value

R = Rejected or unusable value

T = Detected below the quantification limit shown

U = Undetected at the detection limit shown

Z = Blank corrected

Attachment 2 Summary Table of Data Qualifier Flags

Foster Wheeler Environmental
Project: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 22-27, 1999

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCT141R2B	di-n-Butylphthalate	Continuing Calibration % D >20	70 UG
MWCT141R2B	Butylbenzylphthalate	Continuing Calibration % D >20	70 UG
MWCT141R2B	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	130 E
MWCT141R2B	di-n-Octylphthalate	Continuing Calibration % D >20	70 UG
MWCT135R2	di-n-Butylphthalate	Continuing Calibration % D >20	56 UG
MWCT135R2	Butylbenzylphthalate	Continuing Calibration % D >20	56 UG
MWCT135R2	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	140 G
MWCT135R2	di-n-Octylphthalate	Continuing Calibration % D >20	56 UG
MWCT139R2A	di-n-Butylphthalate	Continuing Calibration % D >20	63 UG
MWCT139R2A	Butylbenzylphthalate	Continuing Calibration % D >20	63 UG
MWCT139R2A	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	300 G
MWCT139R2A	di-n-Octylphthalate	Continuing Calibration % D >20	63 UG
MWCT138R2A	di-n-Butylphthalate	Continuing Calibration % D >20	61 UG
MWCT138R2A	Butylbenzylphthalate	Continuing Calibration % D >20	61 UG
MWCT138R2A	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	260 G
MWCT138R2A	di-n-Octylphthalate	Continuing Calibration % D >20	61 UG
MWCT142R2A	Acenaphthylene	Continuing Calibration % D >20	98 G
MWCT142R2A	di-n-Butylphthalate	Continuing Calibration % D >20	56 UG
MWCT142R2A	Butylbenzylphthalate	Continuing Calibration % D >20	56 UG
MWCT142R2A	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	74 G
MWCT142R2A	di-n-Octylphthalate	Continuing Calibration % D >20	56 UG
MWCT144R3A	Acenaphthylene	Continuing Calibration % D >20	75 UG
MWCT144R3A	di-n-Butylphthalate	Continuing Calibration % D >20	56 UG
MWCT144R3A	Butylbenzylphthalate	Continuing Calibration % D >20	56 UG
MWCT144R3A	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	56 UG
MWCT144R3A	di-n-Octylphthalate	Continuing Calibration % D >20	56 UG
MWSS128R1	Pyrene	Continuing Calibration % D >20	3700 L
MWSS128R1	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	690 G
MWSS128R1	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	200 G
MWSS128R1	Benzo(g,h,i)perylene	Continuing Calibration % D >20	830 G

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCT141R2B	Phenol	Surrogate	140 E
MWCT141R2B	Benzyl alcohol	Surrogate	47 UE
MWCT141R2B	2-Methylphenol	Surrogate	23 UE
MWCT141R2B	4-Methylphenol	Surrogate	440 E
MWCT141R2B	2,4-Methylphenol	Surrogate	45 E
MWCT141R2B	Benzoic acid	Surrogate	280 E
MWCT141R2B	Pentachlorophenol	Surrogate	23 UE
MWCT139R2A	Phenol	Surrogate	190 E
MWCT139R2A	Benzyl alcohol	Surrogate	42 UE
MWCT139R2A	2-Methylphenol	Surrogate	21 UE
MWCT139R2A	4-Methylphenol	Surrogate	420 E
MWCT139R2A	2,4-Methylphenol	Surrogate	32 E
MWCT139R2A	Benzoic acid	Surrogate	250 UE
MWCT139R2A	Pentachlorophenol	Surrogate	55 E
MWCT135R2	4,4'-DDT	Continuing Calibration %D >15	1.5 UG
MWCT142R2A	Antimony	MS	4.0 UG
MWSB118R1	Antimony	MS	137 G
MWSB119R1	Antimony	MS	18.8 G
MWSB120R1	Antimony	MS	30.9 G
MWSB121R1	Antimony	MS	40.4 G
MWSB122R1	Antimony	MS	30.2 G
MWSB123R1	Antimony	MS	50.0 G
MWSB124R1	Antimony	MS	65.2 G
MWSB125R1	Antimony	MS	19.0 G
MWSB160R1	Antimony	MS	12.5 G
MWSS128R1	Antimony	MS	4.2 UG
MWCT144R3A	Antimony	MS	19.5 UE
MWCT142R2A	Arsenic	Precision	4.8 E
MWCT144R3A	Arsenic	Precision	3.4 E
MWSB118R1	Arsenic	Precision	330 E
MWSB119R1	Arsenic	Precision	54.3 E
MWSB120R1	Arsenic	Precision	142 E
MWSB121R1	Arsenic	Precision	137 E
MWSB122R1	Arsenic	Precision	198 E
MWSB123R1	Arsenic	Precision	163 E
MWSB124R1	Arsenic	Precision	148 E
MWSB125R1	Arsenic	Precision	40.6E
MWSB160R1	Arsenic	Precision	85.8 E
MWSS128R1	Arsenic	Precision	8.9 E

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCT144R3A	Lead	Serial Dilution	3.6 E
MWCT142R2A	Nickel	Serial Dilution	11.1 E
MWSB118R1	Nickel	Serial Dilution	30.2 E
MWSB119R1	Nickel	Serial Dilution	25.9 E
MWSB120R1	Nickel	Serial Dilution	18.9 E
MWSB121R1	Nickel	Serial Dilution	17.5 E
MWSB122R1	Nickel	Serial Dilution	17.2 E
MWSB123R1	Nickel	Serial Dilution	22.0 E
MWSB124R1	Nickel	Serial Dilution	84.0 E
MWSB125R1	Nickel	Serial Dilution	22.0 E
MWSB160R1	Nickel	Serial Dilution	16.8 E
MWSS128R1	Nickel	Serial Dilution	7.8 E
MWCT138R2A	Total Organic Carbon	Precision	17300 E
MWSB122R1	Total Organic Carbon	Precision	17400 E
MWSB123R1	Total Organic Carbon	Precision	4140 E
MWSB124R1	Total Organic Carbon	Precision	22000 E
MWSB125R1	Total Organic Carbon	Precision	20300 E
MWSB160R1	Total Organic Carbon	Precision	20800 E
MWSS128R1	Total Organic Carbon	Precision	29800 E

Attachment 3 Revised Laboratory Forms

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWCT141R2B

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909053

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909053-2

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1198

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 43 decanted: (Y/N) Y Date Extracted: 09/28/99 OK

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/05/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	23	U	
106-46-7	1,4-Dichlorobenzene	23	U	
95-50-1	1,2-Dichlorobenzene	23	U	
120-82-1	1,2,4-Trichlorobenzene	23	U	
91-20-3	Naphthalene	1800		
91-57-6	2-Methylnaphthalene	560		
131-11-3	Dimethylphthalate	70	U	
208-96-8	Acenaphthylene	1000		
83-32-9	Acenaphthene	500		
132-64-9	Dibenzofuran	380		
84-66-2	Diethylphthalate	70	U	
86-73-7	Fluorene	540		
86-30-6	N-Nitrosodiphenylamine (1)	23	U	
85-01-8	Phenanthrene	1800		
120-12-7	Anthracene	870		
84-74-2	Di-n-butylphthalate	70	U	G
206-44-0	Fluoranthene	3900	D3	
129-00-0	Pyrene	4000	D3	
85-68-7	Butylbenzylphthalate	70	U	G
56-55-3	Benzo(a)anthracene	1300		
218-01-9	Chrysene	1300		
117-81-7	bis(2-Ethylhexyl)phthalate	130		G
117-84-0	Di-n-octylphthalate	70	U	G
205-99-2	Benzo(b)fluoranthene	1300		
207-08-9	Benzo(k)fluoranthene	810		
50-32-8	Benzo(a)pyrene	1200		
193-39-5	Indeno(1,2,3-cd)pyrene	370		
53-70-3	Dibenzo(a,h)anthracene	110		
191-24-2	Benzo(g,h,i)perylene	520		

(1) - Cannot be separated from Diphenylamine

D3 - Result reported from a 5 fold dilution (P1214.D)

PL 10/29/99
QA/QBD PLS 10/31/99
1/15/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWCT135R2

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909053

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909053-1

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1197

Level: (low/med) LOW Date Collected: 09/22/99

% Moisture: 28 decanted: (Y/N) Y Date Extracted:09/28/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/05/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	18	U	
106-46-7	1,4-Dichlorobenzene	18	U	
95-50-1	1,2-Dichlorobenzene	18	U	
120-82-1	1,2,4-Trichlorobenzene	18	U	
91-20-3	Naphthalene	2400	D3	
91-57-6	2-Methylnaphthalene	490		
131-11-3	Dimethylphthalate	56	U	
208-96-8	Acenaphthylene	800		
83-32-9	Acenaphthene	350		
132-64-9	Dibenzofuran	270		
84-66-2	Diethylphthalate	56	U	
86-73-7	Fluorene	440		
86-30-6	N-Nitrosodiphenylamine (1)	18	U	
85-01-8	Phenanthrene	1400		
120-12-7	Anthracene	810		
84-74-2	Di-n-butylphthalate	56	U	G
206-44-0	Fluoranthene	3300	D3	
129-00-0	Pyrene	3400	D3	
85-68-7	Butylbenzylphthalate	56	U	G
56-55-3	Benzo(a)anthracene	1200		
218-01-9	Chrysene	1200		
117-81-7	bis(2-Ethylhexyl)phthalate	140		G
117-84-0	Di-n-octylphthalate	56	U	G
205-99-2	Benzo(b)fluoranthene	1200		
207-08-9	Benzo(k)fluoranthene	710		
50-32-8	Benzo(a)pyrene	1100		
193-39-5	Indeno(1,2,3-cd)pyrene	480		
53-70-3	Dibenzo(a,h)anthracene	140		
191-24-2	Benzo(g,h,i)perylene	590		

(1) - Cannot be separated from Diphenylamine

D3 - Result reported from a 5 fold dilution (P1213.D)

PL 11/2/99

RL/QBD
1/15/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 6100

MWCT139R2A

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909053

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909053-4

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1200

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 37 decanted: (Y/N) Y Date Extracted: 09/28/99 OK

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/05/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	21	U	
106-46-7	1,4-Dichlorobenzene	21	U	
95-50-1	1,2-Dichlorobenzene	21	U	
120-82-1	1,2,4-Trichlorobenzene	21	U	
91-20-3	Naphthalene	1400		
91-57-6	2-Methylnaphthalene	470		
131-11-3	Dimethylphthalate	63	U	
208-96-8	Acenaphthylene	900		
83-32-9	Acenaphthene	350		
132-64-9	Dibenzofuran	270		
84-66-2	Diethylphthalate	63	U	
86-73-7	Fluorene	360		
86-30-6	N-Nitrosodiphenylamine (1)	21	U	
85-01-8	Phenanthrene	1300		
120-12-7	Anthracene	800		
84-74-2	Di-n-butylphthalate	63	U	G
206-44-0	Fluoranthene	3300	D3	
129-00-0	Pyrene	3300	D3	
85-68-7	Butylbenzylphthalate	63	U	G
56-55-3	Benzo(a)anthracene	1400		
218-01-9	Chrysene	1400		
117-81-7	bis(2-Ethylhexyl)phthalate	300		G
117-84-0	Di-n-octylphthalate	63	U	G
205-99-2	Benzo(b)fluoranthene	1600		
207-08-9	Benzo(k)fluoranthene	890		
50-32-8	Benzo(a)pyrene	1400		
193-39-5	Indeno(1,2,3-cd)pyrene	530		
53-70-3	Dibenzo(a,h)anthracene	160		
191-24-2	Benzo(g,h,i)perylene	640		

(1) - Cannot be separated from Diphenylamine

D3 - Result reported from a 5 fold dilution (P1215.D)

QA/QBD
1/15/00
PL 10/28/99
PLS 10/31/99

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCT138R2A

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909053

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909053-10

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1204

Level: (low/med) LOW Date Collected: 09/24/99

% Moisture: 34 decanted: (Y/N) Y Date Extracted: 09/28/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/05/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	20	U	
106-46-7	1,4-Dichlorobenzene	20	U	
95-50-1	1,2-Dichlorobenzene	20	U	
120-82-1	1,2,4-Trichlorobenzene	20	U	
91-20-3	Naphthalene	260		
91-57-6	2-Methylnaphthalene	88		
131-11-3	Dimethylphthalate	61	U	
208-96-8	Acenaphthylene	260		
83-32-9	Acenaphthene	80	U	
132-64-9	Dibenzofuran	200	U	
84-66-2	Diethylphthalate	61	U	
86-73-7	Fluorene	80	U	
86-30-6	N-Nitrosodiphenylamine (1)	20	U	
85-01-8	Phenanthrene	320		
120-12-7	Anthracene	170		
84-74-2	Di-n-butylphthalate	61	U	G
206-44-0	Fluoranthene	640		
129-00-0	Pyrene	580	X	
85-68-7	Butylbenzylphthalate	61	UX	G
56-55-3	Benzo(a)anthracene	310	X	
218-01-9	Chrysene	290	X	
117-81-7	bis(2-Ethylhexyl)phthalate	260	X	G
117-84-0	Di-n-octylphthalate	61	U	G
205-99-2	Benzo(b)fluoranthene	340		
207-08-9	Benzo(k)fluoranthene	320		
50-32-8	Benzo(a)pyrene	380		
193-39-5	Indeno(1,2,3-cd)pyrene	85		
53-70-3	Dibenzo(a,h)anthracene	80	U	
191-24-2	Benzo(g,h,i)perylene	86		

(1) - Cannot be separated from Diphenylamine

X - Result reported from an undiluted reanalysis of the sample

ld/QBO
1/15/00
PL 11/2/99

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.: C136

MWCT142R2A

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909053

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909053-9

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1218

Level: (low/med) LOW Date Collected: 09/24/99

% Moisture: 29 decanted: (Y/N) Y Date Extracted: 09/28/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/06/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG		Q
541-73-1	1,3-Dichlorobenzene	18	U	
106-46-7	1,4-Dichlorobenzene	18	U	
95-50-1	1,2-Dichlorobenzene	18	U	
120-82-1	1,2,4-Trichlorobenzene	18	U	
91-20-3	Naphthalene	190		
91-57-6	2-Methylnaphthalene	75	U	
131-11-3	Dimethylphthalate	56	U	
208-96-8	Acenaphthylene	98		G
83-32-9	Acenaphthene	75	U	
132-64-9	Dibenzofuran	190	U	
84-66-2	Diethylphthalate	56	U	
86-73-7	Fluorene	75	U	
86-30-6	N-Nitrosodiphenylamine (1)	18	U	
85-01-8	Phenanthrene	250		
120-12-7	Anthracene	76		
84-74-2	Di-n-butylphthalate	56	U	G
206-44-0	Fluoranthene	250		
129-00-0	Pyrene	290		
85-68-7	Butylbenzylphthalate	56	U	G
56-55-3	Benzo(a)anthracene	110		
218-01-9	Chrysene	120		
117-81-7	bis(2-Ethylhexyl)phthalate	74		G
117-84-0	Di-n-octylphthalate	56	U	G
205-99-2	Benzo(b)fluoranthene	75	U	
207-08-9	Benzo(k)fluoranthene	75	U	
50-32-8	Benzo(a)pyrene	110		
193-39-5	Indeno(1,2,3-cd)pyrene	75		
53-70-3	Dibenzo(a,h)anthracene	75	U	
191-24-2	Benzo(g,h,i)perylene	87		

(1) - Cannot be separated from Diphenylamine

PL 11/2/99
DW 11/2/99
RL/QBD
11/15/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWCT144R3A

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909053

Matrix: (soil/water) SEDIMENT

Lab Sample ID: 909053-3

Sample wt/vol: 75.0 (g/mL) G

Lab File ID: P1219

Level: (low/med) LOW

Date Collected: 09/23/99

% Moisture: 29 decanted: (Y/N) Y

Date Extracted: 09/28/99 OF

Concentrated Extract Volume: 1000(uL)

Date Analyzed: 10/06/99

Injection Volume: 2.0(uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG		Q
541-73-1	1,3-Dichlorobenzene	18	U	
106-46-7	1,4-Dichlorobenzene	18	U	
95-50-1	1,2-Dichlorobenzene	18	U	
120-82-1	1,2,4-Trichlorobenzene	18	U	
91-20-3	Naphthalene	75	U	
91-57-6	2-Methylnaphthalene	75	U	
131-11-3	Dimethylphthalate	56	U	
208-96-8	Acenaphthylene	75	U	G
83-32-9	Acenaphthene	75	U	
132-64-9	Dibenzofuran	190	U	
84-66-2	Diethylphthalate	56	U	
86-73-7	Fluorene	75	U	
86-30-6	N-Nitrosodiphenylamine (1)	18	U	
85-01-8	Phenanthrene	75	U	
120-12-7	Anthracene	75	U	
84-74-2	Di-n-butylphthalate	56	U	G
206-44-0	Fluoranthene	75	U	
129-00-0	Pyrene	79		
85-68-7	Butylbenzylphthalate	56	U	G
56-55-3	Benzo(a)anthracene	75	U	
218-01-9	Chrysene	75	U	
117-81-7	bis(2-Ethylhexyl)phthalate	56	U	G
117-84-0	Di-n-octylphthalate	56	U	
205-99-2	Benzo(b)fluoranthene	75	U	
207-08-9	Benzo(k)fluoranthene	75	U	
50-32-8	Benzo(a)pyrene	75	U	
193-39-5	Indeno(1,2,3-cd)pyrene	75	U	
53-70-3	Dibenzo(a,h)anthracene	75	U	
191-24-2	Benzo(g,h,i)perylene	75	U	

(1) - Cannot be separated from Diphenylamine

cd/QBD 11/15/00
PL 10/29/99
PGS 11/01/99

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 00019

MWSS128R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909053

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909053-16

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1622

Level: (low/med) LOW Date Collected: 09/27/99

% Moisture: 38 decanted: (Y/N) Y Date Extracted: 10/25/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/17/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
91-20-3	Naphthalene	600		
91-57-6	2-Methylnaphthalene	220		
208-96-8	Acenaphthylene	480		
83-32-9	Acenaphthene	270		
86-73-7	Fluorene	290		
85-01-8	Phenanthrene	1200		
120-12-7	Anthracene	630		
206-44-0	Fluoranthene	2800	D3	
129-00-0	Pyrene	3700	D3	L
56-55-3	Benzo(a)anthracene	1000		
218-01-9	Chrysene	1300		
205-99-2	Benzo(b)fluoranthene	720	D3	
207-08-9	Benzo(k)fluoranthene	590	D3	
50-32-8	Benzo(a)pyrene	910	D3	
193-39-5	Indeno(1,2,3-cd)pyrene	690	D3	G
53-70-3	Dibenzo(a,h)anthracene	200	JD3	G
191-24-2	Benzo(g,h,i)perylene	830	D3	G

D3 - Result reported from a 5 fold dilution (P1611.D)

TV/GBD
1/8/00

Validation

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCT141R2B

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909053

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909053-2

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5605

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 43 decanted: (Y/N) Y Date Extracted: 09/28/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/08/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	140	
100-51-6	Benzyl alcohol	47	U
95-48-7	2-Methylphenol	23	U
106-44-5	4-Methylphenol	440	
105-67-9	2,4-Dimethylphenol	45	
65-85-0	Benzoic acid	280	
87-86-5	Pentachlorophenol	23	U

E

TO/QBO
1/10/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCT139R2A

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909053

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909053-4

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5606

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 37 decanted: (Y/N) Y Date Extracted: 09/28/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/08/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	190	
100-51-6	Benzyl alcohol	42	U
95-48-7	2-Methylphenol	21	U
106-44-5	4-Methylphenol	420	
105-67-9	2,4-Dimethylphenol	32	
65-85-0	Benzoic acid	250	U
87-86-5	Pentachlorophenol	55	

E

TD/QBD
11/10/00

FORM 1
PEST ORGANICS ANALYSIS DATA SHEET

Client SAMPLE NO. 07

MWCT135R2

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909053

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909053-1

Sample wt/vol: 30.0 (g/mL) G Lab File ID: RA071S16

% Moisture: 28 decanted: (Y/N) Y Date Collected: 09/22/99

Extraction: (SepF/Cont/Sonc) Date Extracted: 09/30/99

Concentrated Extract Volume: 10(mL) Date Analyzed: 10/07/99

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
72-55-9	4,4'-DDE	1.5	U	
72-54-8	4,4'-DDD	1.5	U	
50-29-3	4,4'-DDT	1.5	U	G
12674-11-2	Aroclor 1016	46	U	
11104-28-2	Aroclor 1221	46	U	
11141-16-5	Aroclor 1232	46	U	
53469-21-9	Aroclor 1242	46	U	
12672-29-6	Aroclor 1248	46	U	
11097-69-1	Aroclor 1254	46	U	
11096-82-5	Aroclor 1260	46	U	
118-74-1	Hexachlorobenzene	2.3	U	
87-68-3	Hexachlorobutadiene	2.3	U	

RL/BBD 1/4/00

INORGANICS SW-846

00005

1
INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCT142R2A

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909053

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909053-9

% Solids: 68.5

Date Received: 09/24/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	4.0	U		P	G
7440-38-2	Arsenic	4.8			F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.40	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	33.6			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	11.4			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.15	U		CV	
7440-02-0	Nickel	11.1			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.79	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	44.5			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: FINE

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

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12/20/99

INORGANICS SW-846

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1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCT144R3A

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909053

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909053-3

% Solids: 72.4

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	~~3.8~~	~~U~~		P	19.5 UE
7440-38-2	Arsenic	3.4			F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.38	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	27.2			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	3.6			P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.15	U		CV	
7440-02-0	Nickel	9.3			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.77	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	28.1			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

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INORGANICS SW-846

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1

CLIENT ID

INORGANIC ANALYSIS DATA SHEET

MWSB118R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909053

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909053-8

% Solids: 79.6

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	137			P	G
7440-38-2	Arsenic	330			F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.79			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	1150			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	3640			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	6.3			CV	
7440-02-0	Nickel	30.2			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	1.3	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	1350			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: GREEN Clarity After: _____ Artifacts: _____

Comments:

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FORM I - IN

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12/20/99

INORGANICS SW-846

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1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWSB119R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909053

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909053-6

% Solids: 72.1

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	18.8			P	G
7440-38-2	Arsenic	54.3			F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.34	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	1230			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	1830			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	8.6			CV	
7440-02-0	Nickel	25.9			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.67	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	737			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: GREEN Clarity After: _____ Artifacts: _____

Comments:

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12/20/99

INORGANICS SW-846

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1

CLIENT ID

INORGANIC ANALYSIS DATA SHEET

MWSB120R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909053

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909053-7

% Solids: 60.5

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	30.9			P	G
7440-38-2	Arsenic	142			F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.66			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	805			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	669			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	17.5			CV	
7440-02-0	Nickel	18.9			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.85	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	688			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: GREEN Clarity After: _____ Artifacts: _____

Comments:

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12/20/99

INORGANICS SW-846

00010
CLIENT ID

1
INORGANIC ANALYSIS DATA SHEET

MWSB121R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909053

Matrix (soil/water): SEDIMENT Lab Sample ID: 909053-5

% Solids: 66.1 Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	40.4			P	G
7440-38-2	Arsenic	137			F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.54			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	940			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	1250			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	19.9			CV	
7440-02-0	Nickel	17.5			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.80	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	586			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: GREEN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

12/QBD
12/20/99

INORGANICS SW-846

00011

1

CLIENT ID

INORGANIC ANALYSIS DATA SHEET

MWSB122R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909053

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909053-11

% Solids: 68.4

Date Received: 09/24/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	30.2			P	G
7440-38-2	Arsenic	198			F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.68			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	1030			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	1780			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	20.5			CV	
7440-02-0	Nickel	17.2			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.71	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	683			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: GREEN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

EL/QBD
12/20/99

INORGANICS SW-846

00012

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWSB123R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909053

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909053-12

% Solids: 84.7

Date Received: 09/24/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	50.0			P	G
7440-38-2	Arsenic	163			F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.71			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	1020			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	514			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	1.4			CV	
7440-02-0	Nickel	22.0			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.60	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	1270			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: FINE

Color After: GREEN Clarity After: _____ Artifacts: _____

Comments:

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FORM I - IN

LL/QBD
12/20/99

INORGANICS SW-846

00013

1

CLIENT ID

INORGANIC ANALYSIS DATA SHEET

MWSB124R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909053

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909053-13

% Solids: 56.0

Date Received: 09/24/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	65.2			P	G
7440-38-2	Arsenic	148			F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	2.2	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	538			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	413			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	3.0			CV	
7440-02-0	Nickel	84.0			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.88	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	4770			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: GREEN Clarity After: _____ Artifacts: _____

Comments:

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FORM I - IN

RL/QBD
12/20/99

1
INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWSB125R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909053

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909053-14

% Solids: 71.1

Date Received: 09/24/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	19.0			P	G
7440-38-2	Arsenic	40.6			F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.98			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	402			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	228			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.35			CV	
7440-02-0	Nickel	22.0			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.75	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	493			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: GREEN Clarity After: _____ Artifacts: _____

Comments:

_____

_____

_____

_____

RA/QBD
12/20/99

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWSB160R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909053

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909053-15

% Solids: 68.9

Date Received: 09/24/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	12.5			P	G
7440-38-2	Arsenic	85.8			F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.38	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	410			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	205			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	1.7			CV	
7440-02-0	Nickel	16.8			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.75	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	428			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: GREEN Clarity After: _____ Artifacts: _____

Comments:

_____

_____

_____

_____

Rd/QBD
12/20/99

INORGANICS SW-846

00016

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWSS128R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909053

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909053-16

% Solids: 61.6

Date Received: 09/27/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	4.2	U		P	G
7440-38-2	Arsenic	8.9			F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.42	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	99.8			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	46.7			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.39			CV	
7440-02-0	Nickel	7.8			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.83	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	85.4			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

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ed/QBO
12/20/99

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCT138R2A

Lab Name: MULTICHEM

SDG No.: 909053

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909053-10

% Solids:

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
	Carbon	17300		*	TC

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

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INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

00002

CLIENT ID

MWSB122R1

Lab Name: MULTICHEM

SDG No.: 909053

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909053-11

% Solids:

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
	Carbon	17400		*	TC

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

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00003

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWSB123R1

Lab Name: MULTICHEM

SDG No.: 909053

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909053-12

% Solids:

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
	Carbon	4140		*	TC E

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

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INORGANICS SW-846

00004

1

CLIENT ID

INORGANIC ANALYSIS DATA SHEET

MWSB124R1

Lab Name: MULTICHEM

SDG No.: 909053

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909053-13

% Solids: _____

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
	Carbon	22000		*	TC

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANICS SW-846

00005

1

CLIENT ID

INORGANIC ANALYSIS DATA SHEET

MWSB125R1

Lab Name: MULTICHEM

SDG No.: 909053

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909053-14

% Solids:

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
	Carbon	20300		*	TC

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

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INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

00006

CLIENT ID

MWSB160R1

Lab Name: MULTICHEM

SDG No.: 909053

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909053-15

% Solids:

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
	Carbon	20800		*	TC

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

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INORGANICS SW-846

00007
CLIENT ID

1
INORGANIC ANALYSIS DATA SHEET

MWSS128R1

Lab Name: MULTICHEM

SDG No.: 909053

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909053-16

% Solids: _____

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
	Carbon	29800		*	TC

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

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EPA Level 2
DATA VALIDATION REPORT

Project Name: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 23, 1999
SDG: 909056

Prepared for

Foster Wheeler Environmental
10900 NE 8th St.
Bellevue, WA 98004

Purchase Order No. 022828
QBD Job No. 270K

Reviewed and approved,

Lorraine Davis 1/19/00

Lorraine L. Davis, Owner Date

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Attachment 2 Summary Table of Data Qualifier Flags
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Attachment 4 Revised Laboratory Forms

A. Introduction

Laboratory Sciences, Inc., d.b.a. *Quality by Design* (QBD), has completed an EPA Level 2 Data Validation on the submitted data packages in accordance with P.O. Number 022828.

The reporting format and criteria for recommending data qualifying flags for this data set are described in the EPA *"Functional Guidelines for Evaluating Organics Analyses"* and *"Functional Guidelines for Evaluating Inorganics Analyses,"* as revised, 1994; and *"Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound"* ("PSEP Protocols"), May, 1997, or using criteria listed in the method referenced. Data may be qualified for any of the following reasons:

1. By the laboratory prior to receipt by the reviewer
2. Because of laboratory deviation from the designated method
3. Because the data may not meet the criteria listed in the reference above
4. By the professional judgment of the reviewer.

The data set consists of several data packages from Multichem Analytical Services in Renton, Washington, and contains data for the samples shown in Table 1. The data reviewers and senior reviewers are shown in Table 2.

Each data set includes an analytical data package for each sample, copies of the completed chain-of-custody (COC) forms, and a quality control (QC) data package. The analytical data package includes analytical results, blank sample results, both laboratory and client sample identifications, appropriate dates but not times, method reporting limits, method references, surrogate recoveries as appropriate, the laboratory's name and address, and the initials of the person releasing the data. The custody forms include the receipt of the sample but not the laboratory's internal tracking. The QC data package includes a tabular list of the laboratory's sample identification, spiking concentrations, recoveries, percentage calculations, and acceptance windows.

Raw data were provided which includes chromatograms, instrument print outs, injection logs, digestion/preparation logs.

This data validation report consists of several sections, each of which are formatted to follow Functional Guidelines, but which also include subsections discussing QBD contacts with the laboratory, other comments, and a summary table of data qualifiers.

Table 1. Sample Identification and Analysis

Sample Identification	Laboratory Identification	Methods 8081/8082	Method 8270	Method 6010/7000	Method 9060	Grain Size	Conventionals
MWCT139R2A	909056-1				X	X	
MWCT139R4A6	909056-2	X	X	X			
MWCT139R3A	909056-3	X	X	X	X	X	
MWCT143R4A	909056-6	X	X	X	X	X	
MWCT143R2A	909056-7	X	X	X	X	X	
MWCT143R6	909056-9	X	X	X	X	X	
MWCT143R5	909056-8	X	X	X	X	X	
MWST141R1	909056-10		X	X	X	X	
MWST144S1	909056-11	X	X	X	X	X	
MWST144R1	909056-12	X	X	X	X	X	
MWSB118R1	909056-13				X	X	
MWAT046R1	909056-14				X	X	X
MWST154R1	909056-15		X				
MWAT041R1	909056-16				X	X	X
MWCT141R5B	909056-17	X	X				
MWCT141R4B	909056-18	X	X				
MWCT141R3B	909056-19	X	X				
MWCT141R2B	909056-20				X	X	X
MWCT143S3A	909056-21	X	X	X	X	X	X
MWCT143R3A	909056-22	X	X	X	X	X	X
MWCT144E2A	909056-23	X	X	X			
MWSB120R1	909056-24				X	X	
MWSB119R1	909056-25	X			X	X	
MWSB121R1	909056-26	X			X	X	

Sample Identification	Laboratory Identification	Methods 8081/8082	Method 8270	Method 6010/7000	Method 9060	Grain Size	Conventionals
MWCT144R2A	909056-27	X	X	X	X	X	

Key: Method 8270 = Semivolatile organic compounds by gas chromatography/mass spectroscopy
Method 8081/8082 = Pesticides and polychlorinated biphenyls (PCB) by gas chromatography
Method 6010 & 7000 = Metals by inductively coupled plasma (ICP) and cold vapor atomic absorption (CVAA)
Method 9060 = Total organic carbon (TOC)
Conventionals = Sulfide, ammonia, and percent moisture

Table 2. Data Package, Reviewer, and Senior Reviewer

Analysis	Number of Pages	Reviewer	Senior Reviewer
Pest/PCB	638	Randi Schneider	Lorraine L. Davis
SVOC	1247	Melinda Jacobson	Thomas S. Davis
Metals	392	Lorraine L. Davis	Thomas S. Davis
Conventionals	56	Lorraine L. Davis	Thomas S. Davis

B. Chain-of-Custody

The analytical data package was reviewed and compared against the chain-of-custody (COC) form. No data are missing from the COC forms and no transcription errors in accuracy were found. All tests requested on the COC were performed.

Discussion: The grain size analysis was subcontracted to Rosa Environmental and Geotechnical Laboratory in Seattle, Washington.

These samples were collected and archived on September 23, 1999 as SDG 909053. A change order was made on October 19, 1999 authorizing additional analyses.

C. Review of GC/MS Semivolatiles Analyses

EPA Method 8270

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The analyses were added to the work order after the samples had been logged into the laboratory system, and the extraction for this analyses occurred after the 14-day holding time. As stated in the case narrative, the samples were frozen upon receipt and then thawed and extracted. PSDDA recognizes a holding time of one year for sediments which have been frozen. When the samples are thawed, Method 8270 recognizes a 14-day holding time to extraction. Since the request for analysis occurred during the analytical process for the SDG and since the samples were frozen until extraction, no data qualifier flags are recommended.

Sample MWSB119R1 was not requested for analysis on the COC or on the change order. There is no documentation with the package which shows this sample analysis was requested, however, there is a lab report and supporting raw data for the acid fraction.

2. GC/MS Tuning

All decafluorotriphenylphosphine (DFTPP) tune criteria were met for the initial and continuing calibration for all dates of sample analysis, except as noted below.

Discussion: As noted by the laboratory, Sample MWCT144E2A was injected eight minutes past the method required 12 hours following analysis of the tune. It is the reviewers professional opinion that this error does not cause significant analytical problems and no data qualifier flags are recommended.

3. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No target compound list (TCL) analytes had percent relative standard deviations (%RSD) greater than allowed by the method for the initial calibration or percent difference for the continuing calibration checks. All system performance check compound (SPCC) and calibration check compound (CCC) criteria were met, except as noted below.

Table 3. SVOC Data Qualifiers Due to Calibration Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT143R6	Acenaphthylene	Continuing Calibration % D >20	410 G
MWCT143R2A	Acenaphthylene	Continuing Calibration % D >20	500 G
MWST141R1	Acenaphthylene	Continuing Calibration % D >20	1000 G
MWST141R1	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	340 E
MWST114S1	Acenaphthylene	Continuing Calibration % D >20	830 G
MWCT143R4A	Acenaphthylene	Continuing Calibration % D >20	63000 G
MWCT143R5	Acenaphthylene	Continuing Calibration % D >20	2300 G
MWCT144R1	Acenaphthylene	Continuing Calibration % D >20	350 G
MWSB119R1	Acenaphthylene	Continuing Calibration % D >20	120 G
MWCT144R2A	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	320 E
MWST144S1	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	6500 E
MWST144S1	Benzo(k)fluoranthene	Continuing Calibration % D >20	2300 G
MWST144R1	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	4800 E
MWCT144R2A	Acenaphthylene	Continuing Calibration % D >20	3400 G
MWCT143R3A	Acenaphthylene	Continuing Calibration % D >20	2700 G
MWCT143S3A	Acenaphthylene	Continuing Calibration % D >20	3400 G
MWCT143S3A	Benzo(k)fluoranthene	Continuing Calibration % D >20	3700 G
MWCT143R4A	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	41000 L

Discussion: The continuing calibration for the target compound pentachlorophenol had a percent difference of 27.2, which is out of the criteria of <20 percent. Since the recovery of the analyte exceeded the acceptance criteria and since the sample results in Sample MWST154R1 are non-detect, no data qualifier flags are recommended.

The continuing calibration for several target compounds had percent differences out of the criteria of <20 percent. The associated positive results in 14 samples have been flagged appropriately. If the results indicated a high bias, the results were flagged with "L" to indicate that the value is less than the maximum shown and if the results indicated a low bias, the results were flagged with "G" to indicate the reporting limit is greater than the minimum shown.

4. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit, except as noted below.

Table 4. SVOC Data Qualifiers Due to Blank Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT144E2A	di-n-Butylphthalate	Result is less than the detection limit	9.4 U
MWCT144E2A	bis(2-Ethylhexyl)phthalate	Result is less than the detection limit	9.4 U

Discussion: Di-n-butylphthalate and bis(2-ethylhexyl)phthalate were detected in the method blank associated with Sample MWCT144E2A at levels much lower than the reporting limit. The laboratory reported the results as estimated with the "J" flag. The reviewer has changed this result to non-detect.

5. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria, except as noted below.

Table 5. SVOC Data Qualifiers Due to Surrogate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT143R6	Phenol	Surrogate	16 UE
MWCT143R6	Benzyl alcohol	Surrogate	32 UE
MWCT143R6	2-Methylphenol	Surrogate	16 UE
MWCT143R6	4-Methylphenol	Surrogate	16 UE
MWCT143R6	2,4-Dimethylphenol	Surrogate	8.0 UE
MWCT143R6	Benzoic acid	Surrogate	200 UE
MWCT143R6	Pentachlorophenol	Surrogate	16 UE
MWST141R1	Phenol	Surrogate	130 E
MWST141R1	Benzyl alcohol	Surrogate	47 UE
MWST141R1	2-Methylphenol	Surrogate	23 UE

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWST141R1	4-Methylphenol	Surrogate	100 E
MWST141R1	2,4-Dimethylphenol	Surrogate	12 UE
MWST141R1	Benzoic acid	Surrogate	280 UE
MWST141R1	Pentachlorophenol	Surrogate	67 E
MWCT143S3A	Phenol	Surrogate	140 E
MWCT143S3A	Benzyl alcohol	Surrogate	160 E
MWCT143S3A	2-Methylphenol	Surrogate	27 UE
MWCT143S3A	4-Methylphenol	Surrogate	130 E
MWCT143S3A	2,4-Dimethylphenol	Surrogate	91 E
MWCT143S3A	Benzoic acid	Surrogate	320 UE
MWCT143S3A	Pentachlorophenol	Surrogate	27 UE
MWSB119R1	Phenol	Surrogate	110 E
MWSB119R1	Benzyl alcohol	Surrogate	33 UE
MWSB119R1	2-Methylphenol	Surrogate	16 UE
MWSB119R1	4-Methylphenol	Surrogate	60 E
MWSB119R1	2,4-Dimethylphenol	Surrogate	22 E
MWSB119R1	Benzoic acid	Surrogate	200 UE
MWSB119R1	Pentachlorophenol	Surrogate	47 E

Discussion: In Samples MWCT143R4A, MWCT143R2A, MWCT143R5, MWST144S1, MWST144R1, MWCT143R3A, MWCT144R2A, MWSB119R1, and MWSB121R1, a single surrogate was out of criteria. No data qualifier flags are recommended because all other surrogates were in criteria.

The surrogate percent recoveries for 2,4,6-tribromophenol, phenol-d_6, and/or 2-fluorophenol were out of the acceptance criteria in the blanks associated with the data. No data qualifier flags are recommended because the surrogates were acceptable in the samples.

The surrogate percent recoveries for 2,4,6-tribromophenol, phenol-d_6, and/or 2-fluorophenol were out of the acceptance criteria in Samples MWCT143R6, MWST141R1, MWCT143S3A, and MWSB119R1. The associated results have been flagged appropriately. If the results indicated a high bias, the results were flagged with "L" or "UL" to indicate that the value is less than the maximum shown and if the results indicated a low bias, the results were flagged with "G" and "UG" to indicate the reporting limit is greater than the minimum shown. When other QC checks indicated both a high and low bias, the results were flagged with "E" to indicate an estimated value or "UE" to indicate an estimated reporting limit.

In Sample MWCT141R5B, a single surrogate was out of criteria. No data qualifier flags are recommended because all other surrogates were in criteria.

In Samples MWCT143R4A and MWCT143S3A, surrogates were out of acceptance criteria due to large dilutions. Since all other QC checks were in criteria, no data qualifier flags are recommended.

6. Laboratory Control Standards

The laboratory analyzed a second source sample with the analytical batch. The laboratory referred to this sample as a blank spike/blank spike duplicate (BS/BSD) rather than a laboratory control standard (LCS). Any anomalies or comments regarding the second source results are addressed in the next section.

7. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

Matrix spike (MS) and matrix spike duplicates (MSD) were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria, except as noted below.

Table 6. SVOC Data Qualifiers Due to MS/MSD Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSB119R1	Phenol	MS/MSD	110 E
MWST141R1	bis(2-Ethylhexyl)phthalate	BS	340 E
MWST144S1	bis(2-Ethylhexyl)phthalate	BS	6500 E
MWST144R1	bis(2-Ethylhexyl)phthalate	BS	4800 E
MWCT144R2A	bis(2-Ethylhexyl)phthalate	BS	320 E

Discussion: The BS recovery for phenol, 2-methylphenol, 4-methylphenol, 2,4-dimethylphenol, benzoic acid and/or pentachlorophenol were out of criteria. In another BS, the recovery for 2-methylphenol, 4-methylphenol and 2,4-dimethylphenol were out of criteria. Since the recoveries of these analytes were acceptable in the MS/MSD, no data qualifier flags are recommended.

MS and MSDs were not analyzed with the water samples for this analyses. The laboratory analyzed a BS/BSD to measure precision and accuracy. All percent recoveries and RPD within laboratory or method criteria.

Benzyl alcohol, phenol, and benzoic acid were out of criteria in the MS/MSD pair. In another batch, benzyl alcohol, phenol, 2-methylphenol, and 2,4-dimethylphenol were out of criteria in the MS/MSD pair. Since the corresponding BS/BSD for each batch had acceptable recovery, and since the sample spiked was not from this SDG, no data qualifier flags are recommended. for both accuracy (percent recovery) and precision (%RPD) for the MS/MSD pair.

Benzoic acid was out of criteria for the MSD. Since the recovery of this analyte was acceptable in the associated MS, no data qualifier flags are recommended.

The BS recovery for bis(2-ethylhexyl)phthalate and di-n-octylphthalate were high and out of criteria. No data qualifier flags are recommended for di-n-octylphthalate results since the recovery of this analyte was acceptable in the associated MS/MSD. The positive results for bis(2-ethylhexyl)phthalate for Samples MWST141R1, MWST144S1, MWST144R1, and MWCT144R2A have been flagged "E" to indicate an estimated results. "G" and "L" flags could not be applied because the continuing calibration suggested greater values, but the blank spike results suggested lesser values.

Several MS and MSD recoveries were out of criteria due to high concentrations of analytes in the original sample. Since all other QC checks were in criteria, no data qualifier flags are recommended.

The results for precision for naphthalene in the BS/BSD pair analyzed with Batch A0927WW was out of acceptance criteria. Since the RPD for the associated MS/MSD with this batch was acceptable, no data qualifier flags are recommended.

8. Internal Standards Performance for Samples

All internal standard areas were within the required control limits, except as noted below.

Discussion: As noted by the laboratory, internal standards were out of acceptance criteria for some of the samples. The samples were reanalyzed and the compounds associated with the internal standards were reported from the reanalysis where the internal standard was within acceptance criteria. The reviewer concurs that reporting the diluted values was appropriate and no data qualifier flags are recommended. The laboratory should be commended for tracking this problem and taking corrective action.

9. Field Duplicates

No field duplicates were identified with this group of samples.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

11. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

12. TCL Compound Identification

All target compound identifications met the criteria for retention times and peak identification of the referenced method.

13. Tentatively Identified Compounds

No TICs were reported with this data set.

14. Laboratory Contact

There was no verbal or written communication with the laboratory.

15. Other Comments

None.

16. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

D. Review of Pesticides/PCBs Analyses

EPA Method 8081/8082

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Table 7. Pesticide/PCB Data Qualifiers Due to Holding Time Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT144E2A	Aroclor 1016	Holding Time Exceeded	0.94 UE
MWCT144E2A	Aroclor 1221	Holding Time Exceeded	0.94 UE
MWCT144E2A	Aroclor 1232	Holding Time Exceeded	0.94 UE
MWCT144E2A	Aroclor 1242	Holding Time Exceeded	0.94 UE
MWCT144E2A	Aroclor 1248	Holding Time Exceeded	0.94 UE
MWCT144E2A	Aroclor 1254	Holding Time Exceeded	0.94 UE
MWCT144E2A	Aroclor 1260	Holding Time Exceeded	0.94 UE

Discussion: The analysis of Sample MWCT144E2A exceeded the holding time of seven days by 7 days. All values have been flagged "E" to indicate an estimated value.

The analysis of the target compounds hexachlorobenzene and hexachlorobutadiene was performed using Method 8081 instead of the requested Method 8270. No data qualifier flags are recommended since the method utilized is an approved method by PSEP.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No TCL analytes had %RSD greater than that allowed for the initial calibration or percent difference for the continuing calibration checks, except as noted below.

Table 8. Pesticide/PCB Data Qualifiers Due to Calibration Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSB119R1	4,4'-DDD	Continuing Calibration %D >15	18 G

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSB119R1	4,4'-DDT	Continuing Calibration %D >15	4.1 UG
MWSB121R1	4,4'-DDD	Continuing Calibration %D >15	4.9 UG
MWSB121R1	4,4'-DDT	Continuing Calibration %D >15	4.9 UG

Discussion: The continuing calibration for the target compounds 4,4'-DDT and 4,4'-DDD had percent differences greater than 15 percent. Since the percent differences for both columns were out of criteria, the associated results in Samples MWSB119R1 and MWSB121R1 have been flagged with "G" and "UG" to indicate the value is greater than the minimum shown.

The sediment samples were acid cleaned and reanalyzed for the Aroclors on October 12, 1999. The continuing calibration for the target compound for Aroclor 1016 was below the acceptance criteria on one column. Since the analyte recoveries were acceptable on the second column, no data qualifier flags are recommended.

The continuing calibration for the target compounds Aroclor 1016 and Aroclor 1260 were out of criteria. Since the sample results were non-detect and since the continuing calibration verification for the second column was acceptable, so no data qualifier flags are recommended.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within laboratory or method criteria, except as noted below.

Discussion: In Samples MWCT143R4A, MWCT143R2RA, MWST14451, MWCT143S3A, MWCT14343A, and MWCT144R2A, a single surrogate was out of criteria. No data qualifier flags are recommended because all other surrogates were in criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and RPD were within laboratory or method criteria, except as noted below.

Discussion: Aroclor 1260 and hexachlorobutadiene was out of criteria for accuracy in the MS/MSD pair. The spiked sample was a project sample but was from another

SDG. Because the BS results were acceptable, no data qualifier flags are recommended.

6. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWCT143S3A and MWCT143R3A; and Samples MWST144S1 and MWST144R1 were identified as field duplicates. Test results were reviewed, and where positive results were found, the RPD were calculated. All analytes, except those listed in the table below, were reported as non-detect.

Table 9. Pesticide/PCB Field Duplicates and RPD

Compound	MWST144S1 Result	MWST144R1 Result	RPD
Aroclor 1260	130	140	7.4
Total Aroclor	130	140	7.4

7. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

8. TCL Compound Identification

All TCL Compound identifications met the criteria for retention times and peak identification of the referenced method, except as noted below.

Discussion: The laboratory based it's identifications of Aroclors on only three of the five peaks used for quantification. The reviewer visually inspected the chromatograms for additional peaks and pattern matching and concurs that the identifications were correct.

EPA Method 8000B in SW-846 gives guidance for quantifying target analytes which have been confirmed by second column chromatography in a gas chromatograph by suggesting that when significant differences are noted between the two columns, in the interest of protecting public health, the higher of the two results from the two columns should be reported. For this project, the laboratory consistently reported the lower results from the two columns. Because the EPA guidance is not a requirement, the reviewer does not propose to revise the pesticide results to reflect the higher value when the percent difference between the two columns is within criteria. In instances where the percent difference was greater than 25 percent, the reviewer opted to use the higher value. However, in most cases, the values were within 25 percent of each other and the data user should be aware that this data may exhibit a systematic low bias.

9. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards or external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found, except as noted below. The reporting limits meet the requirements of the contract.

Table 10. Pesticide/PCB Data Qualifiers Due to Compound Quantitation Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT143R2A	Hexachlorobenzene	More technically sound value available	15.8

Discussion: Hexachlorobenzene was detected in Sample MWCT143R2A. This compound was confirmed on a second column, however, the results of the two columns differed by more than 25 percent. The laboratory reported the lower result, 3.3 µg/kg and used a "P" flag to indicate the discrepancy between the two columns. The second column value for hexachlorobenzene was 15.8 µg/kg. Since the percent difference between the two columns is greater than 25 percent, the higher value should be reported as the final sample result.

10. Laboratory Contact

There was no verbal or written communication with the laboratory.

11. Other Comments

None.

12. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

E. Review of Metals Analyses

EPA Method 6010/7000

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The analysis of mercury was performed 65 days after the samples were collected. The samples were archived in a frozen state, thawed, and analyzed within the 28-day holding time after thawing. PSEP guidelines allow for up to one year storage of frozen samples. Therefore, no data qualifier flags are recommended.

2. Initial and Continuing Calibration

All initial and continuing calibration Quality Control criteria were met. No TCL analytes had correlation coefficients greater than allowed by the method, and all percent differences for the continuing calibration verifications were acceptable.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit, except as noted below.

Discussion: Mercury was detected in the continuing calibration blanks associated with Samples MWCT135R3, MWCT135R4, and MWCT139R5 but were not detected in the samples. The laboratory's case narrative identified a problem with the mercury analyzer, which was corrected. No data qualifier flags are recommended.

4. ICP Interference Check Standard

An interference check sample (ICS) was analyzed at a frequency required by the referenced method and was within established criteria.

5. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within laboratory or method criteria.

Discussion: All metals, except copper and mercury, were out of the method criteria of 90 to 110 percent recovery for the LCS. However, PSDDA allows 80 to 120 percent recovery of a second source check sample. All analytes were within PSDDA acceptance criteria, and no data qualifier flags are recommended.

6. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MSs were analyzed as required by the referenced method and all percent recoveries and RPD were within laboratory or method criteria, except as noted below.

Table 11. MS Data Qualifiers Due to MS/MSD Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT143R4A	Antimony	MS	4.1 UG
MWCT143R4A	Arsenic	MS	12.3 G

Discussion: The post digestion spike recovery for lead was out of the criteria of 75 to 125 percent. Since the MS was in criteria, no data qualifier flags are recommended.

Arsenic and antimony were out of criteria of 75 to 125 percent at 72.9 and 51.8 percent, respectively for the matrix spike. Since the LCS was in criteria, only the results for these analytes in the sample spiked have been flagged "G" to indicate that the result is greater than the value indicated.

7. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWCT143R3A & MWCT143S3A and MWST144R1 & MWCT144S1 were identified as field duplicates. Test results were reviewed, and where positive results were found, the RPD was calculated.

Table 12. Metals Duplicates and RPD

Compound	MWST144R1 Result	MWST144S1 Result	RPD
Arsenic	18.6	19.6	5.2
Cadmium	1.1	0.79	32.8
Copper	22.2	23.6	6.1
Lead	172	184	6.7
Mercury	0.87	0.80	8.4
Nickel	14.3	14.5	1.4
Zinc	214	225	5.0

Compound	MWCT143R3A Result	MWCT143S3A Result	RPD
Arsenic	10.8	11.1	2.7

Compound	MWCT143R3A Result	MWCT143S3A Result	RPD
Cadmium	0.93	0.83	11.4
Copper	425	293	36.8
Lead	205	172	17.5
Mercury	0.46	0.32	35.9
Nickel	33.2	24.8	29.0
Zinc	418	350	17.7

Discussion: Values near the CRDL (Contract Required Detection Limit) often result in higher RPD and absolute criteria should not be applied. When the data result is near the CRDL, then QBD recommends applying a "five times" (5x) rule in evaluating the RPD. Results that are greater than 5x the CRDL are evaluated against the criteria listed in the QAPP. RPDs that are less than 5x the CRDL are evaluated using the professional judgment of the data user based upon knowledge of both the laboratory results and field conditions.

The high RPD for this analysis may be due to sample inhomogeniety or special circumstances during the sampling process. Because the person who performed the sampling has information that is not available to the data validator, such as sampling conditions or problems with the sampling equipment, the client typically performs any flagging and data qualification based upon field duplicates.

8. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPD were within laboratory or method criteria, except as noted below.

Table 13. Metal Data Qualifiers Due to Duplicate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT142R2A	Mercury	Precision	0.62 E
MWCT143R3A	Mercury	Precision	0.46 E
MWCT143S3A	Mercury	Precision	0.32 E
MWCT144R2A	Mercury	Precision	2.6 E
MWST141R1	Mercury	Precision	0.74 E
MWST144R1	Mercury	Precision	0.87 E
MWST144S1	Mercury	Precision	0.50 E

Discussion: Mercury was out of the criteria of less than 20 percent at 58.1, respectively, in the sample duplicate set. The associated positive results for Samples MWCT142R2A, MWCT143R3A, MWCT143S3A, MWCT144R2A, MWST141R1, MWST144R1, and MWST144S1, have been flagged "E" to indicate an estimated value.

Mercury was out of the criteria of <20 percent in the sample duplicate set. The laboratory reported a 200 RPD for mercury, but one result was non-detect and the other was a trace result. It is the reviewer's opinion that the precision is acceptable and the high value is due to a software flaw.

9. ICP Serial Dilution

Samples that were a factor of 50 above the instrument detection limit (IDL) for the analyte were diluted five-fold and were within criteria required by the referenced method, except as noted below.

Table 14. Metal Data Qualifiers Due to ICP Serial Dilution Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT143R2A	Lead	Serial Dilution	1180 E
MWCT143R3A	Lead	Serial Dilution	205 E
MWCT143R4A	Lead	Serial Dilution	26.2 E
MWCT143R6	Lead	Serial Dilution	3.6 E
MWCT143R5	Lead	Serial Dilution	8.9 E
MWCT143S3A	Lead	Serial Dilution	172 E
MWCT144R2A	Lead	Serial Dilution	283 E
MWCT14R1	Lead	Serial Dilution	172 E
MWCT144S1	Lead	Serial Dilution	184 E

Discussion: A serial dilution of lead had a percent difference of 23.2, which is greater than the acceptance criteria of ±10 percent difference. All associated samples have been flagged "E" to indicate an estimated value.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract, except as noted below.

Discussion: The reporting limit for lead failed to meet the requirement of 0.5 mg/kg that was listed in the QAPP. However, most field samples had positive results. For samples that were non-detect, the laboratory's reporting limit of 1.5 mg/kg was less than the Sediment Quality Standard Criteria of 450 mg/kg and the Sediment Impact Zone and Clean-up Criteria of 530 mg/kg, and no data qualifier flags are recommended.

11. Graphite Furnace Atomic Absorption Analysis

All special criteria for graphite furnace atomic absorption (GFAA) analysis were performed at a frequency required by the referenced method and was within established criteria.

12. Laboratory Contact

There was no verbal or written communication with the laboratory.

13. Other Comments

None.

14. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

F. Review of Conventional Analyses

EPA Method 9060, Grain Size, Percent Moisture, and PSEP Sulfides

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Table 15. Inorganic Data Qualifiers Due to Holding Time Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWAT046R1	Sulfide, Total	Holding Time	20.3 E
MWAT041R1	Sulfide, Total	Holding Time	26.5 E

Discussion: The analysis of Samples MWAT046R1 and MWAT041R1 exceeded the holding time of seven days by one day. All positive results have been flagged with a "E" to indicate an estimated value and all non-detects have been flagged with "UE" to indicate an estimated reporting limit.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met, including the number of standards used and the correlation coefficients. All continuing calibration criteria, including frequency of analysis and percent recovery were met.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within laboratory or method criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and relative percent differences (RPD) were within laboratory or method criteria, except as noted below.

Discussion: A single blank spike for total sulfide was out of criteria but all other accuracy measurements (e.g., MS, MSD, and CCVs) are acceptable and no data qualifying flags are recommended

6. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPD were within laboratory or method criteria, except as noted below.

Discussion: The laboratory analyzed a non-project sample in triplicate for total sulfides. One of the 3 results differed significantly from the other two. The %RSD for the triplicate was 33%, but the RPD of the two similar results was 14.8 and the RPD of a MS/MSD pair was 15.7. Although one replicate was different, two duplicate pairs were acceptable and no data qualifier flags are recommended.

7. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWST144S1 & MWST144R1, and MWCT143S3A & MWCT143R3A were identified as field duplicates. Test results were reviewed, and where positive results were found, the RPD was calculated. All analytes, except those listed in the table below, were reported as non-detect.

Table 16. Inorganic Field Duplicates and RPD

Compound	MWCT143S3A Result	MWCT143R3A Result	RPD
Total Organic Carbon	120000	100000	18.2
Gravel	4.85	9.35	63.4
Sand	18.55	24.92	29.3
Silt	52.62	47.91	9.4
Clay	23.98	17.82	29.5
Total Fines	76.60	65.73	15.3

Compound	MWST144S1 Result	MWST144R1 Result	RPD
Total Organic Carbon	120000	89000	29.7
Gravel	3.31	3.29	0.6
Sand	35.55	35.34	0.6
Silt	46.41	46.64	0.5

Compound	MWST144S1 Result	MWST144R1 Result	RPD
Clay	14.73	14.73	0
Total Fines	61.14	61.37	0.4

Discussion: The high RPD for this analysis may be due to sample inhomogeniety or special circumstances during the sampling process. Because the person who performed the sampling has information that is not available to the data validator, such as sampling conditions or problems with the sampling equipment, the client typically performs any flagging and data qualification based upon field duplicates.

8. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

9. Laboratory Contact

On December 30, 1999 the QBD project manager telephoned and faxed Tori Bayly at Multichem Analytical Services during the data validation process regarding reporting of the sulfide results. and requested that the case narrative and QC data sheets be reissued. On January 11, 2000, Columbia Analytical Services, who had performed the analyses, faxed the requested information to QBD. Copies of laboratory communications are found in Attachment 3, "Communications with the Laboratory."

10. Other Comments

Sample MWST141R1 was analyzed in triplicate for particle size. The results were acceptable for the sand, silt, clay, fractions and total fines. However, the gravel fraction had a %RSD of 53%. This result indicates that the sample was heterogeneous and/or the sample splitting technique was not optimal. There are no QC criteria outlined in the QAPP, so no data qualifier flags are recommended.

11. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

Attachment 1 Puget Sound Estuary Program Data Qualifier Definitions

Used for both organics and inorganic analyses

B = Analyte detected in samples and in method blank

C = Combined with unresolved substances

E = Estimated

G = Value greater than minimum shown

K = Detected at less than the maximum shown

L = Value less than the maximum shown

M = Value is a mean

Q = Questionable value

R = Rejected or unusable value

T = Detected below the quantification limit shown

U = Undetected at the detection limit shown

Z = Blank corrected

Attachment 2 Summary Table of Data Qualifier Flags

Foster Wheeler Environmental
Project: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 22-27, 1999

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCT143R6	Acenaphthylene	Continuing Calibration % D >20	410 G
MWCT143R2A	Acenaphthylene	Continuing Calibration % D >20	500 G
MWST141R1	Acenaphthylene	Continuing Calibration % D >20	1000 G
MWST141R1	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	340 E
MWST114S1	Acenaphthylene	Continuing Calibration % D >20	830 G
MWCT143R4A	Acenaphthylene	Continuing Calibration % D >20	63000 G
MWCT143R5	Acenaphthylene	Continuing Calibration % D >20	2300 G
MWCT144R1	Acenaphthylene	Continuing Calibration % D >20	350 G
MWSB119R1	Acenaphthylene	Continuing Calibration % D >20	120 G
MWCT144R2A	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	320 E
MWST144S1	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	6500 E
MWST144S1	Benzo(k)fluoranthene	Continuing Calibration % D >20	2300 G
MWST144R1	bis(2-Ethylhexyl)phthalate	Continuing Calibration % D >20	4800 E
MWCT144R2A	Acenaphthylene	Continuing Calibration % D >20	3400 G
MWCT143R3A	Acenaphthylene	Continuing Calibration % D >20	2700 G
MWCT143S3A	Acenaphthylene	Continuing Calibration % D >20	3400 G
MWCT143S3A	Benzo(k)fluoranthene	Continuing Calibration % D >20	3700 G
MWCT143R4A	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	41000 L
MWCT144E2A	di-n-Butylphthalate	Result is less than the detection limit	9.4 U
MWCT144E2A	bis(2-Ethylhexyl)phthalate	Result is less than the detection limit	9.4 U
MWCT143R6	Phenol	Surrogate	16 UE
MWCT143R6	Benzyl alcohol	Surrogate	32 UE
MWCT143R6	2-Methylphenol	Surrogate	16 UE
MWCT143R6	4-Methylphenol	Surrogate	16 UE
MWCT143R6	2,4-Dimethylphenol	Surrogate	8.0 UE
MWCT143R6	Benzoic acid	Surrogate	200 UE
MWCT143R6	Pentachlorophenol	Surrogate	16 UE
MWST141R1	Phenol	Surrogate	130 E

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWST141R1	Benzyl alcohol	Surrogate	47 UE
MWST141R1	2-Methylphenol	Surrogate	23 UE
MWST141R1	4-Methylphenol	Surrogate	100 E
MWST141R1	2,4-Dimethylphenol	Surrogate	12 UE
MWST141R1	Benzoic acid	Surrogate	280 UE
MWST141R1	Pentachlorophenol	Surrogate	67 E
MWCT143S3A	Phenol	Surrogate	140 E
MWCT143S3A	Benzyl alcohol	Surrogate	160 E
MWCT143S3A	2-Methylphenol	Surrogate	27 UE
MWCT143S3A	4-Methylphenol	Surrogate	130 E
MWCT143S3A	2,4-Dimethylphenol	Surrogate	91 E
MWCT143S3A	Benzoic acid	Surrogate	320 UE
MWCT143S3A	Pentachlorophenol	Surrogate	27 UE
MWSB119R1	Phenol	Surrogate	110 E
MWSB119R1	Benzyl alcohol	Surrogate	33 UE
MWSB119R1	2-Methylphenol	Surrogate	16 UE
MWSB119R1	4-Methylphenol	Surrogate	60 E
MWSB119R1	2,4-Dimethylphenol	Surrogate	22 E
MWSB119R1	Benzoic acid	Surrogate	200 UE
MWSB119R1	Pentachlorophenol	Surrogate	47 E
MWSB119R1	Phenol	MS/MSD	110 E
MWST141R1	bis(2-Ethylhexyl)phthalate	BS	340 E
MWST144S1	bis(2-Ethylhexyl)phthalate	BS	6500 E
MWST144R1	bis(2-Ethylhexyl)phthalate	BS	4800 E
MWCT144R2A	bis(2-Ethylhexyl)phthalate	BS	320 E
MWCT144E2A	Aroclor 1016	Holding Time Exceeded	0.94 UE
MWCT144E2A	Aroclor 1221	Holding Time Exceeded	0.94 UE
MWCT144E2A	Aroclor 1232	Holding Time Exceeded	0.94 UE
MWCT144E2A	Aroclor 1242	Holding Time Exceeded	0.94 UE
MWCT144E2A	Aroclor 1248	Holding Time Exceeded	0.94 UE
MWCT144E2A	Aroclor 1254	Holding Time Exceeded	0.94 UE
MWCT144E2A	Aroclor 1260	Holding Time Exceeded	0.94 UE
MWSB119R1	4,4'-DDD	Continuing Calibration %D >15	18 G
MWSB119R1	4,4'-DDT	Continuing Calibration %D >15	4.1 UG
MWSB121R1	4,4'-DDD	Continuing Calibration %D >15	4.9 UG
MWSB121R1	4,4'-DDT	Continuing Calibration %D >15	4.9 UG
MWCT143R2A	Hexachlorobenzene	More technically sound value available	15.8
MWCT143R4A	Antimony	MS	4.1 UG

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCT143R4A	Arsenic	MS	12.3 G
MWCT142R2A	Mercury	Precision	0.62 E
MWCT143R3A	Mercury	Precision	0.46 E
MWCT143S3A	Mercury	Precision	0.32 E
MWCT144R2A	Mercury	Precision	2.6 E
MWST141R1	Mercury	Precision	0.74 E
MWST144R1	Mercury	Precision	0.87 E
MWST144S1	Mercury	Precision	0.50 E
MWCT143R2A	Lead	Serial Dilution	1180 E
MWCT143R3A	Lead	Serial Dilution	205 E
MWCT143R4A	Lead	Serial Dilution	26.2 E
MWCT143R6	Lead	Serial Dilution	3.6 E
MWCT143R5	Lead	Serial Dilution	8.9 E
MWCT143S3A	Lead	Serial Dilution	172 E
MWCT144R2A	Lead	Serial Dilution	283 E
MWCT14R1	Lead	Serial Dilution	172 E
MWCT144S1	Lead	Serial Dilution	184 E
MWAT046R1	Sulfide, Total	Holding Time	20.3 E
MWAT041R1	Sulfide, Total	Holding Time	26.5 E

Attachment 3 Communications with the Laboratory

Quality by Design
29 Shipman Street, Suite 101
Hilo, Hawaii 96720
Phone: 808/969-9424 Fax: 808/969-9094
e-mail: qbdhilo@gte.net

Date: December 31, 1999

To: MultiChem Analytical Services
Attn: Tori Bailey
Fax #: 425/228-8336

cc: Foster Wheeler Env. Corp.
Attn: Sherri Wunderlich
Fax #: 425/688-3952

From: Tom Davis

Total pages, including this one: 2

Hi, Tori –

I had left a voicemail for you yesterday but I'm assuming that with the holiday coming up, you didn't get it before you left. We are doing the data validation for Foster Wheeler's Middle Waterway project and have some questions about a couple of the data packages. If there is any question about confidentiality of data, please call Sherri, Gary Braun, or Roger Cadeg at Foster Wheeler for the okay.

We have four items so far:

1. Our report for SDG 909070 is missing Page 410 of the base/neutrals run on 12/10/99. We are also missing a DFTPP printout from HP-1 for electronic file J6238. The missing page was not included in the original data package because it should be between Pages 219 and 220. Could we have copies of these faxed to the letterhead number?

2. Sulfides were subcontracted to Columbia Analytical. On SDG 909056, (CAS No. K9906743), they analyzed sulfides for Samples MWAT046R1 and MWAT041R1 twice, because the initial run's QC failed. They reported the sample results from the re-analysis, but they selectively reported the QC data from the first run. For example, in the first run, the MS had almost 100% recovery but the MSD had zero percent (0%) recovery. Yet, the MS from the first run was reported, the MSD was not, and the sample results were taken from the second run. Could CAS re-issue this report with the correct information?

3. In SDG 909062, our data package is missing the custody form for Samples MWAS037R1 and MWAS034R1. Could we get copies of these faxed?

4. Also in SDG 909070, MAS analyzed a set of samples for EPA 8270 but had problems with the blank. Appropriately, MAS re-ran the sample set. However, the second set was extracted after the holding time. MAS reported only the results of the second analysis. Could we have the results of the first analysis reported for the samples listed below?

HP LaserJet 3100
Printer/Fax/Copier/Scanner

SEND CONFIRMATION REPORT for
Quality by Design
808 969 9094
Dec-31-99 6:07PM

Job	Start Time	Usage	Phone Number or ID	Type	Pages	Mode	Status
636	12/31 6:06PM	0'45"	425 228 8336	Send	2/ 2	EC 96	Completed

Total 0'45" Pages Sent: 2 Pages Printed: 0

Quality by Design
29 Shipman Street, Suite 101
Hilo, Hawaii 96720
Phone: 808/969-9424 Fax: 808/969-9094
e-mail: qbdhilo@gte.net

Date: December 31, 1999

To: MultiChem Analytical Services
Attn: Tori Bailey
Fax #: 425/228-8336

cc: Foster Wheeler Env. Corp.
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From: Tom Davis

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4. Also in SDG 909070, MAS analyzed a set of samples for EPA 8270 but had problems with the blank. Appropriately, MAS re-ran the sample set. However, the second set was extracted after the holding time. MAS reported only the results of the second analysis. Could we have the results of the first analysis reported for the samples listed below?

Sample No.
MWCS137R2
MWCS151R3
MWCS155R2
MWCS116R2
MWCS112R2
MWCS157R2
MWCS152R3

In the same way that you issue two reports for dilutions, this would allow us to select and appropriately flag the most technically suitable results.

Thanks for your help. If there are any questions or problems, please don't hesitate to call.

Send Hard Copy? ___ Yes _XX_ No

FAX

Date: Tuesday, January 11, 2000 **Time:** 2:31:00 PM **Pages** ~~14~~ 6

To: Tom Davis
Fax: 1-808-969-9094
Voice:

From: Richard A Craven
Columbia Analytical Services
Fax: 360-636-1068
Voice: 360-577-7222

Comments:

Here are some revisions requested by Multi Chem. If you would provide your mailing address I will mail the hard copy.

rac

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: MultiChem Analytical Services
Project: Middle Waterway/909056
Sample Matrix: Sediment

Service Request: K9906743
Date Collected: 12/23/99
Date Received: 12/28/99
Date Extracted: NA
Date Analyzed: 12/30/99

Duplicate Summary
Sulfide, Total

Sample Name: Batch QC
Lab Code: K9906740-001DUP
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Sulfide, Total	NONE	9030M	0.5	106	52.9	79.4	67	A

A Outside acceptance limits; see case narrative.

Approved By: Date:

DUP020899/p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	MultiChem Analytical Services	**Service Request:**	K9906743
Project:	Middle Waterway/909056	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	12/30/99

Matrix Spike Summary
Sulfide, Total

Sample Name:	Batch QC	Units:	mg/Kg (ppm)
Lab Code:	K9906740-001MS	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Sulfide, Total	NONE	9030M	0.5	316	106	409	96	60-130	

Approved By: Date:

MS020097/p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	MultiChem Analytical Services	**Service Request:**	K9906743
Project:	Middle Waterway/909056	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	12/30/99

Matrix Spike/Duplicate Matrix Spike Summary
Sulfide, Total

Sample Name:	Batch QC	Units:	mg/Kg (ppm)
Lab Code:	K9906740-001MS, K9906740-001DMS	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Sulfide, Total	NONE	9030M	0.5	316	314	106	409	363	96	82	60-130	16	

Approved By: _____ Date: _____

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	MultiChem Analytical Services	**Service Request:**	K9906743
Project:	Middle Waterway/909056	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	12/30/99

Laboratory Control Sample Summary
Sulfide, Total

Sample Name:	Lab Control Sample	Units:	mg/L (ppm)
Lab Code:	K9906743-LCS	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Sulfide, Total	NONE	9030M	0.90	0.92	102	60-130	

Approved By: Date:

LCS0020097p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: MultiChem Analytical Services
Project: Middle Waterway/909056

Service Request: K9906743
Date Collected: NA
Date Received: NA
Date Analyzed: 9/30/99

Sulfide, Total
PSEP
Units: mg/L (ppm)

CONTINUING CALIBRATION VERIFICATION (CCV)

	True Value	Measured Value	Percent Recovery
CCV 1 Result	0.45	0.46	102
CCV 2 Result	0.45	0.46	102

CONTINUING CALIBRATION BLANK (CCB)

	MRL	Blank Value
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND

Approved By: _____ Date: _____

COMBOQCD/012695

Attachment 4 Revised Laboratory Forms

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 112

MWCT144E2A

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) WATER Lab Sample ID: 909056-23

Sample wt/vol: 1060 (g/mL) ML Lab File ID: J5681

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: _____ decanted: (Y/N)___ Date Extracted:09/29/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/13/99

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
108-95-2	Phenol	9.4	U
95-57-8	2-Chlorophenol	9.4	U
541-73-1	1,3-Dichlorobenzene	9.4	U
106-46-7	1,4-Dichlorobenzene	9.4	U
95-50-1	1,2-Dichlorobenzene	9.4	U
100-51-6	Benzyl alcohol	9.4	U
95-48-7	2-Methylphenol	9.4	U
621-64-7	N-Nitroso-di-n-propylamine	9.4	U
67-72-1	Hexachloroethane	9.4	U
106-44-5	4-Methylphenol	9.4	U
105-67-9	2,4-Dimethylphenol	9.4	U
120-82-1	1,2,4-Trichlorobenzene	9.4	U
91-20-3	Naphthalene	9.4	U
65-85-0	Benzoic acid	47	U
87-68-3	Hexachlorobutadiene	9.4	U
59-50-7	4-Chloro-3-Methylphenol	9.4	U
91-57-6	2-Methylnaphthalene	9.4	U
131-11-3	Dimethylphthalate	9.4	U
208-96-8	Acenaphthylene	9.4	U
83-32-9	Acenaphthene	9.4	U
132-64-9	Dibenzofuran	9.4	U
100-02-7	4-Nitrophenol	47	U
121-14-2	2,4-Dinitrotoluene	9.4	U
84-66-2	Diethylphthalate	9.4	U
86-73-7	Fluorene	9.4	U
86-30-6	N-Nitrosodiphenylamine (1)	9.4	U
118-74-1	Hexachlorobenzene	9.4	U
87-86-5	Pentachlorophenol	9.4	U
85-01-8	Phenanthrene	9.4	U
120-12-7	Anthracene	9.4	U
84-74-2	Di-n-butylphthalate	~~1.1~~	~~JB~~ 9.4 U
206-44-0	Fluoranthene	9.4	U
129-00-0	Pyrene	9.4	U

(1) - Cannot be separated from Diphenylamine

TD/GBD
1/8/00

113

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCT144E2A

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) WATER Lab Sample ID: 909056-23

Sample wt/vol: 1060 (g/mL) ML Lab File ID: J5681

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 09/29/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/13/99

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
85-68-7	Butylbenzylphthalate	9.4	U
56-55-3	Benzo(a)anthracene	9.4	U
218-01-9	Chrysene	9.4	U
117-81-7	bis(2-Ethylhexyl)phthalate	~~1.1~~	~~JB~~
117-84-0	Di-n-octylphthalate	9.4	U
205-99-2	Benzo(b)fluoranthene	9.4	U
207-08-9	Benzo(k)fluoranthene	9.4	U
50-32-8	Benzo(a)pyrene	9.4	U
193-39-5	Indeno(1,2,3-cd)pyrene	9.4	U
53-70-3	Dibenz(a,h)anthracene	9.4	U
191-24-2	Benzo(g,h,i)perylene	9.4	U

9.4 U

TD/QBD
1/18/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWCT143R4A

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909056-6

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1230

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 36 decanted: (Y/N) Y Date Extracted: 09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/07/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	20	U	
106-46-7	1,4-Dichlorobenzene	20	U	
95-50-1	1,2-Dichlorobenzene	20	U	
120-82-1	1,2,4-Trichlorobenzene	2000	UD7	
91-20-3	Naphthalene	2300000	D0	
91-57-6	2-Methylnaphthalene	560000	D8	
131-11-3	Dimethylphthalate	6200	UD7	
208-96-8	Acenaphthylene	63000	D7	G
83-32-9	Acenaphthene	320000	D8	
132-64-9	Dibenzofuran	35000	D7	
84-66-2	Diethylphthalate	6200	UD7	
86-73-7	Fluorene	160000	D7	
86-30-6	N-Nitrosodiphenylamine (1)	2000	UD7	
85-01-8	Phenanthrene	500000	D8	
120-12-7	Anthracene	140000	D7	
84-74-2	Di-n-butylphthalate	6200	UD7	
206-44-0	Fluoranthene	220000	D8	
129-00-0	Pyrene	280000	D8	
85-68-7	Butylbenzylphthalate	6200	UD7	
56-55-3	Benzo(a)anthracene	110000	D7	
218-01-9	Chrysene	100000	D7	
117-81-7	bis(2-Ethylhexyl)phthalate	6200	UD7	
117-84-0	Di-n-octylphthalate	6200	UD7	
205-99-2	Benzo(b)fluoranthene	25000	JD8	
207-08-9	Benzo(k)fluoranthene	54000	D8	
50-32-8	Benzo(a)pyrene	87000	D8	
193-39-5	Indeno(1,2,3-cd)pyrene	41000	D8	L
53-70-3	Dibenzo(a,h)anthracene	11000	JD8	
191-24-2	Benzo(g,h,i)perylene	55000	D8	

(1) - Cannot be separated from Diphenylamine
D7 RESULT REPORTED FROM 100 FOLD DILUTION (P1246.D)
D8 RESULT REPORTED FROM 500 FOLD DILUTION (P1298.D)
D0 RESULT REPORTED FROM 2000 FOLD DILUTION (P1294.D)

TD/RBD
1/11/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCT143R2A

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909056-7

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1226

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 30 decanted: (Y/N) Y Date Extracted: 09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/07/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	18	U	
106-46-7	1,4-Dichlorobenzene	18	U	
95-50-1	1,2-Dichlorobenzene	18	U	
120-82-1	1,2,4-Trichlorobenzene	18	U	
91-20-3	Naphthalene	1300		
91-57-6	2-Methylnaphthalene	650		
131-11-3	Dimethylphthalate	100		
208-96-8	Acenaphthylene	500		G
83-32-9	Acenaphthene	220		
132-64-9	Dibenzofuran	190		
84-66-2	Diethylphthalate	57	U	
86-73-7	Fluorene	310		
86-30-6	N-Nitrosodiphenylamine (1)	93	UD3	
85-01-8	Phenanthrene	1800	D3	
120-12-7	Anthracene	380	D3	
84-74-2	Di-n-butylphthalate	280	UD3	
206-44-0	Fluoranthene	2200	D3	
129-00-0	Pyrene	2500	D3	
85-68-7	Butylbenzylphthalate	57	U	
56-55-3	Benzo(a)anthracene	1400		
218-01-9	Chrysene	1800	D3	
117-81-7	bis(2-Ethylhexyl)phthalate	57	U	
117-84-0	Di-n-octylphthalate	280	UD3	
205-99-2	Benzo(b)fluoranthene	1900	D3	
207-08-9	Benzo(k)fluoranthene	1400	D3	
50-32-8	Benzo(a)pyrene	2000	D3	
193-39-5	Indeno(1,2,3-cd)pyrene	1500	D3	
53-70-3	Dibenzo(a,h)anthracene	490	D3	
191-24-2	Benzo(g,h,i)perylene	1700	D3	

(1) - Cannot be separated from Diphenylamine
D3 -- RESULTS REPORTED FROM A 5 FOLD DILUTION (P1241.D)

TD/QBD
1/11/00

113

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCT143R5

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909056-8

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1227

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 24 decanted: (Y/N) Y Date Extracted: 09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/07/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	17	U	
106-46-7	1,4-Dichlorobenzene	17	U	
95-50-1	1,2-Dichlorobenzene	17	U	
120-82-1	1,2,4-Trichlorobenzene	17	U	
91-20-3	Naphthalene	51000	D6	
91-57-6	2-Methylnaphthalene	15000	D6	
131-11-3	Dimethylphthalate	53	U	
208-96-8	Acenaphthylene	2300	D4	G
83-32-9	Acenaphthene	11000	D4	
132-64-9	Dibenzofuran	950		
84-66-2	Diethylphthalate	53	U	
86-73-7	Fluorene	6400	D4	
86-30-6	N-Nitrosodiphenylamine (1)	17	U	
85-01-8	Phenanthrene	20000	D6	
120-12-7	Anthracene	7700	D4	
84-74-2	Di-n-butylphthalate	53	U	
206-44-0	Fluoranthene	8800	D4	
129-00-0	Pyrene	11000	D4	
85-68-7	Butylbenzylphthalate	530	UD4	
56-55-3	Benzo(a)anthracene	4700	D4	
218-01-9	Chrysene	4900	D4	
117-81-7	bis(2-Ethylhexyl)phthalate	530	UD4	
117-84-0	Di-n-octylphthalate	53	U	
205-99-2	Benzo(b)fluoranthene	1600	D4	
207-08-9	Benzo(k)fluoranthene	910		
50-32-8	Benzo(a)pyrene	4000	D4	
193-39-5	Indeno(1,2,3-cd)pyrene	470		
53-70-3	Dibenzo(a,h)anthracene	160		
191-24-2	Benzo(g,h,i)perylene	460		

(1) - Cannot be separated from Diphenylamine
D4 RESULT REPORTED FROM A 10 FOLD DILUTION (P1242.D)
D6 RESULT REPORTED FROM A 50 FOLD DILUTION (P1268.D)

TD/RBD
1/11/00

154

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCT143R6

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909056-9

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1221

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 18 decanted: (Y/N) Y Date Extracted: 09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/06/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	16	U	
106-46-7	1,4-Dichlorobenzene	16	U	
95-50-1	1,2-Dichlorobenzene	16	U	
120-82-1	1,2,4-Trichlorobenzene	16	U	
91-20-3	Naphthalene	7000	D3	
91-57-6	2-Methylnaphthalene	1800	D3	
131-11-3	Dimethylphthalate	49	U	
208-96-8	Acenaphthylene	410		G
83-32-9	Acenaphthene	1600	D3	
132-64-9	Dibenzofuran	190		
84-66-2	Diethylphthalate	49	U	
86-73-7	Fluorene	800		
86-30-6	N-Nitrosodiphenylamine (1)	16	U	
85-01-8	Phenanthrene	3400	D3	
120-12-7	Anthracene	1000		
84-74-2	Di-n-butylphthalate	49	U	
206-44-0	Fluoranthene	1300		
129-00-0	Pyrene	1300		
85-68-7	Butylbenzylphthalate	49	U	
56-55-3	Benzo(a)anthracene	660		
218-01-9	Chrysene	690		
117-81-7	bis(2-Ethylhexyl)phthalate	49	U	
117-84-0	Di-n-octylphthalate	240	UD3	
205-99-2	Benzo(b)fluoranthene	320	UD3	
207-08-9	Benzo(k)fluoranthene	420	D3	
50-32-8	Benzo(a)pyrene	750	D3	
193-39-5	Indeno(1,2,3-cd)pyrene	510	D3	
53-70-3	Dibenzo(a,h)anthracene	320	UD3	
191-24-2	Benzo(g,h,i)perylene	720	D3	

(1) - Cannot be separated from Diphenylamine

D3 RESULT REPORTED FROM A 5 FOLD DILUTION (P1240.D)

TD 1080
1/11/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWST141R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909056-10

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1228

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 43 decanted: (Y/N) Y Date Extracted:09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/07/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	23	U	
106-46-7	1,4-Dichlorobenzene	30		
95-50-1	1,2-Dichlorobenzene	23	U	
120-82-1	1,2,4-Trichlorobenzene	23	U	
91-20-3	Naphthalene	1300		
91-57-6	2-Methylnaphthalene	390		
131-11-3	Dimethylphthalate	70	U	
208-96-8	Acenaphthylene	1000		G
83-32-9	Acenaphthene	370		
132-64-9	Dibenzofuran	270		
84-66-2	Diethylphthalate	70	U	
86-73-7	Fluorene	500		
86-30-6	N-Nitrosodiphenylamine (1)	48		
85-01-8	Phenanthrene	2600	D3	
120-12-7	Anthracene	850		
84-74-2	Di-n-butylphthalate	70	U	
206-44-0	Fluoranthene	3400	D3	
129-00-0	Pyrene	4100	D3	
85-68-7	Butylbenzylphthalate	70	U	
56-55-3	Benzo(a)anthracene	1500		
218-01-9	Chrysene	1500		
117-81-7	bis(2-Ethylhexyl)phthalate	340		E
117-84-0	Di-n-octylphthalate	70	U	
205-99-2	Benzo(b)fluoranthene	1600		
207-08-9	Benzo(k)fluoranthene	1200		
50-32-8	Benzo(a)pyrene	1500		
193-39-5	Indeno(1,2,3-cd)pyrene	490		
53-70-3	Dibenzo(a,h)anthracene	160		
191-24-2	Benzo(g,h,i)perylene	510		

(1) - Cannot be separated from Diphenylamine

D3 RESULT REPORTED FROM A 5 FOLD DILUTION (P1244.D)

TD/QBD
11/1/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.: MWST144S1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909056-11

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1229

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 62 decanted: (Y/N) Y Date Extracted: 09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/07/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	34	U	
106-46-7	1,4-Dichlorobenzene	60		
95-50-1	1,2-Dichlorobenzene	34	U	
120-82-1	1,2,4-Trichlorobenzene	34	U	
91-20-3	Naphthalene	1300		
91-57-6	2-Methylnaphthalene	570		
131-11-3	Dimethylphthalate	100	U	
208-96-8	Acenaphthylene	830		G
83-32-9	Acenaphthene	380		
132-64-9	Dibenzofuran	350	U	
84-66-2	Diethylphthalate	100	U	
86-73-7	Fluorene	500		
86-30-6	N-Nitrosodiphenylamine (1)	170	UD3	
85-01-8	Phenanthrene	1800	D3	
120-12-7	Anthracene	1100	D3	
84-74-2	Di-n-butylphthalate	530	UD3	
206-44-0	Fluoranthene	14000	D3	
129-00-0	Pyrene	11000	D4	
85-68-7	Butylbenzylphthalate	100	U	
56-55-3	Benzo(a)anthracene	2600		
218-01-9	Chrysene	5200	D4	
117-81-7	bis(2-Ethylhexyl)phthalate	6500	D4	E
117-84-0	Di-n-octylphthalate	1000	UD4	
205-99-2	Benzo(b)fluoranthene	2500	D4	
207-08-9	Benzo(k)fluoranthene	2300	D4	G
50-32-8	Benzo(a)pyrene	2300	D4	
193-39-5	Indeno(1,2,3-cd)pyrene	2000	D4	
53-70-3	Dibenzo(a,h)anthracene	1400	UD4	
191-24-2	Benzo(g,h,i)perylene	2500	D4	

(1) - Cannot be separated from Diphenylamine
D3 RESULT REPORTED FROM A 5 FOLD DILUTION (P1245.D)
D4 RESULT REPORTED FROM A 10 FOLD DILUTION (P1269.D)

TD/QBD
1/11/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 264

MWST144R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909056-12

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1248

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 60 decanted: (Y/N) Y Date Extracted:09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/07/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	32	U	
106-46-7	1,4-Dichlorobenzene	38		
95-50-1	1,2-Dichlorobenzene	32	U	
120-82-1	1,2,4-Trichlorobenzene	32	U	
91-20-3	Naphthalene	860		
91-57-6	2-Methylnaphthalene	330		
131-11-3	Dimethylphthalate	100	U	
208-96-8	Acenaphthylene	350		G
83-32-9	Acenaphthene	220		
132-64-9	Dibenzofuran	330	U	
84-66-2	Diethylphthalate	100	U	
86-73-7	Fluorene	240		
86-30-6	N-Nitrosodiphenylamine (1)	32	U	
85-01-8	Phenanthrene	920		
120-12-7	Anthracene	400		
84-74-2	Di-n-butylphthalate	100	U	
206-44-0	Fluoranthene	1900		
129-00-0	Pyrene	1700		
85-68-7	Butylbenzylphthalate	100	U	
56-55-3	Benzo(a)anthracene	620		
218-01-9	Chrysene	760		
117-81-7	bis(2-Ethylhexyl)phthalate	4800	D3	E
117-84-0	Di-n-octylphthalate	100	U	
205-99-2	Benzo(b)fluoranthene	860		
207-08-9	Benzo(k)fluoranthene	760		
50-32-8	Benzo(a)pyrene	690		
193-39-5	Indeno(1,2,3-cd)pyrene	350		
53-70-3	Dibenzo(a,h)anthracene	130	U	
191-24-2	Benzo(g,h,i)perylene	380		

(1) - Cannot be separated from Diphenylamine
D3 RESULT REPORTED FROM A 5 FOLD DILUTION (P1272.D)

TDL QBD 1/11/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWCT143S3A

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909056-21

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1253

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 50 decanted: (Y/N) Y Date Extracted:09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/08/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	26	U	
106-46-7	1,4-Dichlorobenzene	26	U	
95-50-1	1,2-Dichlorobenzene	26	U	
120-82-1	1,2,4-Trichlorobenzene	26	U	
91-20-3	Naphthalene	110000	D7	
91-57-6	2-Methylnaphthalene	14000	D4	
131-11-3	Dimethylphthalate	800	UD4	
208-96-8	Acenaphthylene	3400	D4	G
83-32-9	Acenaphthene	9900	D4	
132-64-9	Dibenzofuran	2700	UD4	
84-66-2	Diethylphthalate	800	UD4	
86-73-7	Fluorene	4100	D4	
86-30-6	N-Nitrosodiphenylamine (1)	260	UD4	
85-01-8	Phenanthrene	13000	D4	
120-12-7	Anthracene	3700	D4	
84-74-2	Di-n-butylphthalate	800	UD4	
206-44-0	Fluoranthene	12000	D4	
129-00-0	Pyrene	9400	D4	
85-68-7	Butylbenzylphthalate	800	UD4	
56-55-3	Benzo(a)anthracene	3900	D4	
218-01-9	Chrysene	4400	D4	
117-81-7	bis(2-Ethylhexyl)phthalate	800	UD4	
117-84-0	Di-n-octylphthalate	800	UD4	
205-99-2	Benzo(b)fluoranthene	3600	D4	
207-08-9	Benzo(k)fluoranthene	3700	D4	G
50-32-8	Benzo(a)pyrene	4000	D4	
193-39-5	Indeno(1,2,3-cd)pyrene	1400	D4	
53-70-3	Dibenzo(a,h)anthracene	1100	UD4	
191-24-2	Benzo(g,h,i)perylene	1600	D4	

(1) - Cannot be separated from Diphenylamine
D4 RESULT REPORTED FROM A 10 FOLD DILUTION (P1279.D)
D7 RESULT REPORTED FROM A 100 FOLD DILUTION (P1275.D)

TD/QBD
1/11/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWCT143R3A

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909056-22

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1250

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 49 decanted: (Y/N) Y Date Extracted:09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/07/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	25	U	
106-46-7	1,4-Dichlorobenzene	25	U	
95-50-1	1,2-Dichlorobenzene	25	U	
120-82-1	1,2,4-Trichlorobenzene	25	U	
91-20-3	Naphthalene	34000	D6	
91-57-6	2-Methylnaphthalene	7000	D4	
131-11-3	Dimethylphthalate	78	U	
208-96-8	Acenaphthylene	2700	D4	G
83-32-9	Acenaphthene	5300	D4	
132-64-9	Dibenzofuran	670		
84-66-2	Diethylphthalate	78	U	
86-73-7	Fluorene	2000	D4	
86-30-6	N-Nitrosodiphenylamine (1)	25	U	
85-01-8	Phenanthrene	7200	D4	
120-12-7	Anthracene	2700	D4	
84-74-2	Di-n-butylphthalate	78	U	
206-44-0	Fluoranthene	7500	D4	
129-00-0	Pyrene	8400	D4	
85-68-7	Butylbenzylphthalate	78	U	
56-55-3	Benzo(a)anthracene	3600	D4	
218-01-9	Chrysene	3800	D4	
117-81-7	bis(2-Ethylhexyl)phthalate	78	U	
117-84-0	Di-n-octylphthalate	78	U	
205-99-2	Benzo(b)fluoranthene	1600	D4	
207-08-9	Benzo(k)fluoranthene	2000		
50-32-8	Benzo(a)pyrene	4100	D4	
193-39-5	Indeno(1,2,3-cd)pyrene	1400		
53-70-3	Dibenzo(a,h)anthracene	360		
191-24-2	Benzo(g,h,i)perylene	1600		

(1) - Cannot be separated from Diphenylamine
D4 RESULT REPORTED FROM A 10 FOLD DILUTION (P1277.D)
D6 RESULT REPORTED FROM A 50 FOLD DILUTION (P1271.D)

TD/QBD
1/11/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWSB119R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909056-25

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1346

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 19 decanted: (Y/N) N Date Extracted: 09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/13/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
91-20-3	Naphthalene	70	
91-57-6	2-Methylnaphthalene	65	U
208-96-8	Acenaphthylene	120	
83-32-9	Acenaphthene	66	
86-73-7	Fluorene	73	
85-01-8	Phenanthrene	500	
120-12-7	Anthracene	220	
206-44-0	Fluoranthene	1200	
129-00-0	Pyrene	1100	D3
56-55-3	Benzo(a)anthracene	520	D3
218-01-9	Chrysene	670	D3
205-99-2	Benzo(b)fluoranthene	470	D3
207-08-9	Benzo(k)fluoranthene	500	D3
50-32-8	Benzo(a)pyrene	490	D3
193-39-5	Indeno(1,2,3-cd)pyrene	420	D3
53-70-3	Dibenzo(a,h)anthracene	330	UD3
191-24-2	Benzo(g,h,i)perylene	520	D3

G

D3 - Result reported from a 5 fold dilution (P1341.D)

TD/QBD
1/11/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWCT144R2A

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909056-27

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1251

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 61 decanted: (Y/N) Y Date Extracted: 09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/08/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	33	U	
106-46-7	1,4-Dichlorobenzene	33	U	
95-50-1	1,2-Dichlorobenzene	33	U	
120-82-1	1,2,4-Trichlorobenzene	33	U	
91-20-3	Naphthalene	2600		
91-57-6	2-Methylnaphthalene	680		
131-11-3	Dimethylphthalate	100	U	
208-96-8	Acenaphthylene	3400	D3	G
83-32-9	Acenaphthene	610		
132-64-9	Dibenzofuran	440		
84-66-2	Diethylphthalate	100	U	
86-73-7	Fluorene	1100		
86-30-6	N-Nitrosodiphenylamine (1)	33	U	
85-01-8	Phenanthrene	4400	D3	
120-12-7	Anthracene	2100		
84-74-2	Di-n-butylphthalate	100	U	
206-44-0	Fluoranthene	8900	D3	
129-00-0	Pyrene	9300	D3	
85-68-7	Butylbenzylphthalate	100	U	
56-55-3	Benzo(a)anthracene	5000	D3	
218-01-9	Chrysene	5600	D3	
117-81-7	bis(2-Ethylhexyl)phthalate	320		E
117-84-0	Di-n-octylphthalate	100	U	
205-99-2	Benzo(b)fluoranthene	2200	D4	
207-08-9	Benzo(k)fluoranthene	3100	D4	
50-32-8	Benzo(a)pyrene	5200	D4	
193-39-5	Indeno(1,2,3-cd)pyrene	1600		
53-70-3	Dibenzo(a,h)anthracene	450		
191-24-2	Benzo(g,h,i)perylene	1800		

(1) - Cannot be separated from Diphenylamine
D3 RESULT REPORTED FROM A 5 FOLD DILUTION (P1274.D)
D4 RESULT REPORTED FROM A 10 FOLD DILUTION (P1297.D)

TD/QBD
1/11/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 54

MWCT143R56

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909056-~~8~~ 9

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5618

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: ~~24~~ 18 TBJ 12/20/99 decanted: (Y/N) Y Date Extracted: 09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/09/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q		
108-95-2	Phenol	16U	E	~~18~~	U TBJ 12/20/99
100-51-6	Benzyl alcohol	32U	E	~~35~~	U TBJ 12/20/99
95-48-7	2-Methylphenol	16U	E	~~18~~	U TBJ 12/20/99
106-44-5	4-Methylphenol	16U	E	~~18~~	U TBJ 12/20/99
105-67-9	2,4-Dimethylphenol	8.0U	E	~~8.8~~	U TBJ 12/20/99
65-85-0	Benzoic acid	200U	E	~~210~~	U TBJ 12/20/99
87-86-5	Pentachlorophenol	16U	E	~~18~~	U TBJ 12/20/99

Recal based upon 18% moist

TO/QBD
1/21/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 62

MWST141R1

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909056-10

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5624

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 43 decanted: (Y/N) Y Date Extracted:09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/10/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
108-95-2	Phenol	130		E
100-51-6	Benzyl alcohol	47	U	
95-48-7	2-Methylphenol	23	U	
106-44-5	4-Methylphenol	100		
105-67-9	2,4-Dimethylphenol	12	U	
65-85-0	Benzoic acid	280	U	
87-86-5	Pentachlorophenol	67		

Ld/QBD
11/17/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCT143S3A

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909056-21

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5627

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 50 decanted: (Y/N) Y Date Extracted: 09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/10/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
108-95-2	Phenol	140		E
100-51-6	Benzyl alcohol	160		
95-48-7	2-Methylphenol	27	U	
106-44-5	4-Methylphenol	130		
105-67-9	2,4-Dimethylphenol	91		
65-85-0	Benzoic acid	320	U	
87-86-5	Pentachlorophenol	27	U	

1/17/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 119

MWSB119R1

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909056-25

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5638

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 19 decanted: (Y/N) Y Date Extracted: 09/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/10/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	110	
100-51-6	Benzyl alcohol	33	U
95-48-7	2-Methylphenol	16	U
106-44-5	4-Methylphenol	60	
105-67-9	2,4-Dimethylphenol	22	
65-85-0	Benzoic acid	200	U
87-86-5	Pentachlorophenol	47	

E

LL/aco
11/17/00

FORM 1
PEST ORGANICS ANALYSIS DATA SHEET

Client SAMPLE NO.: MWCT144E2A

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) WATER Lab Sample ID: 909056-23

Sample wt/vol: 1060 (g/mL) ML Lab File ID: RA181S27

% Moisture: _____ decanted: (Y/N)___ Date Collected: 09/23/99

Extraction: (SepF/Cont/Sonc) Date Extracted:10/07/99

Concentrated Extract Volume: 10(mL) Date Analyzed: 10/19/99

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
12674-11-2	Aroclor 1016	0.94	U
11104-28-2	Aroclor 1221	0.94	U
11141-16-5	Aroclor 1232	0.94	U
53469-21-9	Aroclor 1242	0.94	U
12672-29-6	Aroclor 1248	0.94	U
11097-69-1	Aroclor 1254	0.94	U
11096-82-5	Aroclor 1260	0.94	U

E ↓

TD/GBD
1/9/00

FORM 1
PEST ORGANICS ANALYSIS DATA SHEET

Client SAMPLE NO.: MWSB119R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909056-25

Sample wt/vol: 30.0 (g/mL) G Lab File ID: RA121S35

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 19 decanted: (Y/N) Y Date Extracted: 09/27/99

Concentrated Extract Volume: 10(mL) Date Analyzed: 10/13/99

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
72-55-9	4,4'-DDE	12		
72-54-8	4,4'-DDD	18		G
50-29-3	4,4'-DDT	4.1	U	G

TO 1880
1/9/00

FORM 1
PEST ORGANICS ANALYSIS DATA SHEET

Client SAMPLE NO. 115

MWSB121R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909056-26

Sample wt/vol: 30.0 (g/mL) G Lab File ID: RA121S36

Level: (low/med) LOW Date Collected: 09/23/99

% Moisture: 32 decanted: (Y/N) Y Date Extracted: 09/27/99

Concentrated Extract Volume: 10(mL) Date Analyzed: 10/13/99

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
72-55-9	4,4'-DDE	4.9	U	
72-54-8	4,4'-DDD	4.9	U	G
50-29-3	4,4'-DDT	4.9	U	G

TO/QBD
1/9/00

FORM 1
PEST ORGANICS ANALYSIS DATA SHEET

Client SAMPLE NO. 37

MWCT143R2A

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909056

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909056-7

Sample wt/vol: 30.0 (g/mL) G Lab File ID: RA101S23

% Moisture: 30 decanted: (Y/N) Y Date Collected: 09/23/99

Extraction: (SepF/Cont/Sonc) Date Extracted: 09/27/99

Concentrated Extract Volume: 10(mL) Date Analyzed: 10/11/99

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
118-74-1	Hexachlorobenzene	~~3.9~~	P	15.8
87-68-3	Hexachlorobutadiene	2.4	U	

FORM I Pest

RCS/QBD

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	MultiChem Analytical Services	**Service Request:**	K9906743
Project:	Middle Waterway/909056	**Date Collected:**	9/23/99
Sample Matrix:	Sediment	**Date Received:**	9/28/99

Sulfide, Total

Prep Method:	NONE	Units:	mg/Kg (ppm)
Analysis Method:	9030M	Basis:	Dry
Test Notes:			

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
MWAT046RI	K9906743-001	0.5	0.5	5	NA	9/30/99	20.3	E
MWAT041RI	K9906743-002	0.5	0.5	5	NA	9/30/99	26.5	E
Method Blank	K9906743-MB	0.5	0.5	1	NA	9/30/99	ND	

Approved By: _____ Date: 10/12/99

1A/020597p

06743WET.LJ1 - Sample 10/12/99

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RLS/QBD
12/29/99

1
INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCT143R4A

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909056

Matrix (soil/water): SEDIMENT Lab Sample ID: 909056-6

% Solids: 66.7 Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	4.1	U		P	G
7440-38-2	Arsenic	12.3			F	G
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.41	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	42.2			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	26.2		E	P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.15	U	*	CV	
7440-02-0	Nickel	12.5			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.83	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	61.4			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

RL/QBD

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCT143R2A

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909056

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909056-7

% Solids: 67.4

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	14.5			P	
7440-38-2	Arsenic	28.6			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	2.8			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	8550			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	1180		E	P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.62		*	CV	E
7440-02-0	Nickel	61.6			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	1.8			P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	1860			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

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12/22/99

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCT143R3A

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909056

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909056-22

% Solids: 51.5

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	5.1	U		P	
7440-38-2	Arsenic	10.8			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.93			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	425			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	205		E	P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.46		*	CV	E
7440-02-0	Nickel	33.2			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	1.0	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	418			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: GREEN Clarity After: _____ Artifacts: _____

Comments:

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ed/QBD
12/22/99

TBJ 12/20/99 04

MWCT143R6

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

~~CLIENT ID~~

TBJ 12/14

~~MWCT143R5~~ ~~05~~

TBJ

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909056

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909056-~~98~~ 9

TBJ 12/2/99 TBJ 12/20/99 TBJ 12/2/99

% Solids: TBJ 12/2/99 ~~81.2~~ ~~76.6~~ TBJ 12/2/99 81.2 TBJ 12/20/99

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony	3.2	U		P
7440-38-2	Arsenic	1.6			F
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium	0.32	U		P
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper	18.8			P
7439-89-6	Iron				NR
7439-92-1	Lead	3.6			P E
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.12	U	*	CV
7440-02-0	Nickel	7.0			P
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver	0.64	U		P
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc	22.9			P
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

TD/QBD 1/7/00

FORM I - IN

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

TBS 12/20/99 05

MWCT143R5

CLIENT ID ~~TBS~~ 12/14/99

~~MWCT143R5~~ 6

8

TBS 12/14/99

TBS 12/20/99

TBS 12/2/99

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909056

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909056-8

% Solids: TBS 12/14/99 ~~76.6~~ ~~81.2~~ TBS 12/2/99 76.6 TBS 12/20/99

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony	3.3	U		P
7440-38-2	Arsenic	2.2			F
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium	0.33	U		P
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper	33.9			P
7439-89-6	Iron				NR
7439-92-1	Lead	8.9			P E
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.13	U	*	CV
7440-02-0	Nickel	9.1			P
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver	0.66	U		P
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc	33.6			P
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

TD/QBO 1/7/00

INORGANICS SW-846

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1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCT143S3A

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909056

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909056-21

% Solids: 53.6

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	4.9	U		P	
7440-38-2	Arsenic	11.1			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.83			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	293			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	172		E	P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.32		*	CV	E
7440-02-0	Nickel	24.8			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.98	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	350			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

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FORM I - IN

12/QBD
12/22/99

INORGANICS SW-846

1
INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCT144R2A

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909056

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909056-27

% Solids: 39.1

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	6.6	U		P	
7440-38-2	Arsenic	27.3		W	F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	2.2			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	267			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	283		E	P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	2.6		*	CV	E
7440-02-0	Nickel	45.0			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	1.3	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	341			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

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12/22/99

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWST141RI

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909056

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909056-10

% Solids: 55.3

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic				NR	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.74		*	CV	E
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

RL/QBD
12/22/99

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWST144R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909056

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909056-12

% Solids: 35.9

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	7.6	U		P	
7440-38-2	Arsenic	18.6			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	1.1			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	222			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	172		E	P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.87		*	CV	E
7440-02-0	Nickel	14.3			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	1.5	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	214			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

CL/QBD
12/22/99

INORGANICS SW-846

1
INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWST144S1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909056

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909056-11

% Solids: 33.6

Date Received: 09/23/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	7.8	U		P	
7440-38-2	Arsenic	19.6			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.79			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	236			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	184		E	P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.80		*	CV	E
7440-02-0	Nickel	14.5			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	225			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

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ld/QBD
12/22/99

Quality By Design

Laboratory Quality Assurance Consulting

29 Shipman Street
Suite 101
Hilo, Hawaii 96720

Phone: (808) 969-9424
Fax: (808) 969-9094
e-mail: qbdhilo@gte.net

EPA Level 2
DATA VALIDATION REPORT

Project Name: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 24, 1999
SDG: 909059

Prepared for

Foster Wheeler Environmental
10900 NE 8th St.
Bellevue, WA 98004

Purchase Order No. 022828
QBD Job No. 270C

Reviewed and approved,

Lorraine Davis 1/19/00

Lorraine L. Davis, Owner Date

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Attachments

Attachment 1 Data Flag Definitions
Attachment 2 Summary Table of Data Qualifier Flags
Attachment 3 Revised Laboratory Forms

A. Introduction

Laboratory Sciences, Inc., d.b.a. *Quality by Design* (QBD), has completed an EPA Level 2 Data Validation on the submitted data packages in accordance with P.O. Number 022828.

The reporting format and criteria for recommending data qualifying flags for this data set are described in the EPA *"Functional Guidelines for Evaluating Organics Analyses"* and *"Functional Guidelines for Evaluating Inorganics Analyses,"* as revised, 1994; and *"Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound"* ("PSEP Protocols"), May 1997; or using criteria listed in the method referenced. Data may be qualified for any of the following reasons:

1. By the laboratory prior to receipt by the reviewer
2. Because of laboratory deviation from the designated method
3. Because the data may not meet the criteria listed in the reference above
4. By the professional judgment of the reviewer.

The data set consists of several data packages from Multichem Analytical Services in Renton, Washington, and contains data for the samples shown in Table 1. The data reviewers and senior reviewers are shown in Table 2.

Each data set includes an analytical data package for each sample, copies of the completed chain-of-custody (COC) forms, and a quality control (QC) data package. The analytical data package includes analytical results, blank sample results, both laboratory and client sample identifications, appropriate dates but not times, method reporting limits, method references, surrogate recoveries as appropriate, the laboratory's name and address, and the initials of the person releasing the data. The custody forms include the receipt of the sample but not the laboratory's internal tracking. The QC data package includes a tabular list of the laboratory's sample identification, spiking concentrations, recoveries, percentage calculations, and acceptance windows.

Raw data were provided which includes chromatograms, instrument print outs, injection logs, digestion/preparation logs.

This data validation report consists of several sections, each of which are formatted to follow Functional Guidelines, but which also include subsections discussing QBD contacts with the laboratory, other comments, and a summary table of data qualifiers.

Table 1. Sample Identification and Analysis

Sample Identification	Laboratory Identification	Methods 8081/8082	Method 8270	Method 6010/7000	Method 9060	Grain Size	Conventionals
MWSB124S1	909059-2			X	X	X	
MWST138R1	909059-5	X	X	X	X	X	
MWCT142R1	909059-6	X	X	X	X	X	
MWRH215R1B	909059-8				X	X	X

Key:
Method 8270 = Semivolatile organic compounds by gas chromatography/mass spectroscopy
Method 8081/8082 = Pesticides and polychlorinated biphenyls (PCB) by gas chromatography
Method 6010 & 7000 = Metals by inductively coupled plasma (ICP) and cold vapor atomic absorption (CVAA)
Method 9060 = Total organic carbon (TOC)
Conventionals = Sulfide, ammonia, and percent moisture

Table 2. Data Package, Reviewer, and Senior Reviewer

Analysis	Number of Pages	Reviewer	Senior Reviewer
SVOC	281	Debbie Copsey	Lorraine Davis
Pest/PCB	423	Randi Schneider	Lorraine Davis
Conventionals	89	Lorraine Davis	Thomas Davis
Metals	209	Lorraine Davis	Thomas Davis

B. Chain-of-Custody

The analytical data package was reviewed and compared against the chain-of-custody (COC) form. No data are missing from the COC forms and no transcription errors in accuracy were found. All tests requested on the COC were performed.

Discussion: The grain size analysis was subcontracted to Rosa Environmental and Geotechnical Laboratory in Seattle, Washington. The sulfide analysis was subcontracted to Columbia Analytical Services, Inc. in Kelso, Washington.

C. Review of GC/MS Semivolatiles Analyses

EPA Method 8270

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. GC/MS Tuning

All decafluorotriphenylphosphine (DFTPP) tune criteria were met for the initial and continuing calibration for all dates of sample analysis.

3. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No target compound list (TCL) analytes had percent relative standard deviations (%RSD) greater than allowed by the method for the initial calibration or percent difference for the continuing calibration checks. All system performance check compound (SPCC) and calibration check compound (CCC) criteria were met.

4. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit, except as noted below.

Table 3. SVOC Data Qualifiers Due to Blank Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWST138R1	Bis(2-ethylhexyl)phthalate	Blank Contamination	700 B
MWST142R1	Bis(2-ethylhexyl)phthalate	Blank Contamination	820 B

Discussion: Bis(2-ethylhexyl)phthalate was detected at a concentration of 75 µg/kg in the method blank associated with all the samples. The associated Samples MWST138R1 and MWST142R1 have been flagged with "B" to indicate that the analyte was detected in the samples and in the method blank.

5. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria, except as noted below.

Discussion: In Samples MWST138R1 and MWST142R1, a single surrogate was out of criteria. No data qualifier flags are recommended because all other surrogates were in criteria.

6. Laboratory Control Standards

The laboratory analyzed a second source sample with the analytical batch. The laboratory referred to this sample as a blank spike/blank spike duplicate (BS/BSD) rather than a laboratory control standard (LCS). Any anomalies or comments regarding the second source results are addressed in the next section.

7. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

Matrix spikes (MS) and matrix spike duplicates (MSD) were analyzed as required by the referenced method and all percent recoveries and relative percent differences (RPD) were within QAPP criteria, except as noted below.

Discussion: The percent recovery for pentachlorophenol was out of criteria in the MS. Since the BS/BSD results were in criteria, no data qualifier flags are recommended.

The percent recovery for 2,4-dimethylphenol was out of criteria at zero percent in the BS/BSD. The laboratory had previously noted this problem and found the root cause to be the medium used for the blank spike (Ottawa sand). Given that this has been identified as a historical issue, the reviewer concurs with the laboratory's action to use the MS/MSD results as their QC check for precision and accuracy. Since the MS/MSD results were in criteria, no data qualifier flags are recommended.

MS and MSD recoveries for phenol and pentachlorophenol were out of criteria due to high concentrations of analytes in the original sample. Since all other QC checks were in criteria, no data qualifier flags are recommended.

8. Internal Standards Performance for Samples

All internal standard areas were within the required control limits and had acceptable retention times, except as noted below.

Discussion: The internal standard perylene-d_{12} was out of the acceptance criteria of –50 to +100 percent at 110 percent. Since the analytes associated with the internal standard were reported from a dilution, no data qualifier flags are recommended.

9. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWSB124R1 and MWSB124S1 were identified as field duplicates. This analysis was not performed on the samples.

10. Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

11. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

12. TCL Compound Identification

All target compound identifications met the criteria for retention times and peak identification of the referenced method.

13. Tentatively Identified Compounds

No TICs were reported with this data set.

14. Laboratory Contact

There was no verbal or written communication with the laboratory.

15. Other Comments

None.

16. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

D. Review of Pesticides/PCBs Analyses

EPA Method 8081/8082

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The analysis of the target compounds hexachlorobenzene and hexachlorobutadiene was performed using Method 8081 instead of the requested Method 8270. No data qualifier flags are recommended since the method utilized is an approved method by PSEP.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No target compound list TCL analytes had %RSD greater than that allowed for the initial calibration or percent difference for the continuing calibration checks, except as noted below.

Table 4. PCB Data Qualifiers Due to Calibration Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWST142R1	Aroclor 1260	Continuing Calibration % D >15	60 L
MWST142R1	Total PCBs	Continuing Calibration % D >15	60 L

Discussion: The continuing calibrations for the target compound hexachlorobutadiene had percent differences of 29.9 and 44.8, which is out of the criteria of 15 percent. No data flags were used to qualify the sample results since this compound was not detected in the samples and both the blank spike and MS/MSD results were acceptable.

The continuing calibration for PCBs (Aroclors 1016 and 1260) associated with Sample MWST142R1 had average percent differences of 26 and 16.6, which was out of the criteria of 15 percent. Aroclor 1260 was detected in the sample and the results have been flagged "L" to indicate the value is less than the maximum shown.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria, except as noted below.

Discussion: A single matrix spike for 4,4'-DDT was out of criteria but all other accuracy measurements (e.g., BSs, MSs, surrogates and calibration verifications) were acceptable, and since 4,4'-DDT was not a target compound, no data qualifier flags are recommended

6. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWSB124R1 and MWSB124S1 were identified as field duplicates. This analysis was not performed on the samples.

7. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

8. TCL Compound Identification

All target compound identifications met the criteria for retention times and peak identification of the referenced method.

9. Compound Quantitation and Reported Detection Limits

Quantitation was reviewed against contract requirements to determine that results were reported on a dry weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. Quantitation from the primary and confirmatory columns was reviewed, and the proper result was reported. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

10. Laboratory Contact

There was no verbal or written communication with the laboratory.

11. Other Comments

None.

12. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

E. Review of Metals Analyses

EPA Method 6010/7000

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The Cover Page –IN was not signed. No action is recommended since there is a laboratory representative's signature for the entire SDG delivered to Foster Wheeler Environmental.

2. Initial and Continuing Calibration

All initial and continuing calibration Quality Control criteria were met. No target compound list (TCL) analytes had correlation coefficients greater than allowed by the method, and all percent differences for the continuing calibration verifications were acceptable.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. ICP Interference Check Standard

An interference check sample (ICS) was analyzed at a frequency required by the referenced method and was within established criteria.

5. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within QAPP criteria, except as noted below.

Discussion: Arsenic, antimony, lead, nickel, and zinc were out of the method criteria of 90 to 110 percent in the LCS. However, PSDDA allows 80 to 120 percent recovery of a second source check sample. Since all five analytes were within PSDDA acceptance criteria, no data qualifier flags are recommended.

6. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and RPDs were within QAPP criteria, except as noted below.

Table 5. Metal Data Qualifiers Due to MS/MSD Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSB124S1	Antimony	MS	88.7 G
MWST142R1	Antimony	MS	5.5 G

Discussion: Antimony was low and out of criteria for accuracy (percent recovery) for the MS/MSD pair. Normally, because the LCS was acceptable, only the results for this analyte in the sample that was spiked would be flagged. However, because all of the matrix spikes in all of the SDGs for this project have been out of criteria, all samples which were analyzed for antimony have been flagged "G" or "UG" to indicate that the value was greater than the minimum shown.

7. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWSB124R1 and MWSB124S1 were identified as field duplicates. Test results were reviewed, and where positive results were found, the relative percent difference (RPD) was calculated. All analytes, except those listed in the table below, were reported as non-detect.

Table 6. Metal Field Duplicates and RPD

Compound	MWSB124S1 Result	MWSB124R1 Result	RPD
Antimony	88.7	65.2	30.5
Arsenic	126	148	16.1
Copper	511	538	5.1
Lead	398	413	3.7
Mercury	2.6	3.0	14.3
Nickel	68.7	84.0	20.0
Zinc	2840	4770	50.7

Discussion: The high RPD for this analysis may be due to sample inhomogeniety or special circumstances during the sampling process. Because the person who performed the sampling has information that is not available to the data validator, such as sampling conditions or problems with the sampling equipment, the client typically performs any flagging and data qualification based upon field duplicates.

8. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all relative percent differences (RPD) were within QAPP criteria, except as noted below.

Table 7. Metal Data Qualifiers Due to Sample Duplicate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSB124S1	Mercury	Precision	2.6 E
MWST138R1	Mercury	Precision	0.40 E
MWST142R1	Mercury	Precision	0.80 E

Discussion: Mercury was out of criteria at 58.1 RPD in the sample duplicate set. The associated results for Samples MWSB124S1, MWST138R1, and MWST142R1 have been flagged "E" to indicate an estimated value.

9. ICP Serial Dilution

Samples that were a factor of 50 above the instrument detection limit (IDL) for the analyte were diluted five-fold and were within criteria required by the referenced method, except as noted below.

Table 8. Metal Data Qualifiers Due to ICP Serial Dilution Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSB124S1	Nickel	Serial Dilution	68.7 E
MWST142R1	Nickel	Serial Dilution	26.9 E

Discussion: A serial dilution for nickel has a percent difference of 24.0 percent, which is greater than the acceptance criteria of ±10 percent. Positive results have been flagged "E" to indicate an estimated value.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract, except as noted below.

Discussion: The reporting limits for cadmium and lead failed to meet the CRDL of 0.3 and 0.5 mg/kg that was listed in the QAPP. However, most field samples had positive results. For samples that were non-detect, the laboratory's reporting limits of 2.2 and 1.5 mg/kg were less than the Sediment Quality Standard Criteria of 5.1 and 450 mg/kg and the Sediment Impact Zone and Clean-up Criteria of 6.7 and 530 mg/kg, and no data qualifier flags are recommended.

11. Graphite Furnace Atomic Absorption Analysis

All special criteria for graphite furnace atomic absorption (GFAA) analysis were performed at a frequency required by the referenced method and was within established criteria.

12. Laboratory Contact

There was no verbal or written communication with the laboratory.

13. Other Comments

None.

14. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

F. Review of Conventional Analyses

EPA Method 9060, Grain Size, Percent Moisture, and PSEP Sulfides

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met, including the number of standards used and the correlation coefficients. All continuing calibration criteria, including frequency of analysis and percent recovery were met.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within laboratory or method criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and RPD were within laboratory or method criteria.

6. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPD were within laboratory or method criteria, except as noted below.

Table 9. Inorganic Data Qualifiers Due to Duplicate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWRH215R1B	Sulfide	Precision	224 E

Discussion: Sulfide was out of criteria in the sample duplicate set. The associated results for Sample MWRH215R1B has been flagged "E" to indicate an estimated value.

7. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWSB124R1 and MWSB124S1 were identified as field duplicates. Because Sample MWSB124R1 was part of SDG 909053, the test results were reviewed in the report for that SDG.

8. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

9. Laboratory Contact

There was no verbal or written communication with the laboratory.

10. Other Comments

None.

11. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

Attachment 1 Puget Sound Estuary Program Data Qualifier Definitions

Used for both organics and inorganic analyses

B = Analyte detected in samples and in method blank

C = Combined with unresolved substances

E = Estimated

G = Value greater than minimum shown

K = Detected at less than the maximum shown

L = Value less than the maximum shown

M = Value is a mean

Q = Questionable value

R = Rejected or unusable value

T = Detected below the quantification limit shown

U = Undetected at the detection limit shown

Z = Blank corrected

Attachment 2 Summary Table of Data Qualifier Flags

Foster Wheeler Environmental
Project: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 24, 1999

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWST138R1	Bis(2-ethylhexyl)phthalate	Blank Contamination	700 B
MWST142R1	Bis(2-ethylhexyl)phthalate	Blank Contamination	820 B
MWST142R1	Aroclor 1260	Continuing Calibration % D >15	60 L
MWST142R1	Total PCBs	Continuing Calibration % D >15	60 L
MWSB124S1	Antimony	MS	88.7 G
MWST142R1	Antimony	MS	5.5 G
MWSB124S1	Mercury	Precision	2.6 E
MWST138R1	Mercury	Precision	0.40 E
MWST142R1	Mercury	Precision	0.80 E
MWSB124S1	Nickel	Serial Dilution	68.7 E
MWST142R1	Nickel	Serial Dilution	26.9 E
MWRH215R1B	Sulfide	Precision	224 E

Attachment 3 Revised Laboratory Forms

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWST138R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909059

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909059-5

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1299

Level: (low/med) LOW Date Collected: 09/24/99

% Moisture: 39 decanted: (Y/N) Y Date Extracted: 09/29/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/09/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	21	U	
106-46-7	1,4-Dichlorobenzene	21	U	
95-50-1	1,2-Dichlorobenzene	21	U	
120-82-1	1,2,4-Trichlorobenzene	21	U	
91-20-3	Naphthalene	420		
91-57-6	2-Methylnaphthalene	150		
131-11-3	Dimethylphthalate	66	U	
208-96-8	Acenaphthylene	280		
83-32-9	Acenaphthene	120		
132-64-9	Dibenzofuran	220	U	
84-66-2	Diethylphthalate	66	U	
86-73-7	Fluorene	120		
86-30-6	N-Nitrosodiphenylamine (1)	21	U	
85-01-8	Phenanthrene	520		
120-12-7	Anthracene	260		
84-74-2	Di-n-butylphthalate	66	U	
206-44-0	Fluoranthene	1200		
129-00-0	Pyrene	860		
85-68-7	Butylbenzylphthalate	66	U	
56-55-3	Benzo(a)anthracene	490		
218-01-9	Chrysene	68	J	
117-81-7	bis(2-Ethylhexyl)phthalate	700	B	B
117-84-0	Di-n-octylphthalate	330	UD3	
205-99-2	Benzo(b)fluoranthene	340	JD3	
207-08-9	Benzo(k)fluoranthene	300	JD3	
50-32-8	Benzo(a)pyrene	450	D3	
193-39-5	Indeno(1,2,3-cd)pyrene	330	JD3	
53-70-3	Dibenzo(a,h)anthracene	430	UD3	
191-24-2	Benzo(g,h,i)perylene	400	JD3	

(1) - Cannot be separated from Diphenylamine

D3 - Results reported from a 5 fold dilution (P1522.D)

RS 11/09/99
ed/QBD 1/10/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWST142R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909059

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909059-6

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1300

Level: (low/med) LOW Date Collected: 09/24/99

% Moisture: 53 decanted: (Y/N) Y Date Extracted: 09/29/99 OK

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/09/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	28	U	
106-46-7	1,4-Dichlorobenzene	28	U	
95-50-1	1,2-Dichlorobenzene	28	U	
120-82-1	1,2,4-Trichlorobenzene	28	U	
91-20-3	Naphthalene	3000	D3	
91-57-6	2-Methylnaphthalene	850		
131-11-3	Dimethylphthalate	85	U	
208-96-8	Acenaphthylene	2700	D3	
83-32-9	Acenaphthene	580		
132-64-9	Dibenzofuran	370		
84-66-2	Diethylphthalate	85	U	
86-73-7	Fluorene	520		
86-30-6	N-Nitrosodiphenylamine (1)	28	U	
85-01-8	Phenanthrene	5500	D3	
120-12-7	Anthracene	1400		
84-74-2	Di-n-butylphthalate	85	U	
206-44-0	Fluoranthene	7800	D3	
129-00-0	Pyrene	4800	D3	
85-68-7	Butylbenzylphthalate	85	U	
56-55-3	Benzo(a)anthracene	3100	D3	
218-01-9	Chrysene	3900	D3	
117-81-7	bis(2-Ethylhexyl)phthalate	820	B	B
117-84-0	Di-n-octylphthalate	85	U	
205-99-2	Benzo(b)fluoranthene	2500	D3	
207-08-9	Benzo(k)fluoranthene	2400	D3	
50-32-8	Benzo(a)pyrene	3100	D3	
193-39-5	Indeno(1,2,3-cd)pyrene	810		
53-70-3	Dibenzo(a,h)anthracene	270		
191-24-2	Benzo(g,h,i)perylene	870		

(1) - Cannot be separated from Diphenylamine

D3-Result reported from a 5 fold dilution (P1523.D)

PAS 11/09/99

11/10/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Client SAMPLE NO.

MWST142R1

Lab Name: MULTICHEM Contract:

Lab Code: Case No.: SAS No.: SDG No.: 909059

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909059-6

Sample wt/vol: 30.0 (g/mL) G Lab File ID: RA151E06

Level: (low/med) LOW Date Collected: 09/24/99

% Moisture: 53 decanted: (Y/N) Y Date Extracted: 09/30/99

Concentrated Extract Volume: 10000(uL) Date Analyzed: 10/15/99

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
12674-11-2	Aroclor-1016	71	U	
11104-28-2	Aroclor-1221	71	U	
1114-16-5	Aroclor-1232	71	U	
53469-21-9	Aroclor-1242	71	U	
12672-29-6	Aroclor-1248	71	U	
11097-69-1	Aroclor-1254	71	U	
11096-82-5	Aroclor-1260	60	J	L
----------	Total Aroclor Concentration	60	J	L

RCS/QBD
1/10/00

INORGANICS SW-846

00001

1

CLIENT ID

INORGANIC ANALYSIS DATA SHEET

MWSB124S1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909059

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909059-2

% Solids: 59.0

Date Received: 09/24/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	88.7			P	G
7440-38-2	Arsenic	126			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	2.2	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	511			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	398			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	2.6		*	CV	E
7440-02-0	Nickel	68.7			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.86	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	2840			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: GREEN Clarity After: _____ Artifacts: _____

Comments:

_____

_____

_____

_____

RCS/QBD
1/10/00

INORGANICS SW-846

00002

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWST138R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909059

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909059-5

% Solids: 53.3

Date Received: 09/24/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic				NR	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.40		*	CV	E
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

4D/GBD
11/2/00

INORGANICS SW-846

0C003

1

CLIENT ID

INORGANIC ANALYSIS DATA SHEET

MWST142R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909059

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909059-6

% Solids: 50.0

Date Received: 09/24/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	5.5			P	G
7440-38-2	Arsenic	20.6			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	2.6			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	333			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	272			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.80		*	CV	E
7440-02-0	Nickel	26.9			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	1.1	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	345			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

RLS/QSD
1/10/00

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	MultiChem Analytical Services	**Service Request:**	K9906742
Project:	Middle Waterway/909059	**Date Collected:**	9/24/99
Sample Matrix:	Sediment	**Date Received:**	9/28/99

Sulfide, Total

Prep Method:	NONE	Units:	mg/Kg (ppm)
Analysis Method:	PSEP	Basis:	Dry
Test Notes:			

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
MWRH215RIB	K9906742-001	0.8	0.8	1	NA	9/29/99	224	E
Method Blank	K9906742-MB	0.8	0.8	1	NA	9/29/99	ND	

Approved By: _____ Date: 10/12/99

IA/020597p

Quality By Design

Laboratory Quality Assurance Consulting

29 Shipman Street
Suite 101
Hilo, Hawaii 96720

Phone: (808) 969-9424
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e-mail: qbdhilo@gte.net

EPA Level 2
DATA VALIDATION REPORT

Project Name: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 27, 1999
SDG: 909062

Prepared for

Foster Wheeler Environmental
10900 NE 8th St.
Bellevue, WA 98004

Purchase Order No. 022828
QBD Job No. 270D

Reviewed and approved,

Lorraine Davis 1/19/00

Lorraine L. Davis, Owner Date

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Attachment 1 Data Flag Definitions
Attachment 2 Summary Table of Data Qualifier Flags
Attachment 3 Communications with the Laboratory
Attachment 4 Revised Laboratory Forms

A. Introduction

Laboratory Sciences, Inc., d.b.a. *Quality by Design* (QBD), has completed an EPA Level 2 Data Validation on the submitted data packages in accordance with P.O. Number 022828.

The reporting format and criteria for recommending data qualifying flags for this data set are described in the EPA *"Functional Guidelines for Evaluating Organics Analyses"* and *"Functional Guidelines for Evaluating Inorganics Analyses,"* as revised, 1994; and *"Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound"* ("PSEP Protocols"), May 1997; or using criteria listed in the method referenced. Data may be qualified for any of the following reasons:

1. By the laboratory prior to receipt by the reviewer
2. Because of laboratory deviation from the designated method
3. Because the data may not meet the criteria listed in the reference above
4. By the professional judgment of the reviewer

The data set consists of one data package from Multichem Analytical Services in Renton, Washington, and contains data for the samples shown in Table 1. The data reviewer and senior reviewers are shown in Table 2.

Each data set includes an analytical data package for each sample, copies of the completed chain-of-custody (COC) forms, and a quality control (QC) data package. The analytical data package includes analytical results, blank sample results, both laboratory and client sample identifications, appropriate dates but not times, method reporting limits, method references, surrogate recoveries as appropriate, the laboratory's name and address, and the initials of the person releasing the data. The custody forms include the receipt of the sample but not the laboratory's internal tracking. The QC data package includes a tabular list of the laboratory's sample identification, spiking concentrations, recoveries, percentage calculations, and acceptance windows.

Raw data were provided which includes chromatograms, instrument print outs, injection logs, digestion/preparation logs.

This data validation report consists of several sections, each of which are formatted to follow Functional Guidelines, but which also include subsections discussing QBD contacts with the laboratory, other comments, and a summary table of data qualifiers.

Table 1. Sample Identification and Analysis

Sample Identification	Laboratory Identification	Methods 8081/8082	Method 8270	Method 6010/7000	Method 9060	Grain Size	Conventionals
MWAS037R1	990962-1				X	X	X
MWAS034R1	990962-2				X	X	X
MWSS115R1	990962-3	X	X	X	X	X	
MWSS117R1	990962-4	X	X	X	X	X	
MWSS126R1	990962-5			X	X	X	
MWSS126S1	990962-6			X	X	X	
MWSS127R1	990962-7	X	X	X	X	X	
MWSS137R1	990962-9	X	X	X	X	X	

Key:
Method 8270 = Semivolatile organic compounds by gas chromatography/mass spectroscopy
Method 8081/8082 = Pesticides and polychlorinated biphenyls (PCB) by gas chromatography
Method 6010 & 7000 = Metals by inductively coupled plasma (ICP) and cold vapor atomic absorption (CVAA)
Method 9060 = Total organic carbon (TOC)
Conventionals = Sulfide, ammonia, and percent moisture

Table 2. Data Package, Reviewer, and Senior Reviewer

Analysis	Number of Pages	Reviewer	Senior Reviewer
Pest/PCB	437	Randi Schneider	Lorraine L. Davis
SVOC	608	Debbie Copsey Lorraine L. Davis	Thomas S. Davis
Metals	217	Lorraine L. Davis	Thomas S. Davis
Conventionals	76	Randi C. Schneider	Lorraine L. Davis

B. Chain-of-Custody

The analytical data package was reviewed and compared against the chain-of-custody (COC) forms. No data are missing from the COC forms and no transcription errors in accuracy were found. All tests requested on the COC were performed.

Discussion: The grain size analysis was subcontracted to Rosa Environmental and Geotechnical Laboratory in Seattle, Washington. The sulfide analysis was subcontracted to Columbia Analytical Services, Inc. in Kelso, Washington.

C. Review of GC/MS Semivolatiles Analyses
EPA Method 8270

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The base neutral fraction analyses were added to the work order after the samples had been logged into the laboratory system, and the extraction for this analyses occurred after the 14-day holding time. As stated in the case narrative, the samples were frozen upon receipt and then thawed and extracted. PSDDA recognizes a holding time of one year for sediments which have been frozen. When the samples are thawed, Method 8270 recognizes a 14-day holding time to extraction. Since the request for analysis occurred during the analytical process for the SDG and since the samples were frozen until extraction, no data qualifier flags are recommended.

2. GC/MS Tuning

All decafluorotriphenylphosphine (DFTPP) tune criteria were met for the initial and continuing calibration for all dates of sample analysis.

3. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No target compound list (TCL) analytes had percent relative standard deviations (%RSD) greater than allowed by the method for the initial calibration or percent difference for the continuing calibration checks. All system performance check compound (SPCC) and calibration check compound (CCC) criteria were met, except as noted below.

Table 3. SVOC Data Qualifiers Due to Calibration Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSS115R1	Acenaphthylene	Continuing Calibration %D >20	600 G

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSS115R1	di-n-Butylphthalate	Continuing Calibration %D >20	56 UG
MWSS115R1	Butylbenzylphthalate	Continuing Calibration %D >20	56 UG
MWSS115R1	bis(2-Ethylhexyl)phthalate	Continuing Calibration %D >20	820 E
MWSS115R1	di-n-Octylphthalate	Continuing Calibration %D >20	56 UG
MWSS117R1	Acenaphthylene	Continuing Calibration %D >20	480 G
MWSS117R1	di-n-Butylphthalate	Continuing Calibration %D >20	54 UG
MWSS117R1	Butylbenzylphthalate	Continuing Calibration %D >20	330 G
MWSS117R1	bis(2-Ethylhexyl)phthalate	Continuing Calibration %D >20	4000 E
MWSS117R1	di-n-Octylphthalate	Continuing Calibration %D >20	54 UG
MWSS117R1	Benzo(k)fluoranthene	Continuing Calibration %D >20	1800 G
MWSS126R1	Acenaphthylene	Continuing Calibration %D >20	480 G
MWSS126S1	Acenaphthylene	Continuing Calibration %D >20	580 G
MWSS137R1	Acenaphthylene	Continuing Calibration %D >20	640 G
MWSS137R1	di-n-Butylphthalate	Continuing Calibration %D >20	69 UG
MWSS137R1	Butylbenzylphthalate	Continuing Calibration %D >20	340 UG
MWSS137R1	di-n-Octylphthalate	Continuing Calibration %D >20	69 UG
MWSS137R1	Benzo(k)fluoranthene	Continuing Calibration %D >20	810 E
MWSS137R1	Benzo(k)fluoranthene	Continuing Calibration %D >20	1100 G
MWSS127R1	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	460 E
MWSS127R1	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	2100 UE
MWSS127R1	Benzo(g,h,i)perylene	Continuing Calibration %D >20	420 E
MWSS117R1	bis(2-Ethylhexyl)phthalate	Initial Calibration %RSD >15	4000 E

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSS115R1	bis(2-Ethylhexyl)phthalate	Initial Calibration %RSD >15	820 E
MWSS137R1	bis(2-Ethylhexyl)phthalate	Initial Calibration %RSD >15	810 E
MWSS115R1	Pentachlorophenol	Continuing Calibration %D >20	290 G
MWSS117R1	Pentachlorophenol	Continuing Calibration %D >20	640 G
MWSS137R1	Pentachlorophenol	Continuing Calibration %D >20	44 G

Discussion: The initial calibration for the target compound bis(2-ethylhexyl)phthalate had a RSD of 15.2, which is out of the criteria of 15 percent. The associated results in Samples MWSS137R1, MWSS115R1, and MWSS117R1 have been flagged with "E" to indicate an estimated value.

The continuing calibration for several target compounds had percent differences which were out of the criteria of <20 percent. The associated results in Samples MWSS115R1, MWSS117R1, MWSS126R1, MWSS126S1, and MWSS137R1 have been flagged with "G" and "UG" to indicate that the value was greater than the minimum shown, except for bis(2-ethylhexylphthalate), which has been flagged "E" to indicate an estimated value. "G" flags could not be assigned because the initial calibration indicated a low bias and the continuing calibration indicated a high bias.

4. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit, except as noted below.

Discussion: Bis(2-ethylhexyl)phthalate was detected in the method blank associated with Samples MWSS115R1, MWSS137R1, and MWSS117R1. Since all sample results were greater than ten times the blank value, no data qualifier flags are recommended.

5. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria, except as noted below.

Discussion: In the matrix spike duplicate, a single surrogate was out of criteria. No data qualifier flags are recommended because all other surrogates in the field samples were in criteria.

The surrogate percent recoveries for nitrobenzene-d_5, 2-fluorobiphenyl, and 1,2-dichlorobenzene-d_4 were out of the QAPP acceptance criteria for Samples MWSS117R1DL2 and MW115R1DL2 due to large dilutions. Since all other QC checks are in criteria, no data qualifier flags are recommended.

In Samples MWSS115R1, MWSS137R1, MWSS115R1MS, and MWSS115R1MSD, a single surrogate was out of criteria. No data qualifier flags are recommended because all other surrogates were in criteria.

6. Laboratory Control Standards

The laboratory analyzed a second source sample with the analytical batch. The laboratory referred to this sample as a blank spike/blank spike duplicate (BS/BSD) rather than a laboratory control standard (LCS). Any anomalies or comments regarding the second source results are addressed in the next section.

7. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and relative percent differences (RPD) were within QAPP criteria, except as noted below.

Table 4. SVOC Data Qualifiers Due to MS/MSD Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSS115R1	Phenol	MS/MSD, BS/BSD	100 E
MWSS115R1	4-Methylphenol	MS/MSD	73 G
MWSS117R1	Phenol	MS/MSD, BS/BSD	290 E
MWSS137R1	Phenol	MS/MSD, BS/BSD	96 E

Discussion: A single BS for n-nitroso-di-phenylamine was out of criteria, but all other accuracy measurements (e.g., MS/MSD, surrogates and calibration verifications) were acceptable and no data qualifying flags are recommended.

MS and MSD recoveries for several analytes were out of criteria due to high concentrations of analytes in the original sample or due to significant matrix interferences that were obvious on the chromatogram. Since all other QC checks were in criteria, no data qualifier flags are recommended.

Phenol was out of criteria for accuracy (percent recovery) for both the MS/MSD and BS/BSD pair. The MS/MSD recoveries were low and the BS/BSD recoveries were high. The associated results in MWSS115R1, MWSS117R1, and MWSS137R1 have been flagged with "E" to indicate an estimated result.

4-Methylphenol was out of criteria for accuracy for the MS/MSD pair. Since the recovery was acceptable in the BS/BSD pair, only the results for this compound in

the sample spiked has been flagged with "G" to indicate that the value is greater than the minimum shown.

A MS spike for pentachlorophenol was out of criteria but all other accuracy measurements (e.g., MSD, BS/BSD, surrogates and calibration verifications) were acceptable and no data qualifier flags are recommended.

A single BS for 2-methylphenol was out of criteria but all other accuracy measurements (e.g., MS/MSD, surrogates and calibration verifications) were acceptable and no data qualifier flags are recommended.

The percent recovery for 2,4-dimethylphenol was out of criteria at zero percent in the BS/BSD. The laboratory had previously noted this problem and found the root cause to be the medium used for the blank spike (Ottawa sand). Given that this has been identified as a historical issue, the reviewer concurs with the laboratory's action to use the MS/MSD results as their QC check for precision and accuracy. Since the MS/MSD results were in criteria, no data qualifier flags are recommended.

8. Internal Standards Performance for Samples

All internal standard areas were within the required control limits, except as noted below.

Discussion: Several internal standards were out of the acceptance criteria of –50 to +100 percent. The laboratory did not report any of the analytes associated with these standards and reanalyzed the samples at a higher dilution. Since the internal standards were acceptable at the higher dilution, and the results were reported with higher detection limits, no data qualifier flags are recommended.

9. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWSS126R1 and MWSS126S1 were identified as field duplicates. Test results were reviewed, and where positive results were found, the relative percent difference (RPD) was calculated. All analytes, except those listed in the table below, were reported as non-detect.

Table 5. SVOC Field Duplicates and RPD

Compound	MWSS126R1 Result	MWSS126S1 Result	RPD
Naphthalene	340	420	21.1
2-Methylnaphthalene	130	170	26.7
Acenaphthylene	480	580	18.9
Acenaphthene	150	180	18.2
Fluorene	180	270	40.0
Phenanthrene	820	1100	29.2

Compound	MWSS126R1 Result	MWSS126S1 Result	RPD
Anthracene	620	740	17.6
Fluoranthene	2300	2800	19.6
Pyrene	1600	2100	27.0
Benzo(a)anthracene	860	1100	24.5
Chrysene	1000	1300	26.1
Benzo(b)fluoranthene	1500	2100	33.3
Benzo(k)fluoranthene	1100	1400	24.0
Benzo(a)pyrene	960	1200	22.2
Indeno(1,2,3-cd)pyrene	290	370	24.2
Benzo(g,h,i)perylene	270	340	23.0

Discussion: The high RPD for this analysis may be due to sample inhomogeniety or special circumstances during the sampling process. Because the person who performed the sampling has information that is not available to the data validator, such as sampling conditions or problems with the sampling equipment, the client typically performs any flagging and data qualification based upon field duplicates.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

11. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

12. TCL Compound Identification

All target compound identifications met the criteria for retention times and peak identification of the referenced method.

13. Tentatively Identified Compounds

No TICs were reported with this data set.

14. Laboratory Contact

There was no verbal or written communication with the laboratory.

15. Other Comments

None.

16. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

D. Review of Pesticides/PCBs Analyses

EPA Method 8081/8082

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The analysis of the target compounds hexachlorobenzene and hexachlorobutadiene was performed using Method 8081 instead of the requested Method 8270. No data qualifier flags are recommended since the method utilized is an approved method by PSEP.

The analysis of Sample MWSS127R1 for pesticides/PCBs was not requested on the COC and there was no change order included in the data package. However, the report from the laboratory has results and raw data to support the analysis.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No TCL analytes had %RSD greater than that allowed for the initial calibration or percent difference for the continuing calibration checks, except as noted below.

Discussion: The continuing calibrations for the target compound hexachlorobutadiene had percent differences which exceeded the criteria of 15 percent. No data qualifier flags are recommended since the associated sample results were below the reporting limit.

The continuing calibration for the target compounds 4,4'-DDD and 4,4'-DDT has percent differences of 44 and 79, respectively, which is out of the criteria of 15 percent. No data qualifier flags are recommended since the CCVs were high and the associated sample results were below the reporting limit.

The continuing calibration for the target compounds Aroclor 1016 and Aroclor 1260 has a percent difference of 25.9 and 16.6, respectively, which exceeds the criteria of 15 percent. Since these compounds were not detected and the results from the confirmation column were acceptable, no data qualifier flags are recommended.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria, except as noted below.

Discussion: A single matrix spike for 4,4'-DDT was out of criteria by one percent. Since all other accuracy measurements (e.g., blank spikes, matrix spike duplicate, surrogates and calibration verifications) were acceptable and no data qualifier flags are recommended.

6. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWSS126R1 and MWSS126S1 were identified as field duplicates. This analysis was not performed on the samples.

7. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

8. TCL Compound Identification

No target compounds were detected.

9. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards or external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

10. Laboratory Contact

There was no verbal or written communication with the laboratory.

11. Other Comments

None.

12. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

E. Review of Metals Analyses

EPA Method 6010/7000

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. Initial and Continuing Calibration

All initial and continuing calibration Quality Control criteria were met. No TCL analytes had correlation coefficients greater than allowed by the method, and all percent differences for the continuing calibration verifications were acceptable.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. ICP Interference Check Standard

An interference check sample (ICS) was analyzed at a frequency required by the referenced method and was within established criteria.

5. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within QAPP criteria, except as noted below.

Discussion: Arsenic, antimony, cadmium, lead, nickel, and zinc were out of the method criteria of 90 to 110 percent for the LCS. However, PSDDA allows 80 to 120 percent recovery of a second source sample. Since all analytes were within PSDDA acceptance criteria, no data qualifier flags are recommended.

6. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MSs were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria, except as noted below.

Table 6 Metal Data Qualifiers Due to MS/MSD Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSS115R1	Antimony	MS/MSD	39.6 G
MWSS117R1	Antimony	MS/MSD	29.3 G
MWSS126R1	Antimony	MS/MSD	6.2 UG
MWSS126S1	Antimony	MS/MSD	6.8 UG
MWSS127R1	Antimony	MS/MSD	7.1 G
MWSS137R1	Antimony	MS/MSD	4.5 UG

Discussion: Arsenic was out of the acceptance criteria of 75 to 125 percent in the MS. Because the sample spiked was a project sample, but was part of another SDG, no data qualifier flags are recommended since the LCS was acceptable.

Antimony was low and out of criteria for accuracy (percent recovery) for the MS/MSD pair. Normally, because the LCS was acceptable, only the results for this analyte in the sample that was spiked would be flagged. However, because all of the matrix spikes in all of the SDGs for this project have been out of criteria, all samples which were analyzed for antimony have been flagged "G" or "UG" to indicate that the value was greater than the minimum shown.

7. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWSS126R1 and MWSS126S1 were identified as field duplicates. Test results were reviewed, and where positive results were found, the relative percent difference (RPD) was calculated. All analytes, except those listed in the table below, were reported as non-detect.

Table 7. Metal Field Duplicates and RPD

Compound	MWSS126R1 Result	MWSS126S1 Result	RPD
Arsenic	36.7	31.6	14.9
Cadmium	0.81	0.85	4.8
Copper	460	467	1.5
Lead	314	333	5.9
Mercury	2.6	2.8	7.4
Nickel	17.1	16.5	3.6
Zinc	303	359	16.9

8. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPD were within QAPP criteria, except as noted below.

Table 8. Metal Data Qualifiers Due to Duplicate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSS115R1	Arsenic	Precision	230 E
MWSS117R1	Arsenic	Precision	312 E
MWSS126R1	Arsenic	Precision	36.7 E
MWSS126S1	Arsenic	Precision	31.6 E
MWSS127R1	Arsenic	Precision	59.4 E
MWSS137R1	Arsenic	Precision	14.8 E

Discussion: Arsenic was out of the criteria of less than 20 percent in the sample duplicate set. Since the sample that was analyzed in duplicate was not from this SDG, but was a sample from this project, the associated positive results for Samples MWSS115R1, MWSS117R1, MWSS126R1, MWSS126S1, MWSS127R1, and MWSS137R1 have been flagged "E" to indicate an estimated value.

9. ICP Serial Dilution

Samples that were a factor of 50 above the instrument detection limit (IDL) for the analyte were diluted five-fold and were within criteria required by the referenced method, except as noted below.

Table 9. Metal Data Qualifiers Due to ICP Serial Dilution Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSS115R1	Nickel	Serial Dilution	14.9 E
MWSS117R1	Nickel	Serial Dilution	40.7 E
MWSS126R1	Nickel	Serial Dilution	17.1 E
MWSS126S1	Nickel	Serial Dilution	16.5 E
MWSS127R1	Nickel	Serial Dilution	13.7 E
MWSS137R1	Nickel	Serial Dilution	11.2 E

Discussion: A serial dilution of nickel has a percent difference greater than the acceptance criteria of ±10 percent. The associated results for Samples MWSS115R1, MWSS117R1, MWSS126R1, MWSS126S1, MWSS127R1, and MWSS137R1 have been flagged "E" to indicate an estimated value.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated

appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract, except as noted below.

Discussion: The reporting limits for lead failed to meet the requirement of 0.5 mg/kg that was listed in the QAPP. However, most field samples had positive results. For samples that were non-detect, the laboratory's reporting limit of 1.5 mg/kg was less than the Sediment Quality Standard Criteria of 450 mg/kg and the Sediment Impact Zone and Clean-up Criteria of 530 mg/kg, and no data qualifier flags are recommended.

11. Graphite Furnace Atomic Absorption Analysis

All special criteria for graphite furnace atomic absorption (GFAA) analysis were performed at a frequency required by the referenced method and were within established criteria.

12. Laboratory Contact

There was no verbal or written communication with the laboratory.

13. Other Comments

None.

14. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

F. Review of Conventional Analyses

EPA 9060, 350.3 and PSEP Sulfide and Grain Size

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times, except as noted below. There are no contractual deviations that have been brought to the attention of the reviewer.

Table 10. Inorganic Data Qualifiers Due to Holding Time Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWAS037R1	Sulfide	Holding Time	21.7 E
MWAS034R1	Sulfide	Holding Time	208 E

Discussion: The analysis of Samples MWAS037R1 and MWAS034R1 for total sulfide exceeded the holding time by seven days. All positive results have been flagged with a "E" to indicate an estimated value.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No target compound list (TCL) analytes had correlation coefficients greater than allowed by the method, and all percent differences for the continuing calibration verifications were acceptable, except as noted below.

Discussion: The laboratory analyzed 12 samples for ammonia between the initial calibration and continuing calibration verification. The method requires that calibration verification be performed after every ten samples. Since all calibration verifications has acceptable results, no data qualifier flags are recommended.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within laboratory or method criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MSs were analyzed as required by the referenced method and all percent recoveries were within laboratory or method criteria.

6. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPDs were within laboratory or method criteria, except as noted below.

Discussion: For the grain size analysis, the laboratory analyzed one sample in triplicate, MWAS037R1. The RSD for the gravel size fraction was 61.7 percent, indicating a high degree of sample heterogeneity. The sand, silt and clay fractions had very low percent RSD values. The results for the gravel fraction suggests a poor sample splitting technique or a problem with the sample. Since there are no QC requirements outlined in the QAPP for grain size analyses, no data qualifier flags are recommended.

7. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWSS126R1 and MWSS126S1 were identified as field duplicates. Test results were reviewed, and where positive results were found, the RPD was calculated. All analytes, except those listed in the table below, were reported as non-detect.

Table 11. Inorganic Field Duplicates and RPD

Compound	MWSS126R1 Result	MWSS126S1 Result	RPD
Gravel	2.30	1.55	39.0
Sand	11.93	11.92	0.1
Silt	56.05	59.07	5.2
Clay	29.72	27.46	7.9
Total Fines	85.77	86.53	0.9
Total Organic Carbon	32000	32300	0.9
Percent Solids	60	62	3.3

8. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate number of standards. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts.

No errors in accuracy or methodology were found, except as noted below. The reporting limits meet the requirements of the contract.

Table 12. Inorganic Data Qualifiers Due to Compound Quantitation Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWAS037R1 MS	Sulfide	Calculation Error in % Recovery	92

Discussion: Calculation errors were found in determining the final result for sulfide MS percent recovery. The corrected value is listed in the summary table and on the laboratory final report forms.

9. Laboratory Contact

The QBD project manager telephoned Tori Baley at Multichem Analytical Services during the data validation process to obtain a copy of the chain of custody that accompanies this SDG on December 30, 1999. This was followed up by a fax to the laboratory. Copies of laboratory communications are found in Attachment 3 "Communications with the Laboratory."

10. Other Comments

None.

11. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

Attachment 1 Puget Sound Estuary Program Data Qualifier Definitions

Used for both organics and inorganic analyses

B = Analyte detected in samples and in method blank

C = Combined with unresolved substances

E = Estimated

G = Value greater than minimum shown

K = Detected at less than the maximum shown

L = Value less than the maximum shown

M = Value is a mean

Q = Questionable value

R = Rejected or unusable value

T = Detected below the quantification limit shown

U = Undetected at the detection limit shown

Z = Blank corrected

Attachment 2 Summary Table of Data Qualifier Flags

Foster Wheeler Environmental
Project: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 22, 1999

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWSS115R1	Acenaphthylene	Continuing Calibration %D >20	600 G
MWSS115R1	di-n-Butylphthalate	Continuing Calibration %D >20	56 UG
MWSS115R1	Butylbenzylphthalate	Continuing Calibration %D >20	56 UG
MWSS115R1	bis(2-Ethylhexyl)phthalate	Continuing Calibration %D >20	820 E
MWSS115R1	di-n-Octylphthalate	Continuing Calibration %D >20	56 UG
MWSS117R1	Acenaphthylene	Continuing Calibration %D >20	480 G
MWSS117R1	di-n-Butylphthalate	Continuing Calibration %D >20	54 UG
MWSS117R1	Butylbenzylphthalate	Continuing Calibration %D >20	330 G
MWSS117R1	bis(2-Ethylhexyl)phthalate	Continuing Calibration %D >20	4000 E
MWSS117R1	di-n-Octylphthalate	Continuing Calibration %D >20	54 UG
MWSS117R1	Benzo(k)fluoranthene	Continuing Calibration %D >20	1800 G
MWSS126R1	Acenaphthylene	Continuing Calibration %D >20	480 G
MWSS126S1	Acenaphthylene	Continuing Calibration %D >20	580 G
MWSS137R1	Acenaphthylene	Continuing Calibration %D >20	640 G
MWSS137R1	di-n-Butylphthalate	Continuing Calibration %D >20	69 UG
MWSS137R1	Butylbenzylphthalate	Continuing Calibration %D >20	340 UG
MWSS137R1	di-n-Octylphthalate	Continuing Calibration %D >20	69 UG
MWSS137R1	Benzo(k)fluoranthene	Continuing Calibration %D >20	810 E
MWSS137R1	Benzo(k)fluoranthene	Continuing Calibration %D >20	1100 G
MWSS127R1	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	460 E
MWSS127R1	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	2100 UE
MWSS127R1	Benzo(g,h,i)perylene	Continuing Calibration %D >20	420 E
MWSS117R1	bis(2-Ethylhexyl)phthalate	Initial Calibration %RSD >15	4000 E
MWSS115R1	bis(2-Ethylhexyl)phthalate	Initial Calibration %RSD >15	820 E
MWSS137R1	bis(2-Ethylhexyl)phthalate	Initial Calibration %RSD >15	810 E
MWSS115R1	Pentachlorophenol	Continuing Calibration %D >20	290 G
MWSS117R1	Pentachlorophenol	Continuing Calibration %D >20	640 G
MWSS137R1	Pentachlorophenol	Continuing Calibration %D >20	44 G

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWSS115R1	Phenol	MS/MSD, BS/BSD	100 E
MWSS115R1	4-Methylphenol	MS/MSD	73 G
MWSS117R1	Phenol	MS/MSD, BS/BSD	290 E
MWSS137R1	Phenol	MS/MSD, BS/BSD	96 E
MWSS115R1	Antimony	MS/MSD	39.6 G
MWSS117R1	Antimony	MS/MSD	29.3 G
MWSS126R1	Antimony	MS/MSD	6.2 UG
MWSS126S1	Antimony	MS/MSD	6.8 UG
MWSS127R1	Antimony	MS/MSD	7.1 G
MWSS137R1	Antimony	MS/MSD	4.5 UG
MWSS115R1	Arsenic	Precision	230 E
MWSS117R1	Arsenic	Precision	312 E
MWSS126R1	Arsenic	Precision	36.7 E
MWSS126S1	Arsenic	Precision	31.6 E
MWSS127R1	Arsenic	Precision	59.4 E
MWSS137R1	Arsenic	Precision	14.8 E
MWSS115R1	Nickel	Serial Dilution	14.9 E
MWSS117R1	Nickel	Serial Dilution	40.7 E
MWSS126R1	Nickel	Serial Dilution	17.1 E
MWSS126S1	Nickel	Serial Dilution	16.5 E
MWSS127R1	Nickel	Serial Dilution	13.7 E
MWSS137R1	Nickel	Serial Dilution	11.2 E
MWAS037R1	Sulfide	Holding Time	21.7 E
MWAS034R1	Sulfide	Holding Time	208 E
MWAS037R1 MS	Sulfide	Calculation Error in % Recovery	92

Attachment 3 Communications with the Laboratory

Quality by Design
29 Shipman Street, Suite 101
Hilo, Hawaii 96720
Phone: 808/969-9424 Fax: 808/969-9094
e-mail: qbdhilo@gte.net

Date: December 31, 1999

To: MultiChem Analytical Services
Attn: Tori Bailey
Fax #: 425/228-8336

cc: Foster Wheeler Env. Corp.
Attn: Sherri Wunderlich
Fax #: 425/688-3952

From: Tom Davis

Total pages, including this one: 2

Hi, Tori –

I had left a voicemail for you yesterday but I'm assuming that with the holiday coming up, you didn't get it before you left. We are doing the data validation for Foster Wheeler's Middle Waterway project and have some questions about a couple of the data packages. If there is any question about confidentiality of data, please call Sherri, Gary Braun, or Roger Cadeg at Foster Wheeler for the okay.

We have four items so far:

1. Our report for SDG 909070 is missing Page 410 of the base/neutrals run on 12/10/99. We are also missing a DFTPP printout from HP-1 for electronic file J6238. The missing page was not included in the original data package because it should be between Pages 219 and 220. Could we have copies of these faxed to the letterhead number?

2. Sulfides were subcontracted to Columbia Analytical. On SDG 909056, (CAS No. K9906743), they analyzed sulfides for Samples MWAT046R1 and MWAT041R1 twice, because the initial run's QC failed. They reported the sample results from the re-analysis, but they selectively reported the QC data from the first run. For example, in the first run, the MS had almost 100% recovery but the MSD had zero percent (0%) recovery. Yet, the MS from the first run was reported, the MSD was not, and the sample results were taken from the second run. Could CAS re-issue this report with the correct information?

3. In SDG 909062, our data package is missing the custody form for Samples MWAS037R1 and MWAS034R1. Could we get copies of these faxed?

4. Also in SDG 909070, MAS analyzed a set of samples for EPA 8270 but had problems with the blank. Appropriately, MAS re-ran the sample set. However, the second set was extracted after the holding time. MAS reported only the results of the second analysis. Could we have the results of the first analysis reported for the samples listed below?

Sample No.
MWCS137R2
MWCS151R3
MWCS155R2
MWCS116R2
MWCS112R2
MWCS157R2
MWCS152R3

In the same way that you issue two reports for dilutions, this would allow us to select and appropriately flag the most technically suitable results.

Thanks for your help. If there are any questions or problems, please don't hesitate to call.

Send Hard Copy? ___ Yes _XX_ No

HP LaserJet 3100
Printer/Fax/Copier/Scanner

SEND CONFIRMATION REPORT for
Quality by Design
808 969 9094
Dec-31-99 6:07PM

Job	Start Time	Usage	Phone Number or ID	Type	Pages	Mode	Status
636	12/31 6:06PM	0'45"	425 228 8336	Send.....	2/ 2	EC 96	Completed.....

Total 0'45" Pages Sent: 2 Pages Printed: 0

Quality by Design
29 Shipman Street, Suite 101
Hilo, Hawaii 96720
Phone: 808/969-9424 Fax: 808/969-9094
e-mail: qbdhilo@gte.net

Date: December 31, 1999

To: MultiChem Analytical Services
Attn: Tori Bailey
Fax #: 425/228-8336

cc: Foster Wheeler Env. Corp.
Attn: Sherri Wunderlich
Fax #: 425/688-3952

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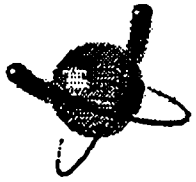

MultiChem
ANALYTICAL SERVICES

FAX Cover Sheet

To:	**Tom Davis**	**FAX Number:**	**808-969-9094**
Company:	**QBD**	**Date:**	**01/05/00**
From:	**Tori Bayly**	**Pages (including**	
Phone:	**425-228-8335**	**cover page):**	**2**
Fax:	**425-228-8336**	**In re/accession:**	**Middle Waterway**

Tom~
Here is the copy of the COC for 909062 (item #3).
I am about to send the information for item #2 to Columbia.
Items #1 and #4 will take a bit longer, and I will be giving the information to the GC/MS department here shortly... I need to find the data packages for them first.

Tori

560 Naches Avenue SW, Suite 101, Renton, Washington 98055-2200
425-228-8335 ● FAX 425-228-8336 ● 1-800-609-0580 ● info@multichem.com

MultiChem ANALYTICAL SERVICES

560 Naches Ave. SW Suite 10[redacted] Renton, WA 98055
(800) 609-0580 • (425) 228-83[redacted] FAX (425) 228-8336

[redacted] 1771 2

DATE: [redacted]/27/99
PAGE: of

COMPANY: Foster Wheeler
ADDRESS: 10900 NE 8th St Ste 1300
Bellevue WA 98004

PHONE: (425) 688-3700 FAX (425) 688-3952
PROJ. MGR / CONTACT: Gary Braun
PROJECT NUMBER: 1699.0014.0000
PROJECT NAME: Middle WW IB
DISPOSAL: ☑ MAS ☐ HOLD ☐ RETURN

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	FUELS: TPH-HCID	BETX / TPH G BETX / AK101	BETX (by 8021)	TPH-G	TPH-D TPHD-extended	8015 modified	418.1	413.2	AK-GRO AK101	AK-DRO AK102 / 103	ORGANIC COMPOUNDS: 8240 / 8260 GCMS Volatiles	8270 GCMS Semivolatiles	8081 Pesticides / PCDs	-PCB only (by 8081) STD / LL	8021 Halogenated VOCs	8021 Aromatic VOCs	8310 HPLC PAHs	8041 Phenols	8151 OC Herbicides	METALS: Metals indicate below:	Total / Dissolved Lead	RCRA Metals (8)	PP Metals (13)	TAL Metals (23)	TCLP: TCLP 8240 (ZHE)	TCLP 8270 Semivolatiles	TCLP 8081 Pesticides	TCLP 8151 Herbicides	TCLP Metals	OTHER: Grain Size	TOC	Ammonia	Sulfide	Total # of Containers
MWAS 037 R1	9/27	1099	sed																																		3
MW AS 034 R1	9/27	1035	sed																																		3

TAT:
☐ 24 HOURS
☐ 48 HOURS
☐ 72 HOURS
☐ 7 DAYS
☐ SP
☐ STANDARD

SPECIAL INSTRUCTIONS/COMMENTS:

METALS NEEDED: 1,3

RELINQUISHED BY	RECEIVED BY	RELINQUISHED BY
SIGNATURE:	SIGNATURE:	SIGNATURE:
PRINT NAME: D. B. Jones	PRINT NAME:	PRINT NAME:
DATE: 9/27/99 TIME: 1840	DATE: TIME:	DATE: TIME:
COMPANY:	COMPANY:	COMPANY:
RELINQUISHED BY	**RECEIVED BY**	**RELINQUISHED BY**
SIGNATURE:	SIGNATURE:	SIGNATURE:
PRINT NAME: Dwayne Peterson	PRINT NAME:	PRINT NAME:
DATE: 9/27/99 TIME: 1840	DATE: TIME:	DATE: TIME:
COMPANY: MAS	COMPANY:	COMPANY:

MAS-SUPERVISOR

TOTAL P.02

JAN-05-2000 11:40 MULTICHEM 206 3631742 P.02/02

Attachment 4 Revised Laboratory Forms

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 00046

MWSS115R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909062

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909062-3

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1303

Level: (low/med) LOW Date Collected: 09/27/99

% Moisture: 29 decanted: (Y/N) Y Date Extracted: 09/29/99 OK

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/10/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	18	U	
106-46-7	1,4-Dichlorobenzene	18	U	
95-50-1	1,2-Dichlorobenzene	21		
120-82-1	1,2,4-Trichlorobenzene	18	U	
91-20-3	Naphthalene	340		
91-57-6	2-Methylnaphthalene	210		
131-11-3	Dimethylphthalate	56	U	
208-96-8	Acenaphthylene	600		G
83-32-9	Acenaphthene	530		
132-64-9	Dibenzofuran	370		
84-66-2	Diethylphthalate	56	U	
86-73-7	Fluorene	740		
86-30-6	N-Nitrosodiphenylamine (1)	18	U	
85-01-8	Phenanthrene	4000	D3	
120-12-7	Anthracene	1900	D3	
84-74-2	Di-n-butylphthalate	56	U	G
206-44-0	Fluoranthene	6900	D3	
129-00-0	Pyrene	5800	D3	
85-68-7	Butylbenzylphthalate	56	U	G
56-55-3	Benzo(a)anthracene	3100	D3	
218-01-9	Chrysene	3500	D3	
117-81-7	bis(2-Ethylhexyl)phthalate	820	B	E
117-84-0	Di-n-octylphthalate	56	U	G
205-99-2	Benzo(b)fluoranthene	2000	D4	
207-08-9	Benzo(k)fluoranthene	1900	D4	
50-32-8	Benzo(a)pyrene	2400	D4	
193-39-5	Indeno(1,2,3-cd)pyrene	640		
53-70-3	Dibenzo(a,h)anthracene	230		
191-24-2	Benzo(g,h,i)perylene	580		

(1) - Cannot be separated from Diphenylamine

D3 Result reported from a 5 fold dilution (P1323.D)

D4 Result reported from a 10 fold dilution (P1322.D)

PJS 11/05/99

ck/QBD 1/16/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWSS137R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909062

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909062-9

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1307

Level: (low/med) LOW Date Collected: 09/27/99

% Moisture: 42 decanted: (Y/N) Y Date Extracted: 09/29/99 — OK

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/10/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	22	U	
106-46-7	1,4-Dichlorobenzene	22	U	
95-50-1	1,2-Dichlorobenzene	22	U	
120-82-1	1,2,4-Trichlorobenzene	22	U	
91-20-3	Naphthalene	820		
91-57-6	2-Methylnaphthalene	290		
131-11-3	Dimethylphthalate	69	U	
208-96-8	Acenaphthylene	640		G
83-32-9	Acenaphthene	350		
132-64-9	Dibenzofuran	230	U	
84-66-2	Diethylphthalate	69	U	
86-73-7	Fluorene	340		
86-30-6	N-Nitrosodiphenylamine (1)	22	U	
85-01-8	Phenanthrene	1200		
120-12-7	Anthracene	780		
84-74-2	Di-n-butylphthalate	69	U	G
206-44-0	Fluoranthene	3100	D3	
129-00-0	Pyrene	2400	D3	
85-68-7	Butylbenzylphthalate	340	UD3	G
56-55-3	Benzo(a)anthracene	1200	D3	
218-01-9	Chrysene	1400	D3	
117-81-7	bis(2-Ethylhexyl)phthalate	810	D3B	E
117-84-0	Di-n-octylphthalate	69	U	G
205-99-2	Benzo(b)fluoranthene	1300		
207-08-9	Benzo(k)fluoranthene	1100		G
50-32-8	Benzo(a)pyrene	1100		
193-39-5	Indeno(1,2,3-cd)pyrene	250		
53-70-3	Dibenzo(a,h)anthracene	91	U	
191-24-2	Benzo(g,h,i)perylene	250		

(1) - Cannot be separated from Diphenylamine

D3 = Result reported from a 5 fold dilution (P1324.D)

RGS 11/00/99

la/CBD 1/10/00

00092

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWSS117R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909062

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909062-4

Sample wt/vol: 75.0 (g/mL) G Lab File ID: . P1304

Level: (low/med) LOW Date Collected: 09/27/99

% Moisture: 26 decanted: (Y/N) Y Date Extracted: 09/29/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/10/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	18	U	
106-46-7	1,4-Dichlorobenzene	18	U	
95-50-1	1,2-Dichlorobenzene	18	U	
120-82-1	1,2,4-Trichlorobenzene	18	U	
91-20-3	Naphthalene	170		
91-57-6	2-Methylnaphthalene	140		
131-11-3	Dimethylphthalate	54	U	
208-96-8	Acenaphthylene	480		
83-32-9	Acenaphthene	380		
132-64-9	Dibenzofuran	190		
84-66-2	Diethylphthalate	54	U	
86-73-7	Fluorene	380		
86-30-6	N-Nitrosodiphenylamine (1)	18	U	
85-01-8	Phenanthrene	2200	D1	
120-12-7	Anthracene	930	D1	
84-74-2	Di-n-butylphthalate	54	U	G
206-44-0	Fluoranthene	6200	D4	
129-00-0	Pyrene	4500	D4	
85-68-7	Butylbenzylphthalate	330		G
56-55-3	Benzo(a)anthracene	2500	D4	
218-01-9	Chrysene	3300	D4	
117-81-7	bis(2-Ethylhexyl)phthalate	4000	D4B	E
117-84-0	Di-n-octylphthalate	54	U	G
205-99-2	Benzo(b)fluoranthene	1800	D4	
207-08-9	Benzo(k)fluoranthene	1800	D4	G
50-32-8	Benzo(a)pyrene	2100	D4	
193-39-5	Indeno(1,2,3-cd)pyrene	770		
53-70-3	Dibenzo(a,h)anthracene	260		
191-24-2	Benzo(g,h,i)perylene	750		

(1) - Cannot be separated from Diphenylamine

D1 - Result reported from a 2 fold dilution (P1329.D)
D4 - Result reported from a 10 fold dilution (P1321.D)

FORM I SV

RMC 11/10/99

EC/QBD 1/16/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 12176

MWSS127R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909062

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909062-7

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1747

Level: (low/med) LOW Date Collected: 09/27/99

% Moisture: 49 decanted: (Y/N) N Date Extracted: 10/27/99

Concentrated Extract Volume: 2000(uL) Date Analyzed: 12/01/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
91-20-3	Naphthalene	710		
91-57-6	2-Methylnaphthalene	280		
208-96-8	Acenaphthylene	820		
83-32-9	Acenaphthene	360		
86-73-7	Fluorene	360		
85-01-8	Phenanthrene	2000		
120-12-7	Anthracene	940		
206-44-0	Fluoranthene	4500	D3	
129-00-0	Pyrene	4200	D3	
56-55-3	Benzo(a)anthracene	1900	D3	
218-01-9	Chrysene	2400	D3	
205-99-2	Benzo(b)fluoranthene	2100	JD4	
207-08-9	Benzo(k)fluoranthene	1800	JD4	
50-32-8	Benzo(a)pyrene	1900	JD4	
193-39-5	Indeno(1,2,3-cd)pyrene	460	JD4	E
53-70-3	Dibenzo(a,h)anthracene	2100	UD4	E
191-24-2	Benzo(g,h,i)perylene	420	JD4	E

D3 - Result reported from a 5 fold dilution (P1740.D)
D4 - Result reported from a 10 fold dilution (P1775.D)

EA/GBD
12/22/99

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWSS115R1

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909062

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909062-3

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5970

Level: (low/med) LOW Date Collected: 09/27/99

% Moisture: 29 decanted: (Y/N) Y Date Extracted: 09/29/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/04/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
108-95-2	Phenol	100		E
100-51-6	Benzyl alcohol	38	U	
95-48-7	2-Methylphenol	19	U	
106-44-5	4-Methylphenol	73		G
105-67-9	2,4-Dimethylphenol	24		
65-85-0	Benzoic acid	240		
87-86-5	Pentachlorophenol	290		G

TD/QBO
1/10/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWSS117R1

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909062

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909062-4

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5971

Level: (low/med) LOW Date Collected: 09/27/99

% Moisture: 26 decanted: (Y/N) Y Date Extracted: 09/29/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/05/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
108-95-2	Phenol	290		E
100-51-6	Benzyl alcohol	520		
95-48-7	2-Methylphenol	18	U	
106-44-5	4-Methylphenol	110		
105-67-9	2,4-Dimethylphenol	27		
65-85-0	Benzoic acid	3100	D2	
87-86-5	Pentachlorophenol	640		G

D2 = Value from a four fold diluted analysis
D2 data file = >J5980

TD/QBD
11/10/00

00043

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWSS137R1

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909062

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909062-9

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5972

Level: (low/med) LOW Date Collected: 09/27/99

% Moisture: 42 decanted: (Y/N) Y Date Extracted: 09/29/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/05/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
108-95-2	Phenol	96		E
100-51-6	Benzyl alcohol	46	U	
95-48-7	2-Methylphenol	23	U	
106-44-5	4-Methylphenol	120		
105-67-9	2,4-Dimethylphenol	12	U	
65-85-0	Benzoic acid	280	U	
87-86-5	Pentachlorophenol	44		9

TD/QBO
1/10/00

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

00001
CLIENT ID

MWSS115R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909062

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909062-3

% Solids: 63.5

Date Received: 09/27/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	39.6			P	G
7440-38-2	Arsenic	230			F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	2.0			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	1850			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	739			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	7.2			CV	
7440-02-0	Nickel	14.9			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.76	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	2550			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: GREEN Clarity After: _____ Artifacts: _____

Comments:

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FORM I - IN

ed/QBD
12/24/99

INORGANICS SW-846

00002

CLIENT ID

1

INORGANIC ANALYSIS DATA SHEET

MWSS117R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909062

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909062-4

% Solids: 66.8

Date Received: 09/27/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	29.3			P	G
7440-38-2	Arsenic	312			F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	1.5			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	2900			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	660			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	2.4			CV	
7440-02-0	Nickel	40.7			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	1.5	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	1620			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: GREEN Clarity After: _____ Artifacts: _____

Comments:

_____

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FORM I - IN

QA/QBD
12/24/99

INORGANICS SW-846

00003

1

CLIENT ID

INORGANIC ANALYSIS DATA SHEET

MWSS126R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909062

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909062-5

% Solids: 39.7

Date Received: 09/27/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	6.2	U		P	G
7440-38-2	Arsenic	36.7			F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.81			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	460			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	314			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	2.6			CV	
7440-02-0	Nickel	17.1			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	1.2	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	303			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: FINE

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

12/QBD
12/24/99

INORGANICS SW-846

00004
CLIENT ID

1
INORGANIC ANALYSIS DATA SHEET

MWSS126S1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909062

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909062-6

% Solids: 37.9

Date Received: 09/27/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	6.8	U		P	G
7440-38-2	Arsenic	31.6			F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.85			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	467			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	333			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	2.8			CV	
7440-02-0	Nickel	16.5			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	1.4	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	359			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: FINE

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

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12/24/99

INORGANICS SW-846

00005
CLIENT ID

1
INORGANIC ANALYSIS DATA SHEET

MWSS127R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909062

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909062-7

% Solids: 49.7

Date Received: 09/27/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	7.1			P	G
7440-38-2	Arsenic	59.4			F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.88			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	490			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	305			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	2.2			CV	
7440-02-0	Nickel	13.7			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	1.6			P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	356			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: FINE

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

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RL/QBD
12/24/99

INORGANICS SW-846

00006

1

CLIENT ID

INORGANIC ANALYSIS DATA SHEET

MWSS137R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909062

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909062-9

% Solids: 54.4

Date Received: 09/27/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony	4.5	U		P
7440-38-2	Arsenic	14.8		W	F
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium	0.59			P
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper	201			P
7439-89-6	Iron				NR
7439-92-1	Lead	87.8			P
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.53			CV
7440-02-0	Nickel	11.2			P
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver	0.90	U		P
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc	145			P
	Cyanide				NR

G
E
E

Color Before: BROWN Clarity Before: _____ Texture: FINE

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

QL/QBD
12/24/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	MultiChem Analytical Services	**Service Request:**	K9906884
Project:	Middle Waterway/909062	**Date Collected:**	9/27/99
Sample Matrix:	Sediment	**Date Received:**	10/1/99

Sulfide, Total

Prep Method:	NONE	Units:	mg/Kg (ppm)
Analysis Method:	PSEP	Basis:	Dry
Test Notes:			

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
MWAS037RI	K9906884-001	0.5	0.5	5	NA	10/5/99	21.7 E	H
MWAS034RI	K9906884-002	0.5	0.5	25	NA	10/5/99	208 E	H
Method Blank	K9906884-MB	0.5	0.5	1	NA	10/5/99	ND	

H The analysis was performed past the recommended hold time.

Approved By: _____ Date: 10/19/99

RAS/QBD
12/29/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: MultiChem Analytical Services
Project: Middle Waterway/909062
Sample Matrix: Sediment

Service Request: K9906884
Date Collected: 9/27/99
Date Received: 10/1/99
Date Extracted: NA
Date Analyzed: 10/5/99

Matrix Spike Summary
Sulfide, Total

Sample Name: MWAS037RI
Lab Code: K9906884-001MS
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Sulfide, Total	NONE	PSEP	0.5	320	21.7	315	~~95~~ 92	60-130	

Approved By: MMR Date: 10/15/99

06884WET.LJ1 - MS 10/15/99

12/QBD 1/8/00

Quality By Design

Laboratory Quality Assurance Consulting

29 Shipman Street
Suite 101
Hilo, Hawaii 96720

Phone: (808) 969-9424
Fax: (808) 969-9094
e-mail: qbdhilo@gte.net

EPA Level 2
DATA VALIDATION REPORT

Project Name: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 27-28, 1999
SDG: 909066

Prepared for

Foster Wheeler Environmental
10900 NE 8th St.
Bellevue, WA 98004

Purchase Order No. 022828
QBD Job No. 270E

Reviewed and approved,

Lorraine Davis 1/19/00

Lorraine L. Davis, Owner Date

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Attachments

Attachment 1 Data Flag Definitions
Attachment 2 Summary Table of Data Qualifier Flags
Attachment 3 Revised Laboratory Forms

A. Introduction

Laboratory Sciences, Inc., d.b.a. *Quality by Design* (QBD), has completed an EPA Level 2 Data Validation on the submitted data packages in accordance with P.O. Number 022828.

The reporting format and criteria for recommending data qualifying flags for this data set are described in the EPA *"Functional Guidelines for Evaluating Organics Analyses"* and *"Functional Guidelines for Evaluating Inorganics Analyses,"* as revised, 1994; and *"Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound"* ("PSEP Protocols"), May, 1997, or using criteria listed in the method referenced. Data may be qualified for any of the following reasons:

1. By the laboratory prior to receipt by the reviewer
2. Because of laboratory deviation from the designated method
3. Because the data may not meet the criteria listed in the reference above
4. By the professional judgment of the reviewer.

The data set consists of several data packages from Multichem Analytical Services in Renton, Washington, and contains data for the samples shown in Table 1. The data reviewer and senior reviewers are shown in Table 2.

Each data set includes an analytical data package for each sample, copies of the completed chain-of-custody (COC) forms, and a quality control (QC) data package. The analytical data package includes analytical results, blank sample results, both laboratory and client sample identifications, appropriate dates but not times, method reporting limits, method references, surrogate recoveries as appropriate, the laboratory's name and address, and the initials of the person releasing the data. The custody forms include the receipt of the sample but not the laboratory's internal tracking. The QC data package includes a tabular list of the laboratory's sample identification, spiking concentrations, recoveries, percentage calculations, and acceptance windows.

Raw data were provided which includes chromatograms, instrument print outs, injection logs, digestion/preparation logs.

This data validation report consists of several sections, each of which are formatted to follow Functional Guidelines, but which also include subsections discussing QBD contacts with the laboratory, other comments, and a summary table of data qualifiers.

Table 1. Sample Identification and Analysis

Sample Identification	Laboratory Identification	Methods 8081/8082	Method 8270	Method 6010/7000	Method 9060	Grain Size	Conventionals
MWSS108R1	909066-1			X		X	
MWSS109R1	909066-3			X		X	
MWSB101S1	909066-4			X		X	
MWSB101R1	909066-5			X		X	
MWSB102R1	909066-6			X		X	
MWRC214R1	909066-7				X	X	X
MWRC213R1	909066-8				X	X	X
MWST136R1	909066-9	X	X	X	X	X	
MWSB104R1	909066-10			X		X	
MWSB103R1	909066-11			X		X	
MWSS107R1	909066-12			X		X	
MWSS106R1	909066-13			X		X	
MWSS105R1	909066-14			X		X	

Key:
Method 8270 = Semivolatile organic compounds by gas chromatography/mass spectroscopy
Method 8081/8082 = Pesticides and polychlorinated biphenyls (PCB) by gas chromatography
Method 6010 & 7000 = Metals by inductively coupled plasma (ICP) and cold vapor atomic absorption (CVAA)
Method 9060 = Total organic carbon (TOC)
Conventionals = Sulfide, ammonia, and percent moisture

Table 2. Data Package, Reviewer, and Senior Reviewer

Analysis	Number of Pages	Reviewer	Senior Reviewer
Pest/PCB	92	Randi Schneider	Lorraine L. Davis
SVOC	196	Debbie Copsey	Lorraine L. Davis
Metals	176	Lorraine L. Davis	Thomas S. Davis
Conventionals	83	Lorraine L. Davis	Thomas S. Davis

B. Chain-of-Custody

The analytical data package was reviewed and compared against the chain-of-custody (COC) form. No data are missing from the COC forms and no transcription errors in accuracy were found. All tests requested on the COC were performed.

Discussion: The grain size analysis was subcontracted to Rosa Environmental and Geotechnical Laboratory in Seattle, Washington. The sulfide analysis was subcontracted to Columbia Analytical Services, Inc. in Kelso, Washington.

C. Review of GC/MS Semivolatiles Analyses

EPA Method 8270

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. GC/MS Tuning

All decafluorotriphenylphosphine (DFTPP) tune criteria were met for the initial and continuing calibration for all dates of sample analysis.

3. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No target compound list (TCL) analytes had percent relative standard deviations (%RSD) greater than allowed by the method for the initial calibration or percent difference for the continuing calibration checks. All system performance check compound (SPCC) and calibration check compound (CCC) criteria were met.

4. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit, except as noted below.

Table 3. SVOC Data Qualifiers Due to Blank Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWST136R1	Bis(2-ethylhexyl)phthalate	Blank Contamination	350 B

Discussion: The case narrative incorrectly states that bis(2-ethylhexyl)phthalate was detected in the method blank below the reporting limit and was flagged "B". The concentration of bis(2-ethylhexyl)phthalate was above the reporting limit at 75 µg/kg. The associated results in Sample MWST136R1 have been flagged "B" to indicate that the analyte was detected in the sample and in the method blank.

5. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria, except as noted below.

Discussion: In Samples MWST136R1 and MWSS115R1, a single surrogate was out of criteria. No data qualifier flags are recommended because all other surrogates were in criteria.

A single surrogate percent recovery for nitrobenzene-d_5 was out of criteria for Sample MWST136R1DL due to large dilutions. Since all other QC checks were in criteria, no data qualifier flags are recommended.

6. Laboratory Control Standards

The laboratory analyzed a second source sample with the analytical batch. The laboratory referred to this sample as a blank spike/blank spike duplicate (BS/BSD) rather than a laboratory control standard (LCS). Any anomalies or comments regarding the second source results are addressed in the next section.

7. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

Matrix Spike (MS) and matrix spike duplicates (MSD) were analyzed as required by the referenced method and all percent recoveries and relative percent differences (RPD) were within QAPP criteria, except as noted below.

Discussion: The percent recovery for 2,4-dimethylphenol was out of criteria at zero percent in the BS/BSD. The laboratory had previously noted this problem and found the root cause to be the medium used for the blank spike (Ottawa sand). Given that this has been identified as a historical issue, the reviewer concurs with the laboratory's action to use the MS/MSD results as their QC check for precision and accuracy. Since the MS/MSD results were in criteria, no data qualifier flags are recommended.

MS and MSD recoveries for several target compounds were out of criteria due to high concentrations of analytes in the original sample. Since all other QC checks were in criteria, no data qualifier flags are recommended.

8. Internal Standards Performance for Samples

All internal standard areas were within the required control limits, except as noted below.

Discussion: The internal standard Perylene-d_{12} was out of the acceptance criteria of +100 percent at 132 percent. Since the associated sample results were not reported from this particular analyses, but from a dilution, no data qualifier flags are recommended.

9. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWSB101S1 and MWSB101R1 were identified as field duplicates. This analysis was not performed on the samples.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards or external standardization, except as noted below. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

Table 4. SVOC Data Qualifiers Due to Compound Quantitation Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWST136R1	Benzo(b)fluoranthene	More technically sound data	540 U
MWST136R1	Benzo(k)fluoranthene	More technically sound data	460
MWST136R1	Benzo(a)pyrene	More technically sound data	760
MWST136R1	Indeno(1,2,3-cd)pyrene	More technically sound data	210
MWST136R1	Benzo(g,h,i)perylene	More technically sound data	220
MWST136R1	Di-n-octyl phthalate	More technically sound data.	62 U

Discussion: The laboratory reported the results for MWST136R1 from a dilution. Upon review of the original analytical results, and the diluted results, the reviewer decided that the original results were more technically sound than the diluted results. The laboratory results have been changed to reflect that decision.

11. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

12. TCL Compound Identification

All target compound identifications met the criteria for retention times and peak identification of the referenced method.

13. Tentatively Identified Compounds

No TICs were reported with this data set.

14. Laboratory Contact

There was no verbal or written communication with the laboratory.

15. Other Comments

None.

16. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

D. Review of Pesticides/PCBs Analyses

EPA Method 8081/8082

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The analysis of the target compounds hexachlorobenzene and hexachlorobutadiene was performed using Method 8081 instead of the requested Method 8270. No data qualifier flags are recommended since the method utilized is an approved method by PSEP.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No TCL analytes had %RSD greater than that allowed for the initial calibration or percent difference for the continuing calibration checks, except as noted below.

Discussion: Continuing calibrations for the target compound hexachlorobutadiene has percent differences which exceeded the criteria of 15 percent. Since all other QC checks were in criteria, and since the sample results were non-detect, no data qualifier flags are recommended.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria.

6. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWSB101R1 and MWSB101S1 were identified as field duplicates. This analysis was not performed on the samples.

7. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

8. TCL Compound Identification

All target compound identifications met the criteria for retention times and peak identification of the referenced method.

9. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards or external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

10. Laboratory Contact

There was no verbal or written communication with the laboratory.

11. Other Comments

None.

12. Data Use and Overall Assessment

The data are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results.

E. Review of Metals Analyses

EPA Method 6010/7000

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. Initial and Continuing Calibration

All initial and continuing calibration Quality Control criteria were met. No TCL analytes had correlation coefficients greater than allowed by the method, and all percent differences for the continuing calibration verifications were acceptable.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. ICP Interference Check Standard

An interference check sample (ICS) was analyzed at a frequency required by the referenced method and was within established criteria.

5. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within QAPP criteria, except as noted below.

Discussion: Arsenic, antimony, and nickel were out of the method criteria of 90 to 110 percent recovery for the LCS. However, PSDDA allows 80 to 120 percent recovery of a second source check sample. All three analytes were within PSDDA acceptance criteria. Therefore, no data qualifier flags are recommended.

6. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MSs were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria, except as noted below.

Table 5. Metal Data Qualifiers Due to ICP Serial Dilution Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSB104R1	Antimony	MS	14.4 UE
MWSS109R1	Antimony	MS	18.3 UE

Discussion: Arsenic was out of the criteria of 75 to 125 percent for accuracy at 72.9 percent in the MS. Since the LCS was acceptable, no data qualifier flags are recommended.

A single post digestion spike for lead was out of criteria, but since the MS was acceptable, no data qualifier flags are recommended.

Antimony was low and out of criteria for accuracy (percent recovery) for the MS with a 20.8 percent recovery. Normally, the associated samples would be flagged "R" because the percent recovery was less than 30%, and because the LCS was acceptable, the only sample that would be associated with this MS is the sample that was spiked. However, all of the matrix spikes in all of the SDGs for this project have been out of criteria, some of which have been above 30% and some of which have been less than 30%. In a telephone conversation with Foster Wheeler, it was noted that some of the analyte was recovered from the spike (i.e, the percent recovery was not zero) and that a low percent recovery may imply a higher detection limit. In keeping with the recommendations in *Functional Guidelines*, it was agreed that samples with positive results would be flagged "G" to indicate that the value was greater than the minimum shown. It was also agreed that the detection limit for non-detect samples would be increased proportional to the spike recovery and flagged "UE", to indicate that the detection limit is estimated.

7. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWSB101R1 and MWSB101S1 were identified as field duplicates. Test results were reviewed, and where positive results were found, the relative percent difference (RPD) was calculated. All analytes, except those listed in the table below, were reported as non-detect.

Table 6. Metal Field Duplicates and RPD

Compound	MWSB101R1 Result	MWSB101S1 Result	RPD
Copper	571	485	16.3
Mercury	0.63	0.76	18.7

8. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all relative percent differences (RPD) were within QAPP criteria, except as noted below.

Table 7. Metal Data Qualifiers Due to Duplicate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSB104R1	Arsenic	Precision	3.4 E
MWSS109R1	Arsenic	Precision	20.8 E

Discussion: Arsenic was out of the criteria of less than 20 percent at 25.5 percent in the sample duplicate set. The associated positive results for Samples MWSB104R1 and MWSS109R1 have been flagged "E" to indicate an estimated value.

9. ICP Serial Dilution

Samples that were a factor of 50 above the instrument detection limit (IDL) for the analyte were diluted five-fold and were within criteria required by the referenced method, except as noted below.

Table 8. Metal Data Qualifiers Due to ICP Serial Dilution Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSB104R1	Lead	Serial Dilution	15.2 E
MWSB104R1	Zinc	Serial Dilution	52.8 E
MWSS109R1	Lead	Serial Dilution	27.3 E
MWSS109R1	Zinc	Serial Dilution	68.5 E

Discussion: A serial dilution of lead and zinc had a percent difference greater than the acceptance criteria of ±10 percent. The associated results for Samples MWSB104R1 and MWSS109R1 have been flagged "E" to indicate an estimated value.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract, except as noted below.

Discussion: The reporting limits for lead failed to meet the requirement of 0.5 mg/kg that was listed in the QAPP. However, most field samples had positive results. For samples that were non-detect, the laboratory's reporting limit of 1.5 mg/kg was less than the Sediment Quality Standard Criteria of 450 mg/kg and the Sediment

Impact Zone and Clean-up Criteria of 530 mg/kg, and no data qualifier flags are recommended.

11. Graphite Furnace Atomic Absorption Analysis

All special criteria for graphite furnace atomic absorption (GFAA) analysis were performed at a frequency required by the referenced method and was within established criteria.

12. Laboratory Contact

There was no verbal or written communication with the laboratory.

13. Other Comments

None.

14. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

F. Review of Conventional Analyses

EPA Method 9060, Grain Size, Percent Moisture, and PSEP Sulfides

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were analyzed within the technical holding times. There are no contractual holding time criteria that have been brought to the attention of the reviewer, except as noted below.

Table 9. Inorganic Data Qualifiers Due to Holding Time Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWRC214R1	Sulfide	Holding Time	6.8 E
MWRC213R1	Sulfide	Holding Time	134 E

Discussion: The analysis of Samples MWRC214R1 and MWRC213R1 for sulfide exceeded the holding time by one day All positive results have been flagged with a "E" to indicate an estimated value.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met, including the number of standards used and the correlation coefficients. All continuing calibration criteria, including frequency of analysis and percent recovery were met, except as noted below.

Discussion: A calculation error was noted in the percent recovery of a continuing calibration verification for sulfide. The recalculated value was within acceptance criteria and no data qualifier flags are recommended. The change has been marked by hand on the laboratory report, a copy of which is attached to this report.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within laboratory criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MSs were analyzed as required by the referenced method and all percent recoveries RPD were within laboratory criteria.

6. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPD were within laboratory criteria, except as noted below.

Table 10. Inorganic Data Qualifiers Due to Duplicate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWRC214R1	Sulfide	Precision	6.8 E
MWRC213R2	Sulfide	Precision	134 E

Discussion: There was a calculation error for the RPD of laboratory duplicates. The recalculated value for sulfide was out of the criteria of <20 RPD in the sample duplicate set. The associated results in Samples MWRC214R1 and MWRC213R1 have been flagged "E" to indicate and estimated value.

7. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWSB101R1 and MWSB101SB were identified as field duplicates. Test results were reviewed, and where positive results were found, the RPD was calculated. All analytes, except those listed in the table below, were reported as non-detect.

Table 11. Inorganic Field Duplicates and RPD

Compound	MWSB101R1 Result	MWSB101SB Result	RPD
Moisture	36	35	2.8

8. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately, except as noted below. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

Discussion: Calculation errors were found in determining the RPD for the sulfide duplicates and the percent recovery for CCV2 in the sulfide analysis. Corrected values are listed on the laboratory final report forms.

9. Laboratory Contact

There was no verbal or written communication with the laboratory.

10. Other Comments

None.

11. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

Attachment 1 Puget Sound Estuary Program Data Qualifier Definitions

Used for both organics and inorganic analyses

B = Analyte detected in samples and in method blank

C = Combined with unresolved substances

E = Estimated

G = Value greater than minimum shown

K = Detected at less than the maximum shown

L = Value less than the maximum shown

M = Value is a mean

Q = Questionable value

R = Rejected or unusable value

T = Detected below the quantification limit shown

U = Undetected at the detection limit shown

Z = Blank corrected

Attachment 2 Summary Table of Data Qualifier Flags

Foster Wheeler Environmental
Project: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 27-28, 1999

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWST136R1	Bis(2-ethylhexyl)phthalate	Blank Contamination	350 B
MWST136R1	Benzo(b)fluoranthene	More technically sound data	540 U
MWST136R1	Benzo(k)fluoranthene	More technically sound data	460
MWST136R1	Benzo(a)pyrene	More technically sound data	760
MWST136R1	Indeno(1,2,3-cd)pyrene	More technically sound data	210
MWST136R1	Benzo(g,h,i)perylene	More technically sound data	220
MWST136R1	Di-n-octyl phthalate	More technically sound data	62 U
MWSB104R1	Arsenic	Precision	3.4 E
MWSS109R1	Arsenic	Precision	20.8 E
MWSB104R1	Lead	Serial Dilution	15.2 E
MWSB104R1	Zinc	Serial Dilution	52.8 E
MWSS109R1	Lead	Serial Dilution	27.3 E
MWSS109R1	Zinc	Serial Dilution	68.5 E
MWRC214R1	Sulfide	Holding Time	6.8 E
MWRC213R1	Sulfide	Holding Time	134 E
MWRC214R1	Sulfide	Precision	6.8 E
MWRC213R2	Sulfide	Precision	134 E
MWSB104R1	Antimony	MS	14.4 UE
MWSS109R1	Antimony	MS	18.3 UE

added by SLW 1/21/00

Attachment 3 Revised Laboratory Forms

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	MultiChem Analytical Services	**Service Request:**	K9906888
Project:	Middle Waterway/909066	**Date Collected:**	9/27/99
Sample Matrix:	Sediment	**Date Received:**	10/1/99

Sulfide, Total

Prep Method:	NONE	Units:	mg/Kg (ppm)
Analysis Method:	PSEP	Basis:	Dry
Test Notes:			

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
MWRC214RI	K9906888-001	0.5	0.5	1	NA	10/5/99	6.8	H E
MWRC213RI	K9906888-002	0.5	0.5	25	NA	10/5/99	134	H E
Method Blank	K9906888-MB	0.5	0.5	1	NA	10/5/99	ND	

H The analysis was performed past the recommended hold time.

Approved By: _____ Date: 10/19/99

ed/QBD
12/25/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: MultiChem Analytical Services
Project: Middle Waterway/909066
Sample Matrix: Sediment

Service Request: K9906888
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 10/5/99

Duplicate Summary
Sulfide, Total

Sample Name: Batch QC
Lab Code: K9906884-001DUP
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Sulfide, Total	NONE	PSEP	0.5	21.7	16.4	~~21.0~~ 19.05	~~17~~ 27.8	

Approved By: MMMR Date: 10/15/99

06888WET.LJ1 - DUP 10/15/99

12/QBD
12/25/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: MultiChem Analytical Services
Project: Middle Waterway/909066

Service Request: K9906888
Date Collected: NA
Date Received: NA
Date Analyzed: 10/5/99

Sulfide, Total
PSEP
Units: mg/Kg (ppm)

CONTINUING CALIBRATION VERIFICATION (CCV)

	True Value	Measured Value	Percent Recovery
CCV 1 Result	0.42	0.42	100
CCV 2 Result	0.42	0.44	~~107~~ 105

CONTINUING CALIBRATION BLANK (CCB)

	MRL	Blank Value
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND

Approved By: _____ Date: 10/15/99

COMBOQCD/042695

Q-CCV.XLT

00011

10/6/95

12/25/99

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWST136R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909066

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909066-9

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1330

Level: (low/med) LOW Date Collected: 09/28/99

% Moisture: 35 decanted: (Y/N) Y Date Extracted: 09/29/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/11/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	20	U	
106-46-7	1,4-Dichlorobenzene	20	U	
95-50-1	1,2-Dichlorobenzene	20	U	
120-82-1	1,2,4-Trichlorobenzene	20	U	
91-20-3	Naphthalene	660		
91-57-6	2-Methylnaphthalene	210		
131-11-3	Dimethylphthalate	62	U	
208-96-8	Acenaphthylene	540		
83-32-9	Acenaphthene	210		
132-64-9	Dibenzofuran	200	U	
84-66-2	Diethylphthalate	62	U	
86-73-7	Fluorene	240		
86-30-6	N-Nitrosodiphenylamine (1)	24		
85-01-8	Phenanthrene	1200		
120-12-7	Anthracene	540		
84-74-2	Di-n-butylphthalate	62	U	
206-44-0	Fluoranthene	1800	D3	
129-00-0	Pyrene	1300		
85-68-7	Butylbenzylphthalate	62	U	
56-55-3	Benzo(a)anthracene	770		
218-01-9	Chrysene	830		
117-81-7	bis(2-Ethylhexyl)phthalate	350		B
117-84-0	Di-n-octylphthalate	~~310~~	UD3	62U
205-99-2	Benzo(b)fluoranthene	~~410~~	UD3	540U
207-08-9	Benzo(k)fluoranthene	~~520~~	D3	460
50-32-8	Benzo(a)pyrene	~~790~~	D3	760
193-39-5	Indeno(1,2,3-cd)pyrene	~~530~~	D3	210
53-70-3	Dibenzo(a,h)anthracene	410	UD3	
191-24-2	Benzo(g,h,i)perylene	~~740~~	D3	220

(1) - Cannot be separated from Diphenylamine

D3 - Result reported from a 5 fold dilution (P1320.D)

Pt 11/5/99
RCS/QBD
1/11/00

DAT 11/9/99

INORGANICS SW-846

00011

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWSS109R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909066

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909066-3

% Solids: 69.8

Date Received: 09/28/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	~~3.8~~	U		P	18.3 UE
7440-38-2	Arsenic	20.8		~~W~~	F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.38	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	115			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	27.3		E	P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.28			CV	
7440-02-0	Nickel	6.9			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.75	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	68.5		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

ld/QBD

12/24/99

INORGANICS SW-846

00066

1

CLIENT ID

INORGANIC ANALYSIS DATA SHEET

MWSB104R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909066

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909066-10

% Solids: 82.5

Date Received: 09/28/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	~~3.0~~	U		P	14.4 UE
7440-38-2	Arsenic	3.4		W 12/28/99	F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.30	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	46.0			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	15.2		E 12/28/99	P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	1.0			CV	
7440-02-0	Nickel	16.9			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.61	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	52.8		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

ld/QBD
12/24/99

Quality By Design

Laboratory Quality Assurance Consulting

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Suite 101
Hilo, Hawaii 96720

Phone: (808) 969-9424
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EPA Level 2
DATA VALIDATION REPORT

Project Name: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 28, 1999
SDG: 909067

Prepared for

Foster Wheeler Environmental
10900 NE 8th St.
Bellevue, WA 98004

Purchase Order No. 022828
QBD Job No. 270F

Reviewed and approved,

Lorraine Davis 1/19/00

Lorraine L. Davis, Owner — Date

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Attachment 2 Summary Table of Data Qualifier Flags
Attachment 3 Revised Laboratory Forms

A. Introduction

Laboratory Sciences, Inc., d.b.a. *Quality by Design* (QBD), has completed an EPA Level 2 Data Validation on the submitted data packages in accordance with P.O. Number 022828.

The reporting format and criteria for recommending data qualifying flags for this data set are described in the EPA *"Functional Guidelines for Evaluating Organics Analyses"* and *"Functional Guidelines for Evaluating Inorganics Analyses,"* as revised, 1994; and *"Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound"* ("PSEP Protocols"), May, 1997, or using criteria listed in the method referenced. Data may be qualified for any of the following reasons:

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2. Because of laboratory deviation from the designated method
3. Because the data may not meet the criteria listed in the reference above
4. By the professional judgment of the reviewer.

The data set consists of several data packages from Multichem Analytical Services in Renton, Washington, and contains data for the samples shown in Table 1. The data reviewer and senior reviewers are shown in Table 2.

Each data set includes an analytical data package for each sample, copies of the completed chain-of-custody (COC) forms, and a quality control (QC) data package. The analytical data package includes analytical results, blank sample results, both laboratory and client sample identifications, appropriate dates but not times, method reporting limits, method references, surrogate recoveries as appropriate, the laboratory's name and address, and the initials of the person releasing the data. The custody forms include the receipt of the sample but not the laboratory's internal tracking. The QC data package includes a tabular list of the laboratory's sample identification, spiking concentrations, recoveries, percentage calculations, and acceptance windows.

Raw data were provided which includes chromatograms, instrument print outs, injection logs, digestion/preparation logs.

This data validation report consists of several sections, each of which are formatted to follow Functional Guidelines, but which also include subsections discussing QBD contacts with the laboratory, other comments, and a summary table of data qualifiers.

Table 1. Sample Identification and Analysis

Sample Identification	Laboratory Identification	Methods 8081/8082	Method 8270	Method 6010/7000	Method 9060	Grain Size	Conventionals
MWSS102E1	909067-1	X	X	X			

Key:
- Method 8270 = Semivolatile organic compounds by gas chromatography/mass spectroscopy
- Method 8081/8082 = Pesticides and polychlorinated biphenyls (PCB) by gas chromatography
- Method 6010 & 7000 = Metals by inductively coupled plasma (ICP) and cold vapor atomic absorption (CVAA)
- Method 9060 = Total organic carbon (TOC)
- Conventionals = Sulfide, ammonia, and percent moisture

Table 2. Data Package, Reviewer, and Senior Reviewer

Analysis	Number of Pages	Reviewer	Senior Reviewer
SVOC	104	Debbie Copsey	Lorraine Davis
Pest/PCB	281	Randi Schneider	Lorraine Davis
Metals	99	Lorraine L. Davis	Thomas S. Davis

B. Chain-of-Custody

The analytical data package was reviewed and compared against the chain-of-custody (COC) form. No data are missing from the COC forms and no transcription errors in accuracy were found. All tests requested on the COC were performed.

Discussion: For this sample delivery group (SDG), the laboratory sample receipt form showed anomalies in the sample condition upon receipt. Sample MWSS102E1 was received by the laboratory without proper preservation for metals analysis. The laboratory received the sample on the same day as it was collected and added acid to preserve the sample. No data qualifier flags are recommended.

The COC does not show that the samples were relinquished by the sampler to the laboratory. Foster Wheeler was contacted regarding this and field notes confirm the sample was taken and transported to the laboratory. No further action is recommended.

C. Review of GC/MS Semivolatiles Analyses

EPA Method 8270

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. GC/MS Tuning

All decafluorotriphenylphosphine (DFTPP) tune criteria were met for the initial and continuing calibration for all dates of sample analysis.

3. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No target compound list (TCL) analytes had percent relative standard deviations (%RSD) greater than allowed by the method for the initial calibration or percent difference for the continuing calibration checks. All system performance check compound (SPCC) and calibration check compound (CCC) criteria were met.

4. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

5. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria.

6. Laboratory Control Standards

The laboratory analyzed a second source sample with the analytical batch. The laboratory referred to this sample as a blank spike/blank spike duplicate (BS/BSD) rather than a laboratory control standard (LCS). Any anomalies or comments regarding the second source results are addressed in the next section.

7. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

Matrix spikes and matrix spike duplicates (MS/MSD) were not analyzed with this set of analyses. The laboratory analyzed a BS and BSD to measure precision and accuracy. Except as noted below, all percent recoveries (%Rec) and relative percent differences (RPDs) were within QAPP criteria.

Discussion: The percent recovery of 1,2,4-trichlorobenzene was out of the acceptance criteria of 37 to 113 at 119 percent in one of the BS/BSD pair. Since all other QC checks were in criteria, no data qualifier flags are recommended.

8. Internal Standards Performance for Samples

All internal standard areas were within the required control limits.

9. Field Duplicates

No field duplicates were identified with this group of samples.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards, except as noted below. Quantitation was reviewed against contract requirements to determine that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

Table 3. SVOC Data Qualifiers Due to Compound Quantitation Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSS102E1	n-Nitrosodiphenylamine	Value reported are less than the reporting limit	9.7 U
MWSS102E1	Fluoranthene	Value reported are less than the reporting limit	9.7 U
MWSS102E1	Pyrene	Value reported are less than the reporting limit	9.7 U
MWSS102E1	Chrysene	Value reported are less than the reporting limit	9.7 U

Discussion: The values reported for n-nitrosodiphenylamine, fluoranthene, pyrene, and chrysene were all below the reporting limit. The laboratory has appropriately flagged the data with a "J" to indicated an estimated value. According the PSSDA guidance, all values below the reporting limit should be reported as a "U" to indicate the compound is not present at the reporting limit. Therefore, the values have been flagged with "U" to indicate the compound was not detected at the reporting limit.

11. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

12. TCL Compound Identification

All target compound identifications met the criteria for retention times and peak identification of the referenced method.

13. Tentatively Identified Compounds

No TICs were reported with this data set.

14. Laboratory Contact

There was no verbal or written communication with the laboratory.

15. Other Comments

None.

16. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

D. Review of Pesticides/PCBs Analyses

EPA Method 8081/8082

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The analysis of the target compounds hexachlorobenzene and hexachlorobutadiene was performed using Method 8081 instead of the requested Method 8270. No data qualifier flags are recommended since the method utilized is an approved method by PSEP.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No TCL analytes had %RSD greater than that allowed for the initial calibration or percent difference for the continuing calibration checks, except as noted below.

Discussion: The continuing calibrations for the target compound hexachlorobutadiene had a percent difference that is out of the criteria of 15 percent. Since this analyte was not found in the sample, and since the MS/MSD and BS/BSD percent recoveries were acceptable, no data qualifier flags are recommended

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSDs were not analyzed with this set of analyses. The laboratory analyzed a blank spike (BS) and blank spike duplicate (BSD) to measure precision and accuracy. All percent recoveries and relative percent differences (RPD) within laboratory or method criteria.

6. Field Duplicates

No field duplicates were identified with this group of samples.

7. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

8. TCL Compound Identification

No target compounds were detected.

9. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using the appropriate external standardization. Quantitation was reviewed against contract requirements to determine that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

10. Laboratory Contact

There was no verbal or written communication with the laboratory.

11. Other Comments

None.

13. Data Use and Overall Assessment

The data are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results.

E. Review of Metals Analyses

EPA Method 6010/7000

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times, except as noted below. There are no contractual deviations that have been brought to the attention of the reviewer.

Discussion: The laboratory noted that SampleMWSS102E1 was received without acid preservation and that they had added nitric acid about 24 hours after collection. To the reviewer's knowledge, there is no published PSEP or USEPA guidance regarding holding times for metals in unpreserved water. However, the USEPA's Office of Water has issued a letter to drinking water providers and laboratories that describes a procedure for unpreserved water samples which are in transit or being shipped for two or more days, and which are to be analyzed for lead and copper. In essence, the samples are preserved with nitric acid upon their arrival at the laboratory and a minimum of 48 hours must then elapse before analysis to allow leaching of the metals back into the water. This sample was handled in this fashion, and no data qualifier flags are recommended.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met, including the number of standards used and the correlation coefficients. All continuing calibration criteria, including frequency of analysis and percent recovery were met.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. ICP Interference Check Standard

An interference check sample (ICS) was analyzed at a frequency required by the referenced method and was within established criteria.

5. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within QAPP criteria.

6. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and RPD were within laboratory or method criteria.

7. Field Duplicates

No field duplicates were identified with this group of samples.

8. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPD were within QAPP criteria.

9. ICP Serial Dilution

No samples were a factor of 50 above the instrument detection limit (IDL).

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate standardization. Quantitation was reviewed against contract requirements to determine that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and digestion amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract, except as noted below.

Discussion: The reporting limit for nickel and lead of 10 and 30 µg/L failed to meet the requirement of 7.9 and 5.8 µg/L that was listed in Table 5 of the QAPP for the Chronic Marine Water Quality Standard. The analysis was performed by inductively coupled plasma spectroscopy (ICP). If obtaining this lower reporting limit is crucial for decision making, the laboratory should be instructed to analyze all water samples for lead using graphite furnace atomic absorption or ICP/Mass Spectroscopy.

11. Graphite Furnace Atomic Absorption Analysis

Not applicable to this SDG's analyses.

12. Laboratory Contact

There was no verbal or written communication with the laboratory.

13. Other Comments

None.

14. Data Use and Overall Assessment

The data are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results.

Attachment 1 Puget Sound Estuary Program Data Qualifier Definitions

Used for both organics and inorganic analyses

B = Analyte detected in samples and in method blank

C = Combined with unresolved substances

E = Estimated

G = Value greater than minimum shown

K = Detected at less than the maximum shown

L = Value less than the maximum shown

M = Value is a mean

Q = Questionable value

R = Rejected or unusable value

T = Detected below the quantification limit shown

U = Undetected at the detection limit shown

Z = Blank corrected

Attachment 2 Summary Table of Data Qualifier Flags

Foster Wheeler Environmental
Project: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 28, 1999

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWSS102E1	n-Nitrosodiphenylamine	Value reported are less than the reporting limit	9.7 U
MWSS102E1	Fluoranthene	Value reported are less than the reporting limit	9.7 U
MWSS102E1	Pyrene	Value reported are less than the reporting limit	9.7 U
MWSS102E1	Chrysene	Value reported are less than the reporting limit	9.7 U

Attachment 3 Revised Laboratory Forms

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
00211
MWSS102E1

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909067

Matrix: (soil/water) WATER ✓ Lab Sample ID: 909067-1 ✓

Sample wt/vol: 1030 ✓ (g/mL) ML Lab File ID: J5723 ✓

Level: (low/med) LOW Date Collected: 09/28/99

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 09/29/99 ✓ OK

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/18/99 ✓

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q	
108-95-2	Phenol	9.7	U	
95-57-8	2-Chlorophenol	9.7	U	
541-73-1	1,3-Dichlorobenzene	9.7	U	
106-46-7	1,4-Dichlorobenzene	9.7	U	
95-50-1	1,2-Dichlorobenzene	9.7	U	✓
100-51-6	Benzyl alcohol	9.7	U	
95-48-7	2-Methylphenol	9.7	U	
621-64-7	N-Nitroso-di-n-propylamine	9.7	U	
67-72-1	Hexachloroethane	9.7	U	
106-44-5	4-Methylphenol	9.7	U	
105-67-9	2,4-Dimethylphenol	9.7	U	
120-82-1	1,2,4-Trichlorobenzene	9.7	U	
91-20-3	Naphthalene	9.7	U	
65-85-0	Benzoic acid	48	U	
87-68-3	Hexachlorobutadiene	9.7	U	
59-50-7	4-Chloro-3-Methylphenol	9.7	U	
91-57-6	2-Methylnaphthalene	9.7	U	
131-11-3	Dimethylphthalate	9.7	U	
208-96-8	Acenaphthylene	9.7	U	
83-32-9	Acenaphthene	9.7	U	
132-64-9	Dibenzofuran	9.7	U	✓
100-02-7	4-Nitrophenol	48	U	✓
121-14-2	2,4-Dinitrotoluene	9.7	U	
84-66-2	Diethylphthalate	9.7	U	
86-73-7	Fluorene	9.7	U	
86-30-6	N-Nitrosodiphenylamine (1)	~~8.4~~	~~J~~	✓ 9.7 u
118-74-1	Hexachlorobenzene	9.7	U	
87-86-5	Pentachlorophenol	9.7	U	
85-01-8	Phenanthrene	9.7	U	
120-12-7	Anthracene	9.7	U	
84-74-2	Di-n-butylphthalate	9.7	U	
206-44-0	Fluoranthene	~~0.51~~	~~J~~	✓ 9.7 u
129-00-0	Pyrene	~~0.24~~	~~J~~	✓ 9.7 u

(1) - Cannot be separated from Diphenylamine

ek/QBU
1/7/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO: 00012

MWSS102E1

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909067

Matrix: (soil/water) WATER ✓ Lab Sample ID: 909067-1 ✓

Sample wt/vol: 1030 ✓ (g/mL) ML Lab File ID: J5723 ✓

Level: (low/med) LOW Date Collected: 09/28/99

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 09/29/99 ✓ OK

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/18/99 ✓

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q	
85-68-7	Butylbenzylphthalate	9.7	U	
56-55-3	Benzo(a)anthracene	9.7	U	
218-01-9	Chrysene	~~0.32~~	~~J~~ ✓	9.7 U
117-81-7	bis(2-Ethylhexyl)phthalate	11	B ✓	
117-84-0	Di-n-octylphthalate	9.7	U	
205-99-2	Benzo(b)fluoranthene	9.7	U	
207-08-9	Benzo(k)fluoranthene	9.7	U	
50-32-8	Benzo(a)pyrene	9.7	U ✓	
193-39-5	Indeno(1,2,3-cd)pyrene	9.7	U	
53-70-3	Dibenz(a,h)anthracene	9.7	U	
191-24-2	Benzo(g,h,i)perylene	9.7	U	

12/08/99 11/7/00

Quality By Design

Laboratory Quality Assurance Consulting

29 Shipman Street
Suite 101
Hilo, Hawaii 96720

Phone: (808) 969-9424
Fax: (808) 969-9094
e-mail: qbdhilo@gte.net

EPA Level 2
DATA VALIDATION REPORT

Project Name: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 29-30, 1999
SDG: 909070

Prepared for

Foster Wheeler Environmental
10900 NE 8th St.
Bellevue, WA 98004

Purchase Order No. 022828
QBD Job No. 270G

Reviewed and approved,

Lorraine Davis 1/19/00

Lorraine L. Davis, Owner

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Attachments

Attachment 1 Data Flag Definitions
Attachment 2 Summary Table of Data Qualifier Flags
Attachment 3 Communications with the Laboratory
Attachment 4 Revised Laboratory Forms

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The reporting format and criteria for recommending data qualifying flags for this data set are described in the EPA *"Functional Guidelines for Evaluating Organics Analyses"* and *"Functional Guidelines for Evaluating Inorganics Analyses,"* as revised, 1994; and *"Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound"* ("PSEP Protocols"), May, 1997, or using criteria listed in the method referenced. Data may be qualified for any of the following reasons:

1. By the laboratory prior to receipt by the reviewer
2. Because of laboratory deviation from the designated method
3. Because the data may not meet the criteria listed in the reference above
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The data set consists of several data packages from Multichem Analytical Services in Renton, Washington, and contains data for the samples shown in Table 1. The data reviewers and senior reviewers are shown in Table 2.

Each data set includes an analytical data package for each sample, copies of the completed chain-of-custody (COC) forms, and a quality control (QC) data package. The analytical data package includes analytical results, blank sample results, both laboratory and client sample identifications, appropriate dates but not times, method reporting limits, method references, surrogate recoveries as appropriate, the laboratory's name and address, and the initials of the person releasing the data. The custody forms include the receipt of the sample but not the laboratory's internal tracking. The QC data package includes a tabular list of the laboratory's sample identification, spiking concentrations, recoveries, percentage calculations, and acceptance windows.

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Table 1. Sample Identification and Analysis

Sample Identification	Laboratory Identification	Methods 8081/8082	Method 8270	Method 6010/7000	Method 9060	Grain Size	Conventionals
MWCS106R2	909070-1			X		X	X
MWCS107R2	909070-2			X		X	X
MWCS105R2	909070-3			X		X	X
MWCS108R2	909070-4			X		X	X
MWCS156R2A	909070-5	X	X	X	X	X	X
MWCS136R2A	909070-6	X	X	X	X	X	X
MWCS111R2A	909070-7	X	X	X	X	X	X
MWCS137R2	909070-8	X	X	X	X	X	X
MWCS127R2	909070-9	X	X	X	X	X	X
MWCS151R3	909070-10	X	X	X	X	X	X
MWCS155R2	909070-11	X	X	X	X	X	X
MWCS116R2	909070-12	X	X	X	X	X	X
MWCS126R2	909070-13		X	X	X	X	X
MWCS112R2	909070-14	X	X	X	X	X	X
MWCS114R2	909070-15	X	X	X	X	X	X
MWCS157R2	909070-16	X	X	X	X	X	X
MWCS152R3	909070-17	X	X	X	X	X	X
MWCS113R2B	909070-18	X	X	X	X	X	X

Key:
- Method 8270 = Semivolatile organic compounds by gas chromatography/mass spectroscopy
- Method 8081/8082 = Pesticides and polychlorinated biphenyls (PCB) by gas chromatography
- Method 6010 & 7000 = Metals by inductively coupled plasma (ICP) and cold vapor atomic absorption (CVAA)
- Method 9060 = Total organic carbon (TOC)
- Conventionals = Sulfide, ammonia, and percent moisture

Table 2. Data Package, Reviewer, and Senior Reviewer

Analysis	Number of Pages	Reviewer	Senior Reviewer
SVOC	1073	Debbie Copsey Melinda Jacobson	Thomas S. Davis
Pest/PCB	566	Randi Schneider	Lorraine L. Davis
Metals	167	Lorraine L. Davis	Thomas S. Davis
Conventionals	47	Lorraine L. Davis	Thomas S. Davis

B. Chain-of-Custody

The analytical data package was reviewed and compared against the chain-of-custody (COC) form. No data are missing from the COC forms and no transcription errors in accuracy were found. All tests requested on the COC were performed.

Discussion: The grain size analysis was subcontracted to Rosa Environmental and Geotechnical Laboratory in Seattle, Washington. The sulfide analysis was subcontracted to Columbia Analytical Services, Inc. in Kelso, Washington.

C. Review of GC/MS Semivolatiles Analyses

EPA Method 8270

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: Analyses were added to the work order after the samples had been logged into the laboratory system, and the extraction for this analyses occurred after the 14-day holding time. As stated in the case narrative, the samples were frozen upon receipt and then thawed and extracted. PSDDA recognizes a holding time of one year for sediments which have been frozen. When the samples are thawed, Method 8270 recognizes a 14-day holding time to extraction. Since the request for analysis occurred during the analytical process for the SDG and since the samples were frozen until extraction, no data qualifier flags are recommended.

The data package was missing the DFTPP printout for November 22, 1999. The laboratory was contacted and provided the printout, a copy of which is attached to this report.

2. GC/MS Tuning

All decafluorotriphenylphosphine (DFTPP) tune criteria were met for the initial and continuing calibration for all dates of sample analysis.

3. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No target compound list (TCL) analytes had percent relative standard deviations (%RSD) greater than allowed by the method for the initial calibration or percent difference for the continuing calibration checks. All system performance check compound (SPCC) and calibration check compound (CCC) criteria were met, except as noted below.

Table 3. SVOC Data Qualifiers Due to Calibration Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS155R2	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	65 L
MWCS155R2	Benzo(g,h,i)perylene	Continuing Calibration %D >20	92 L

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS114R2	bis(2-Ethylhexyl)phthalates	Continuing Calibration %D >20	1000 G
MWCS157R2	bis(2-Ethylhexyl)phthalates	Continuing Calibration %D >20	680 G
MWCS113R2B	bis(2-Ethylhexyl)phthalates	Continuing Calibration %D >20	3000 G
MWCS151R3	bis(2-Ethylhexyl)phthalates	Continuing Calibration %D >20	180 G
MWCS137R2	bis(2-Ethylhexyl)phthalates	Continuing Calibration %D >20	1700 G
MWCS116R2RE	Pyrene	Continuing Calibration %D >20	5900 L
MWCS116R2RE	Butylbenzylphthalate	Continuing Calibration %D >20	310 G
MWCS113R2BRE	Pentachlorophenol	Continuing Calibration %D >20	120 E

Discussion: The continuing calibration for several of the target compounds had percent differences out of the criteria of <20 percent. The associated results in Samples MWCS155R2, MWCS114R2, MWCS157R2, MWCS113R2B, MWCS151R3, MWCS137R2 and MWCS116R2RE have been flagged appropriately with "G" or "L". If the calibration check indicated a high bias, the data was flagged with "L" to indicate that the value was less than the maximum shown. If the calibration check indicated a low bias, the data was flagged with "G" to indicate that the values are greater than the minimum shown.

4. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

5. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria, except as noted below.

Table 4. SVOC Data Qualifiers Due to Surrogate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS116R2	1,3-Dichlorobenzene	Surrogate	20 UR
MWCS116R2	1,4-Dichlorobenzene	Surrogate	20 UR
MWCS116R2	1,2-Dichlorobenzene	Surrogate	20 UR
MWCS116R2	1,2,3-Trichlorobenzene	Surrogate	20 UR
MWCS116R2	Naphthalene	Surrogate	85 R

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS116R2	2-Methylnaphthalene	Surrogate	82 UR
MWCS116R2	Dimethylphthalate	Surrogate	62 UR
MWCS116R2	Acenaphthylene	Surrogate	160 R
MWCS116R2	Acenaphthene	Surrogate	98 R
MWCS116R2	Dibenzofuran	Surrogate	200 UR
MWCS116R2	Diethylphthalate	Surrogate	62 UR
MWCS116R2	Fluorene	Surrogate	99 R
MWCS116R2	n-Nitrosodiphenylamine	Surrogate	20 UR
MWCS116R2	Phenanthrene	Surrogate	620 R
MWCS116R2	Anthracene	Surrogate	300 R
MWCS116R2	Di-n-butylphthalate	Surrogate	62 UR
MWCS116R2	Fluoranthene	Surrogate	1600 R
MWCS116R2	Pyrene	Surrogate	1600 R
MWCS116R2	Butylbenzylphthalate	Surrogate	310 UR
MWCS116R2	Benzo(a)anthracene	Surrogate	760 R
MWCS116R2	Chrysene	Surrogate	1000 R
MWCS116R2	bis(2-Ethylhexyl)phthalate	Surrogate	740 R
MWCS116R2	Di-n-octylphthalate	Surrogate	62 UR
MWCS116R2	Benzo(b)fluoranthene	Surrogate	1000 R
MWCS116R2	Benzo(k)fluoranthene	Surrogate	680 R
MWCS116R2	Benzo(a)pyrene	Surrogate	720 R
MWCS116R2	Indeno(1,2,3-cd)pyrene	Surrogate	160 R
MWCS116R2	Dibenzo(a,h)anthracene	Surrogate	82 UR
MWCS116R2	Benzo(g,h,i)perylene	Surrogate	130 R
MWCS137R2RE	Phenol	Surrogate	75 E
MWCS137R2RE	Benzyl alcohol	Surrogate	47 UE
MWCS137R2RE	2-Methylphenol	Surrogate	23 UE
MWCS137R2RE	4-Methylphenol	Surrogate	140 E
MWCS137R2RE	2,4-Methylphenol	Surrogate	12 UE
MWCS137R2RE	Benzoic acid	Surrogate	280 UE
MWCS137R2RE	Pentachlorophenol	Surrogate	53 E
MWCS151R3RE	Phenol	Surrogate	61 E
MWCS151R3RE	Benzyl alcohol	Surrogate	39 UE
MWCS151R3RE	2-Methylphenol	Surrogate	20 UE
MWCS151R3RE	4-Methylphenol	Surrogate	68 E
MWCS151R3RE	2,4-Methylphenol	Surrogate	24 E
MWCS151R3RE	Benzoic acid	Surrogate	240 UE
MWCS151R3RE	Pentachlorophenol	Surrogate	20 UE

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS155R2RE	Phenol	Surrogate	35 E
MWCS155R2RE	Benzyl alcohol	Surrogate	32 UE
MWCS155R2RE	2-Methylphenol	Surrogate	16 UE
MWCS155R2RE	4-Methylphenol	Surrogate	30 E
MWCS155R2RE	2,4-Methylphenol	Surrogate	64 E
MWCS155R2RE	Benzoic acid	Surrogate	190 UE
MWCS155R2RE	Pentachlorophenol	Surrogate	16 UE
MWCS116R2RE	Phenol	Surrogate	83 E
MWCS116R2RE	Benzyl alcohol	Surrogate	41 UE
MWCS116R2RE	2-Methylphenol	Surrogate	20 UE
MWCS116R2RE	4-Methylphenol	Surrogate	40 E
MWCS116R2RE	2,4-Methylphenol	Surrogate	12 E
MWCS116R2RE	Benzoic acid	Surrogate	450 E
MWCS116R2RE	Pentachlorophenol	Surrogate	250 E
MWCS112R2RE	Phenol	Surrogate	68 E
MWCS112R2RE	Benzyl alcohol	Surrogate	49 UE
MWCS112R2RE	2-Methylphenol	Surrogate	25 UE
MWCS112R2RE	4-Methylphenol	Surrogate	68 E
MWCS112R2RE	2,4-Methylphenol	Surrogate	12 UE
MWCS112R2RE	Benzoic acid	Surrogate	300 UE
MWCS112R2RE	Pentachlorophenol	Surrogate	31 E
MWCS157R2RE	Phenol	Surrogate	140 E
MWCS157R2RE	Benzyl alcohol	Surrogate	51 UE
MWCS157R2RE	2-Methylphenol	Surrogate	49 E
MWCS157R2RE	4-Methylphenol	Surrogate	210 E
MWCS157R2RE	2,4-Methylphenol	Surrogate	65 E
MWCS157R2RE	Benzoic acid	Surrogate	310 UE
MWCS157R2RE	Pentachlorophenol	Surrogate	26 UE

Discussion: In Samples MWCS112R2 and MWCS113R2B, a single surrogate was out of criteria. No data qualifier flags are recommended because all other surrogates were in criteria.

Surrogates failed in the original analysis of Sample MWCS116R2. The sample was reanalyzed and the surrogate results were in criteria. The original results have been flagged with "R" for unusable since the surrogates in the reanalyzed sample were in criteria.

In the first batch of samples for the acid fraction analyses, the method blank had all three surrogates out of criteria. Samples MWCT126R2A had no surrogates out of criteria and Samples MWCS112R2A and MWCS114R2 had only a single

surrogate out of criteria. No data qualifier flags are recommended for the field samples.

The re-extracted samples were split into two batches. In the first batch, the blank had a single surrogate that was low and out of the QAPP criteria. The MS/MSD pair each had two surrogates out of criteria, one high and one low. In the second batch, the QC check samples included two method blanks, two MS/MSD pairs, and two BS/BSD pairs. Both blanks again had a single surrogate out of criteria, three of the four matrix spikes had two surrogates out of criteria but the fourth was acceptable, and all four blank spikes had two surrogates out of criteria. Sample MWCT136R2ARE and MWCT152R3RE had only one surrogate out of criteria each, and all three surrogates were acceptable in Samples MWCS116R4 and MWCS113R2BRE, and no data qualifier flags are recommended for them. All other samples had two surrogates that were out of criteria and all analytes in these samples have been flagged "E" to indicate estimated values of "UE" to indicate estimated reporting limits. "G" and "L" flags were not applied because the surrogate recoveries were a mixture of high and low recoveries with no apparent pattern.

6. Laboratory Control Standards

The laboratory analyzed a second source sample with the analytical batch. The laboratory referred to this sample as a blank spike/blank spike duplicate (BS/BSD) rather than a laboratory control standard (LCS). Any anomalies or comments regarding the second source results are addressed in the next section.

7. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and relative percent differences (RPD) were within QAPP criteria, except as noted below.

Table 5 SVOC Data Qualifiers Due to MS/MSD Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS137R2RE	Benzoic acid	MS/MSD, BS/BSD	280 UE
MWCS151R3RE	Benzoic acid	MS/MSD, BS/BSD	240 UE
MWCS155R2RE	Benzoic acid	MS/MSD, BS/BSD	190 UE
MWCS116R2RE	Benzoic acid	MS/MSD, BS/BSD	450 E
MWCS112R2RE	Benzoic acid	MS/MSD, BS/BSD	300 UE
MWCS114R2RE	Benzoic acid	MS/MSD, BS/BSD	280 UE
MWCS157R2RE	Benzoic acid	MS/MSD, BS/BSD	310 UE
MWCS152R3RE	Benzoic acid	MS/MSD, BS/BSD	220 UE
MWCT136R2A	Phenol	MS/MSD	30 L

Discussion: A BS recovery for n-nitrosodiphenylamine and di-n-octylphthalate was out of the QAPP acceptance criteria. Since the compound recoveries were acceptable in the BSD, no data qualifier flags are recommended.

A single matrix spike for pyrene was out of criteria, but since all other accuracy measurements (e.g., the other matrix spike, surrogates and calibration verifications) are acceptable, no data qualifier flags are recommended.

Several target compounds were out of criteria due to high concentrations of analytes in the original samples. Since all other QC checks were in criteria, no data qualifier flags are recommended.

The percent recovery for 2,4-dimethylphenol was out of criteria at zero percent in the BS/BSD. The laboratory had previously noted this problem and found the root cause to be the medium used for the blank spike (Ottawa sand). Given that this as been identified as a historical issue, the reviewer concurs with the laboratory's action to use the MS/MSD results as their QC check for precision and accuracy. Since the MS/MSD results were in criteria, no data qualifier flags are recommended.

2-Methylephenol and 4-methylphenol had zero percent recovery, which was out of criteria for accuracy for the BS/BSD pair that were extracted on October 5, 1999. However, the MS was in criteria and, because the referenced method states that the BS/BSD is evaluated only if the MS/MSD is out of criteria, no data qualifier flags are recommended.

Benzoic acid was high and out of criteria for one of the two MSs and was low and out of criteria for the BS/BSD that were extracted on October 20, 1999, and all samples associated with this extraction have been flagged "E" or "UE" to indicate that the values are estimated. "G" and "L" flags are not recommended because the precision is poor, with both high and low values.

Phenol was high and out of criteria for the MS/MSD pair but the BS/BSD pair were acceptable. Only the sample spiked (MWCT136R2A) is flagged "L" to indicate that the value is less than the maximum shown.

2-Methylphenol and 4-methylphenol were low and out of criteria for accuracy for the BS/BSD pair that were extracted on November 3, 1999. The MSs were high and out of criteria for all analytes, however, the laboratory's case narrative stated that they suspected, but could not prove, that the sample was double spiked. Assuming that the sample was double spiked, most analytes are acceptable, including 2-methylphenol and 4-methylphenol. Because the referenced method states that the BS/BSD is evaluated only if the MS/MSD is out of criteria, no data qualifier flags are recommended for these analytes.

Phenol and benzoic acid were high and out of criteria for accuracy for the BS/BSD pair that were extracted on November 3, 1999. Again assuming that the MS was

double spiked, both analytes were acceptable in the MS and no data qualifier flags are recommended.

Assuming that the MS/MSD pair were double spiked, pentachlorophenol was low and out of criteria. Because the sample spiked was a project sample but from a different SDG, and the BS/BSD recoveries were acceptable, no data qualifier flags are recommended.

8. Internal Standards Performance for Samples

All internal standard areas were within the required control limits and had acceptable retention times, except as noted below.

Discussion: As noted by the laboratory, internal standards were out of the acceptance criteria of –50 to +100 percent for some of the sample analyses. Those samples which were out of criteria were reanalyzed at a dilution with acceptable results. It should be noted that the method requires that internal standards are monitored for the continuing calibration standards only, and not sample analysis. The laboratory showed extra diligence in reviewing sample analyses.

9. Field Duplicates

No field duplicates were identified with this group of samples.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards or external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. Except as noted below, no errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

Table 6. SVOC Data Qualifiers Due to Compound Quantitation Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT136R2ARE	Phenol	More technically sound value available	18 UR
MWCT136R2ARE	Benzyl alcohol	More technically sound value available	37 UR
MWCT136R2ARE	2-Methylphenol	More technically sound value available	18 UR
MWCT136R2ARE	4-Methylphenol	More technically sound value available	38 UR
MWCT136R2ARE	2,4-Dimethylphenol	More technically sound value available	9.3 UR

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT136R2ARE	Benzoic acid	More technically sound value available	220 UR
MWCT136R2ARE	Pentachlorophenol	More technically sound value available	18 UR

Discussion: Several samples were re-analyzed due to quality control issues. For Sample MWCT136R2A, the laboratory reported results for the original analysis and for the re-analysis. The results were condensed to one result per analyte per sample. Therefore, these results should not be used because more technically sound data are available and have been flagged "R" for unusable.

11. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

12. TCL Compound Identification

All target compound identifications met the criteria for retention times and peak identification of the referenced method.

13. Tentatively Identified Compounds

No TICs were reported with this data set.

14. Laboratory Contact

There was no verbal or written communication with the laboratory.

15. *Other Comments*

None.

16. Data Use and Overall Assessment

The analytes qualified with an "R" are unusable. All other data as qualified are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

D. Review of Pesticides/PCBs Analyses

EPA Method 8081/8082

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The analysis of the target compounds hexachlorobenzene and hexachlorobutadiene was performed using Method 8081 instead of the requested Method 8270. No data qualifier flags are recommended since the method utilized is an approved method by PSEP.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No TCL analytes had %RSD greater than that allowed for the initial calibration or percent difference for the continuing calibration checks, except as noted below.

Discussion: The continuing calibrations for the target compound hexachlorobutadiene (HCBD) had percent differences of 23.0 and 28.7, which is out of the criteria of less than 15 percent. Since HCBD was not detected in any of the samples, and the high recovery for the continuing calibration verification suggests a high bias, no data qualifier flags are recommended.

As noted in the case narrative, the continuing calibration verification for 4,4'-DDD, 4,4'-DDT, Aroclor 1016, and Aroclor 1260 were outside the acceptance criteria of less than 15 percent for one gas chromatograph (GC) column. Since the percent differences were acceptable on the second GC column, no data qualifier flags are recommended.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria.

Discussion: In several samples, the surrogate recoveries reported on Form II Pest do not match the raw data values. Since the recalculated recoveries are within criteria, no data qualifier flags are recommended. Form II Pest has the corrected values and is attached to this report.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria.

6. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWCS127R2 & MWCS127S2 were identified as field duplicates. Test results were reviewed, and where positive results were found, the RPD was calculated. All analytes, except those listed in the table below, were reported as non-detect.

Table 7. Pesticide/PCB Field Duplicates and RPD

Compound	MWCS127R2 Result	WSCS127S2 Result	RPD
4,4'-DDE	17.1	13	30.6
Aroclor 1254	480	300	46.2
Total Aroclors	480	300	46.2

Discussion: The high RPD for this analysis may be due to sample inhomogeniety or special circumstances during the sampling process. Because the person who performed the sampling has information that is not available to the data validator, such as sampling conditions or problems with the sampling equipment, the client typically performs any flagging and data qualification based upon field duplicates.

7. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

8. TCL Compound Identification

All TCL Compound identifications met the criteria for retention times, and peak identification of the referenced method.

9. Compound Quantitation and Reported Detection Limits

Quantitation was reviewed against contract requirements to determine that results were reported on a dry weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for

dilutions and extraction amounts. Quantitation from the primary and confirmatory columns was reviewed, and the proper result was reported. Except as noted below, no errors in accuracy or methodology were found.

Table 8. Pesticide/PCB Data Qualifiers Due to Compound Quantitation Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS127R2	4,4`-DDE	More Technically Sound Data	17.7

Discussion: The laboratory reported a value of 7.1 µg/kg of 4,4'-DDE in Sample MWCS127R2. This was quantified on two different GC columns. The percent difference between the two results was greater than 25 percent, and the laboratory reported the lower value. The larger value of 17.7 µg/kg should be reported for this sample as described in EPA Method 8000B, Section 7.10.4.2.

10. Laboratory Contact

There was no verbal or written communication with the laboratory.

11. Other Comments

None.

13. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

E. Review of Metals Analyses

EPA Method 6010/7000

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met, including the number of standards used and the correlation coefficients. All continuing calibration criteria, including frequency of analysis and percent recovery were met, except as noted below.

Table 9. Metal Data Qualifiers Due to Calibration Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT156R2A	Arsenic	Continuing Calibration %D >10	7.0 E
MWCT137R2	Arsenic	Continuing Calibration %D >10	50.8 L
MWCS127R2	Arsenic	Continuing Calibration %D >10	212 L
MWCS151R3	Arsenic	Continuing Calibration %D >10	20.0 L
MWCS155R2	Arsenic	Continuing Calibration %D >10	19.6 L
MWCS126R2	Arsenic	Continuing Calibration %D >10	60.9 L
MWCS114R2	Arsenic	Continuing Calibration %D >10	18.1 L
MWCS157R2	Arsenic	Continuing Calibration %D >10	75.3 L
MWCS113R2B	Arsenic	Continuing Calibration %D >10	115 L

Discussion: The continuing calibration for the target compound arsenic had a percent recoveries at 111.2 and 114.6, which is out of the criteria of 90 to 110 percent. The associated results in Samples MWCT137R2, MWCS127R2, MWCS1515R3, MWCS155R2, MWCS126R2, MWCS114R2, MWCS157R2, and MWCS113R2B have been flagged "L" to indicate that the result is lower than the value indicated.

Sample MWCT156R2A is flagged "E" because there are other QC checks show both low and high biases.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. ICP Interference Check Standard

An interference check sample (ICS) was analyzed at a frequency required by the referenced method and was within established criteria.

5. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within QAPP criteria, except as noted below.

Discussion: All of the metals except mercury were out of the method criteria of 90 to 110 percent recovery for the LCS. However, PSDDA allows 80 to 120 percent recovery of a second source check sample. All analytes were within PSDDA acceptance criteria and no data qualifier flags are recommended.

6. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MSs were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria, except as noted below.

Table 10. Metal Data Qualifiers Due to MS/MSD Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCT156R2A	Copper	MS	60.7 G
MWCT156R2A	Zinc	MS	67.1 G
MWCS111R2A	Antimony	MS	4.7 G
MWCS112R2	Antimony	MS	10.0 G
MWCS113R2B	Antimony	MS	12.7 G
MWCS114R2	Antimony	MS	4.8 UG
MWCS116R2	Antimony	MS	26.1 G
MWCS126R2	Antimony	MS	10.0 G
MWCS127R2	Antimony	MS	20.3 G
MWCS137R2	Antimony	MS	7.9 G
MWCS151R3	Antimony	MS	4.0 UG
MWCS152R3	Antimony	MS	4.0 UG
MWCS155R2	Antimony	MS	8.0 G

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS157R2	Antimony	MS	6.0 G
MWCS156R2A	Antimony	MS	3.7 G

Discussion: Copper and zinc were out of criteria for accuracy (percent recovery) in the MS. Since the LCS was acceptable, only the results for these compounds in the sample spiked has been flagged with a "G" to indicate the value is greater than the minimum shown.

Antimony was low and out of criteria for accuracy (percent recovery) for the MS/MSD pair. Normally, because the LCS was acceptable, only the results for this analyte in the sample that was spiked would be flagged. However, because all of the matrix spikes in all of the SDGs for this project have been out of criteria, all samples which were analyzed for antimony have been flagged "G" or "UG" to indicate that the value was greater than the minimum shown.

7. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWCS105R2 and MWCS105S2; and Samples MWCS127R2 and MWCS127S2 were identified as field duplicates. Test results were reviewed, and where positive results were found, the relative percent difference (RPD) was calculated. All analytes, except those listed in the table below, were reported as non-detect.

Table 11. Metal Field Duplicates and RPD

Compound	MWCS127R2 Result	MWCS127S2 Result	RPD
Antimony	20.3	25.2	21.5
Arsenic	212	242	13.2
Cadmium	2.5	2.4	4.1
Copper	1090	996	9.0
Lead	603	649	7.3
Mercury	4.3	3.6	17.7
Nickel	10.0	10.9	8.6
Silver	6.1	5.2	15.9
Zinc	825	1070	25.9

Compound	MWCS105R2 Result	MWCS105S2 Result	RPD
Copper	672	684	1.8
Mercury	1.1	1.0	9.5

8. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all relative percent differences (RPD) were within QAPP criteria, except as noted below.

Table 12. Metals Data Qualifiers Due to Duplicate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS111R2A	Lead	Precision	49.2 E
MWCS111R2A	Zinc	Precision	63.6 E
MWCS112R2	Lead	Precision	225 E
MWCS112R2	Zinc	Precision	666 E
MWCS113R2B	Lead	Precision	554 E
MWCS113R2B	Zinc	Precision	733 E
MWCS114R2	Lead	Precision	96.1 E
MWCS114R2	Zinc	Precision	213 E
MWCS116R2	Lead	Precision	563 E
MWCS116R2	Zinc	Precision	1120 E
MWCS126R2	Lead	Precision	481 E
MWCS126R2	Zinc	Precision	452 E
MWCS127R2	Lead	Precision	603 E
MWCS127R2	Zinc	Precision	825 E
MWCS137R2	Lead	Precision	366 E
MWCS137R2	Zinc	Precision	455 E
MWCS151R3	Lead	Precision	105 E
MWCS151R3	Zinc	Precision	111 E
MWCS152R3	Lead	Precision	12.0 E
MWCS152R3	Zinc	Precision	29.8 E
MWCS155R2	Lead	Precision	194 E
MWCS155R2	Zinc	Precision	149 E
MWCS157R2	Lead	Precision	466 E
MWCS157R2	Zinc	Precision	368 E
MWCT156R2A	Lead	Precision	38.5 E
MWCT156R2A	Zinc	Precision	67.1 E

Discussion: Lead and zinc were out of the criteria of <20 RPD at 25.3 and 30.8, respectively, in the sample duplicate set. The associated results for all samples have been flagged "E" to indicate an estimated value.

The laboratory reported a 200 RPD for mercury but one result was non-detect and the other was a trace result. It is the reviewer's opinion that precision was acceptable and the high RPD value was due to a software flaw.

9. ICP Serial Dilution

Samples that were a factor of 50 above the instrument detection limit (IDL) for the analyte were diluted five-fold and were within criteria required by the referenced method.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract, except as noted below.

Discussion: The reporting limit for lead failed to meet the requirement of 0.5 mg/kg that was listed in the QAPP. However, most field samples had positive results. For samples that were non-detect, the laboratory's reporting limit of 1.5 mg/kg was less than the Sediment Quality Standard Criteria of 450 mg/kg and the Sediment Impact Zone and Clean-up Criteria of 530 mg/kg, and no data qualifier flags are recommended.

11. Graphite Furnace Atomic Absorption Analysis

All special criteria for graphite furnace atomic absorption (GFAA) analysis were performed at a frequency required by the referenced method and was within established criteria.

12. Laboratory Contact

There was no verbal or written communication with the laboratory.

13. Other Comments

None.

14. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

F. Review of Conventional Analyses

EPA Method 9060, Grain Size, Percent Moisture, and PSEP Sulfides

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met, including the number of standards used and the correlation coefficients. All continuing calibration criteria, including frequency of analysis and percent recovery were met.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within laboratory or method criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MSs were analyzed as required by the referenced method and all percent recoveries and RPD were within laboratory or method criteria.

6. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPD were within laboratory or method criteria.

7. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWCS127R2 and MWCS127S2 were identified as field duplicates. Because Sample MWCS127S2 is in SDG910001, the review of these field duplicates is included in the report for that SDG.

8. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

9. Laboratory Contact

There was no verbal or written communication with the laboratory.

10. Other Comments

None.

11. Data Use and Overall Assessment

The data are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results.

Attachment 1 Puget Sound Estuary Program Data Qualifier Definitions

Used for both organics and inorganic analyses

B = Analyte detected in samples and in method blank

C = Combined with unresolved substances

E = Estimated

G = Value greater than minimum shown

K = Detected at less than the maximum shown

L = Value less than the maximum shown

M = Value is a mean

Q = Questionable value

R = Rejected or unusable value

T = Detected below the quantification limit shown

U = Undetected at the detection limit shown

Attachment 2 Summary Table of Data Qualifier Flags

Foster Wheeler Environmental
Project: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 29-30, 1999

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCS155R2	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	65 L
MWCS155R2	Benzo(g,h,i)perylene	Continuing Calibration %D >20	92 L
MWCS114R2	bis(2-Ethylhexyl)phthalates	Continuing Calibration %D >20	1000 G
MWCS157R2	bis(2-Ethylhexyl)phthalates	Continuing Calibration %D >20	680 G
MWCS113R2B	bis(2-Ethylhexyl)phthalates	Continuing Calibration %D >20	3000 G
MWCS151R3	bis(2-Ethylhexyl)phthalates	Continuing Calibration %D >20	180 G
MWCS137R2	bis(2-Ethylhexyl)phthalates	Continuing Calibration %D >20	1700 G
MWCS116R2RE	Pyrene	Continuing Calibration %D >20	5900 L
MWCS116R2RE	Butylbenzylphthalate	Continuing Calibration %D >20	310 G
MWCS113R2BRE	Pentachlorophenol	Continuing Calibration %D >20	120 E
MWCS116R2	1,3-Dichlorobenzene	Surrogate	20 UR
MWCS116R2	1,4-Dichlorobenzene	Surrogate	20 UR
MWCS116R2	1,2-Dichlorobenzene	Surrogate	20 UR
MWCS116R2	1,2,3-Trichlorobenzene	Surrogate	20 UR
MWCS116R2	Naphthalene	Surrogate	85 R
MWCS116R2	2-Methylnaphthalene	Surrogate	82 UR
MWCS116R2	Dimethylphthalate	Surrogate	62 UR
MWCS116R2	Acenaphthylene	Surrogate	160 R
MWCS116R2	Acenaphthene	Surrogate	98 R
MWCS116R2	Dibenzofuran	Surrogate	200 UR
MWCS116R2	Diethylphthalate	Surrogate	62 UR
MWCS116R2	Fluorene	Surrogate	99 R
MWCS116R2	n-Nitrosodiphenylamine	Surrogate	20 UR
MWCS116R2	Phenanthrene	Surrogate	620 R
MWCS116R2	Anthracene	Surrogate	300 R
MWCS116R2	Di-n-butylphthalate	Surrogate	62 UR
MWCS116R2	Fluoranthene	Surrogate	1600 R
MWCS116R2	Pyrene	Surrogate	1600 R
MWCS116R2	Butylbenzylphthalate	Surrogate	310 UR

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCS116R2	Benzo(a)anthracene	Surrogate	760 R
MWCS116R2	Chrysene	Surrogate	1000 R
MWCS116R2	bis(2-Ethylhexyl)phthalate	Surrogate	740 R
MWCS116R2	Di-n-octylphthalate	Surrogate	62 UR
MWCS116R2	Benzo(b)fluoranthene	Surrogate	1000 R
MWCS116R2	Benzo(k)fluoranthene	Surrogate	680 R
MWCS116R2	Benzo(a)pyrene	Surrogate	720 R
MWCS116R2	Indeno(1,2,3-cd)pyrene	Surrogate	160 R
MWCS116R2	Dibenzo(a,h)anthracene	Surrogate	82 UR
MWCS116R2	Benzo(g,h,i)perylene	Surrogate	130 R
MWCS137R2RE	Phenol	Surrogate	75 E
MWCS137R2RE	Benzyl alcohol	Surrogate	47 UE
MWCS137R2RE	2-Methylphenol	Surrogate	23 UE
MWCS137R2RE	4-Methylphenol	Surrogate	140 E
MWCS137R2RE	2,4-Methylphenol	Surrogate	12 UE
MWCS137R2RE	Benzoic acid	Surrogate	280 UE
MWCS137R2RE	Pentachlorophenol	Surrogate	53 E
MWCS151R3RE	Phenol	Surrogate	61 E
MWCS151R3RE	Benzyl alcohol	Surrogate	39 UE
MWCS151R3RE	2-Methylphenol	Surrogate	20 UE
MWCS151R3RE	4-Methylphenol	Surrogate	68 E
MWCS151R3RE	2,4-Methylphenol	Surrogate	24 E
MWCS151R3RE	Benzoic acid	Surrogate	240 UE
MWCS151R3RE	Pentachlorophenol	Surrogate	20 UE
MWCS155R2RE	Phenol	Surrogate	35 E
MWCS155R2RE	Benzyl alcohol	Surrogate	32 UE
MWCS155R2RE	2-Methylphenol	Surrogate	16 UE
MWCS155R2RE	4-Methylphenol	Surrogate	30 E
MWCS155R2RE	2,4-Methylphenol	Surrogate	64 E
MWCS155R2RE	Benzoic acid	Surrogate	190 UE
MWCS155R2RE	Pentachlorophenol	Surrogate	16 UE
MWCS116R2RE	Phenol	Surrogate	83 E
MWCS116R2RE	Benzyl alcohol	Surrogate	41 UE
MWCS116R2RE	2-Methylphenol	Surrogate	20 UE
MWCS116R2RE	4-Methylphenol	Surrogate	12 E
MWCS116R2RE	2,4-Methylphenol	Surrogate	40 E
MWCS116R2RE	Benzoic acid	Surrogate	450 E
MWCS116R2RE	Pentachlorophenol	Surrogate	250 E

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCS112R2RE	Phenol	Surrogate	68 E
MWCS112R2RE	Benzyl alcohol	Surrogate	49 UE
MWCS112R2RE	2-Methylphenol	Surrogate	25 UE
MWCS112R2RE	4-Methylphenol	Surrogate	68 E
MWCS112R2RE	2,4-Methylphenol	Surrogate	12 UE
MWCS112R2RE	Benzoic acid	Surrogate	300 UE
MWCS112R2RE	Pentachlorophenol	Surrogate	31 E
MWCS157R2RE	Phenol	Surrogate	140 E
MWCS157R2RE	Benzyl alcohol	Surrogate	51 UE
MWCS157R2RE	2-Methylphenol	Surrogate	49 E
MWCS157R2RE	4-Methylphenol	Surrogate	210 E
MWCS157R2RE	2,4-Methylphenol	Surrogate	65 E
MWCS157R2RE	Benzoic acid	Surrogate	310 UE
MWCS157R2RE	Pentachlorophenol	Surrogate	26 UE
MWCS137R2RE	Benzoic acid	MS/MSD, BS/BSD	280 UE
MWCS151R3RE	Benzoic acid	MS/MSD, BS/BSD	240 UE
MWCS155R2RE	Benzoic acid	MS/MSD, BS/BSD	190 UE
MWCS116R2RE	Benzoic acid	MS/MSD, BS/BSD	450 E
MWCS112R2RE	Benzoic acid	MS/MSD, BS/BSD	300 UE
MWCS114R2RE	Benzoic acid	MS/MSD, BS/BSD	280 UE
MWCS157R2RE	Benzoic acid	MS/MSD, BS/BSD	310 UE
MWCS152R3RE	Benzoic acid	MS/MSD, BS/BSD	220 UE
MWCT136R2A	Phenol	MS/MSD	30 L
MWCT136R2ARE	Phenol	More technically sound value available	18 UR
MWCT136R2ARE	Benzyl alcohol	More technically sound value available	37 UR
MWCT136R2ARE	2-Methylphenol	More technically sound value available	18 UR
MWCT136R2ARE	4-Methylphenol	More technically sound value available	38 UR
MWCT136R2ARE	2,4-Dimethylphenol	More technically sound value available	9.3 UR
MWCT136R2ARE	Benzoic acid	More technically sound value available	220 UR
MWCT136R2ARE	Pentachlorophenol	More technically sound value available	18 UR
MWCS127R2	4,4`-DDE	More Technically Sound Data available	17.7
MWCT156R2A	Arsenic	Continuing Calibration %D >10	7.0 E
MWCT137R2	Arsenic	Continuing Calibration %D >10	50.8 L

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCS127R2	Arsenic	Continuing Calibration %D >10	212 L
MWCS151R3	Arsenic	Continuing Calibration %D >10	20.0 L
MWCS155R2	Arsenic	Continuing Calibration %D >10	19.6 L
MWCS126R2	Arsenic	Continuing Calibration %D >10	60.9 L
MWCS114R2	Arsenic	Continuing Calibration %D >10	18.1 L
MWCS157R2	Arsenic	Continuing Calibration %D >10	75.3 L
MWCS113R2B	Arsenic	Continuing Calibration %D >10	115 L
MWCT156R2A	Antimony	MS	3.7 UG
MWCT156R2A	Copper	MS	60.7 G
MWCT156R2A	Zinc	MS	67.1 G
MWCS111R2A	Lead	Precision	49.2 E
MWCS111R2A	Zinc	Precision	63.6 E
MWCS112R2	Lead	Precision	225 E
MWCS112R2	Zinc	Precision	666 E
MWCS113R2B	Lead	Precision	554 E
MWCS113R2B	Zinc	Precision	733 E
MWCS114R2	Lead	Precision	96.1 E
MWCS114R2	Zinc	Precision	213 E
MWCS116R2	Lead	Precision	563 E
MWCS116R2	Zinc	Precision	1120 E
MWCS126R2	Lead	Precision	481 E
MWCS126R2	Zinc	Precision	452 E
MWCS127R2	Lead	Precision	603 E
MWCS127R2	Zinc	Precision	825 E
MWCS137R2	Lead	Precision	366 E
MWCS137R2	Zinc	Precision	455 E
MWCS151R3	Lead	Precision	206 E
MWCS151R3	Zinc	Precision	111 E
MWCS152R3	Lead	Precision	12.0 E
MWCS152R3	Zinc	Precision	29.8 E
MWCS155R2	Lead	Precision	194 E
MWCS155R2	Zinc	Precision	149 E
MWCS157R2	Lead	Precision	466 E
MWCS157R2	Zinc	Precision	368 E
MWCT156R2A	Lead	Precision	38.5 E
MWCT156R2A	Zinc	Precision	67.1 E

Attachment 3 Communications with the Laboratory

Attachment 4 Revised Laboratory Forms

Attachment 3 Communications with the Laboratory

Quality by Design
29 Shipman Street, Suite 101
Hilo, Hawaii 96720
Phone: 808/969-9424 Fax: 808/969-9094
e-mail: qbdhilo@gte.net

Date: December 31, 1999

To: MultiChem Analytical Services
Attn: Tori Bailey
Fax #: 425/228-8336

cc: Foster Wheeler Env. Corp.
Attn: Sherri Wunderlich
Fax #: 425/688-3952

From: Tom Davis

Total pages, including this one: 2

Hi, Tori –

I had left a voicemail for you yesterday but I'm assuming that with the holiday coming up, you didn't get it before you left. We are doing the data validation for Foster Wheeler's Middle Waterway project and have some questions about a couple of the data packages. If there is any question about confidentiality of data, please call Sherri, Gary Braun, or Roger Cadeg at Foster Wheeler for the okay.

We have four items so far:

1. Our report for SDG 909070 is missing Page 410 of the base/neutrals run on 12/10/99. We are also missing a DFTPP printout from HP-1 for electronic file J6238. The missing page was not included in the original data package because it should be between Pages 219 and 220. Could we have copies of these faxed to the letterhead number?

2. Sulfides were subcontracted to Columbia Analytical. On SDG 909056, (CAS No. K9906743), they analyzed sulfides for Samples MWAT046R1 and MWAT041R1 twice, because the initial run's QC failed. They reported the sample results from the re-analysis, but they selectively reported the QC data from the first run. For example, in the first run, the MS had almost 100% recovery but the MSD had zero percent (0%) recovery. Yet, the MS from the first run was reported, the MSD was not, and the sample results were taken from the second run. Could CAS re-issue this report with the correct information?

3. In SDG 909062, our data package is missing the custody form for Samples MWAS037R1 and MWAS034R1. Could we get copies of these faxed?

4. Also in SDG 909070, MAS analyzed a set of samples for EPA 8270 but had problems with the blank. Appropriately, MAS re-ran the sample set. However, the second set was extracted after the holding time. MAS reported only the results of the second analysis. Could we have the results of the first analysis reported for the samples listed below?

Sample No.
MWCS137R2
MWCS151R3
MWCS155R2
MWCS116R2
MWCS112R2
MWCS157R2
MWCS152R3

In the same way that you issue two reports for dilutions, this would allow us to select and appropriately flag the most technically suitable results.

Thanks for your help. If there are any questions or problems, please don't hesitate to call.

Send Hard Copy? ___ Yes XX No

HP LaserJet 3100
Printer/Fax/Copier/Scanner

SEND CONFIRMATION REPORT for
Quality by Design
808 969 9094
Dec-31-99 6:07PM

Job	Start Time	Usage	Phone Number or ID	Type	Pages	Mode	Status
636	12/31 6:06PM	0'45"	425 228 8336	Send	2/ 2	EC 96	Completed

Total 0'45" Pages Sent: 2 Pages Printed: 0

Quality by Design
29 Shipman Street, Suite 101
Hilo, Hawaii 96720
Phone: 808/969-9424 Fax: 808/969-9094
e-mail: qbdhilo@gte.net

Date: December 31, 1999

To: MultiChem Analytical Services
Attn: Tori Bailey
Fax #: 425/228-8336

cc: Foster Wheeler Env. Corp.
Attn: Sherri Wunderlich
Fax #: 425/688-3952

From: Tom Davis

Total pages, including this one: 2

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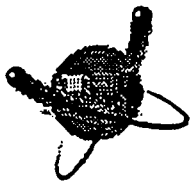

MultiChem
ANALYTICAL SERVICES

FAX Cover Sheet

To:	**Tom Davis**	**FAX Number:**	**808-969-9094**
Company:	**QBD**	**Date:**	**01/07/00**
From:	**Tori Bayly**	**Pages (including**	
Phone:	**425-228-8335**	**cover page):**	**2**
Fax:	**425-228-8336**	**In re/accession:**	**Middle Waterway**

Tom~
Oops! Item # 1, here's missing page 410 from the 909070 base/neutrals. That should be everything except for the CAS information. Original page 410 will go to Foster Wheeler.

cc: Sherri Wunderlich

560 Naches Avenue SW, Suite 101, Renton, Washington 98055-2200
425-228-8335 • FAX 425-228-8336 • 1-800-609-0580 • info@multichem.com

Quantitation Report (QT Reviewed)

00410

Data File : C:\HPCHEM\1\DATA\1017A\P1376.D Vial: 1
Acq On : 17 Oct 1999 20:57 Operator: PL
Sample : 909070-14DL Inst : HP#5
Misc : 4 , 75GM:1ML D1:4 Multiplr: 1.00
MS Integration Params: RTEINT.P
Quant Time: Oct 18 16:13 1999 Quant Results File: PSEDBN.RES

Quant Method : C:\HPCHEM\1\METHODS\PSEDBN.M (RTE Integrator)
Title : SEMIVOLATILES BY SW-8270
Last Update : Fri Oct 08 17:32:14 1999
Response via : Initial Calibration
DataAcq Meth : PSEDBN

	Compound	R.T.	QIon	Response	Conc	Unit	Qvalue
47)	Benzo(k)fluoranthene	18.14	252	1852162m	20.86	ng/uL	
48)	Benzo(a)pyrene	18.69	252	1193605	15.09	ng/uL	89
49)	Indeno(1,2,3-cd)pyrene	20.52	276	372790	3.61	ng/uL	88
50)	Dibenzo(a,h)anthracene	20.52	278	107040m	1.17	ng/uL	
51)	Benzo(g,h,i)perylene	21.01	276	353019	3.78	ng/uL	91

(#) = qualifier out of range (m) = manual integration

Subject: Middle Waterway
Date: Fri, 07 Jan 2000 09:42:21 AKST
From: "Victoria \(Tori\) Bayly" <vbayly_masak@hotmail.com>
To: qbdhilo@gte.net
CC: Jbuerger@multichem.com

Tom~ Status of Items 1,2 and 4:
1) Paul is out with the flu today, so I will enlist someone else to find the missing page for you.

2) The contact that I faxed the original request to is also out with the flu, so I have redirected the request to his backup. I have faxed the request again to him, and also left a VM message explaining the urgency of the request. I will let you know how that develops.

4) Because of the problems with the blank, the data was deemed unusable and was never processed. Because Paul is out sick today, we would not be able to provide the "crunched" data in the time frame you require. After discussing this issue with John Buerger, he agreed that the data should stand as it is.

I will keep working on 1 & 2 for you... More later.
Thanks!
Tori

Victoria (Tori) Bayly - Project Manager
MultiChem Analytical Services
2000 W. International Airport Rd, C7
Anchorage, AK 99512
907-248-8273 * fax 907-248-8274
OR
560 Naches Avenue SW #101
Renton, WA 98055
425-228-8335 * fax 425-228-8336

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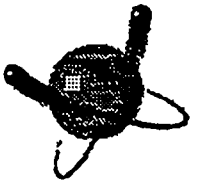

MultiChem
ANALYTICAL SERVICES

FAX Cover Sheet

To:	**Tom Davis**	**FAX Number:**	**808-969-9094**
Company:	**QBD**	**Date:**	**01/07/00**
From:	**Tori Bayly**	**Pages (including**	
Phone:	**425-228-8335**	**cover page):**	**3**
Fax:	**425-228-8336**	**In re/accession:**	**Middle Waterway**

Tom~
Update on the update:

Sherri Wunderlich called and suggested that if we could provide documentation that the sample data in item #4 was from previously frozen jars, then the data you have for 909070 would have been considered within hold time and usable. Attached is a copy of the re-extract summary and notes that indicates that the sample IDs you requested were indeed from frozen jars. If they were not, then that information would have been noted. Sample IDs were, respectively, 909070-8, 10-12, 14, 16 and 17. The case narrative for the acid fraction for these analyses clearly states at the end of the third paragraph that the sample aliquots were from frozen jars. Therefore, the samples are considered re-extracted within the acceptable hold time.

Also, I received a call back from CAS regarding item #2. They will be pulling the pack today. Revisions will be sent directly to you (I gave them your phone, fax and e-mail address) in order to save time.

Thanks,
Tori

CC Sherri Wunderlich

560 Naches Avenue SW, Suite 101, Renton, Washington 98055-2200
425-228-8335 • FAX 425-228-8336 • 1-800-609-0580 • info@multichem.com

MultiChem-Renton, WA

EXTRACTION SUMMARY AND SUPPLEMENTAL NOTES

ACID

Access # : 909070 - Re-ex. Due Date:
Project # : Hold Date:

Samples: 6-8, 10-12, 14-17

Test Method: WWSIM Matrix: Sediment

Prep Description: (sox) sonic CLLE sep SPE vortex Other:

Surrogate spike #:	8270 sed. surr	Matrix spike ID:	Sediment MS mix
Amount added:	1000 µL	Amount added:	500 µL
Concentration:	20/40 µg/mL	Concentration:	20/100 µg/mL
Ext. Solvent:	CH_2Cl_2: Acetone	Fin. Solvent:	~~Hexane~~, Hexane
Final Volume:	0.5 mL	RFV:	1.0 mL

Cleanup 1: GPC Required: (Yes) No
Cleanup 2: Derivitization Required: (Yes) No
Cleanup 3: N/A Required: Yes No

Special Requirements: Extract 75g. of sample
Derivitize after GPC - No Sand!

Analyst's Notes: not in requested list
Samples 7 & 15 had no frozen jar. Used out-of-hold jars. Samples 8, 12, 14, 14MS, 14MSD, 15 & 16 Run on GPC in 2 vials, combined after GPC. Spilled ~10% of #16.

MAS I.D. # 909070

CASE NARRATIVE

CLIENT : FOSTER WHEELER ENVIRONMENTAL
PROJECT # : 1699.0014.0000
PROJECT NAME : MIDDLE WATER WAY

CASE NARRATIVE: SEMIVOLATILE ORGANICS ANALYSIS - ACID FRACTION

The following anomalies were associated with the preparation and/or analysis of the samples in this accession:

Per SW-846 method 3540B, moisture was decanted from all samples in this accession prior to extraction and analysis.

With the exception of sample 909070-18 (MWCS113R2B), all samples in this accession for which acid compound analysis was requested were extracted on October 5, 1999. Analysis of the method blank associated with this preparation batch yielded percent recovery values for all three surrogate compounds which fell below MultiChem's advisory limits. In addition, analysis of the blank spike/blank spike duplicate (BS/BSD) samples associated with this preparation batch yielded no percent recovery of 2-methylphenol, 4-methylphenol and 2,4-dimethylphenol in either sample. For these reasons, the preparation batch was reextracted on October 20, 1999. With two exceptions, frozen aliquots of all of the affected samples were available for reextraction. Since the Puget Sound Dredging and Disposal Authority (PSDDA) recognizes a holding time of one year for sediments if they are frozen, sample preparation was performed within the recommended holding time. The two samples for which frozen aliquots were not available were 909070-7 (MWCS111R2A) and 909070-15 (MWCS114R2). Results for these two samples have been reported from the initial extraction on October 5, 1999. No further corrective action was performed.

Sample 909070-18 (MWCS113R2B) was initially extracted on October 6, 1999. Due to the use of a contaminated lot of acetone which introduced target analytes into all of the sample extracts, analysis of this preparation batch yielded no reportable data. Sample 909070-18 (MWCS113R2B) was reprepared for analysis on November 3, 1999, using an aliquot of sample which was frozen upon receipt and thawed just prior to reextraction. No further corrective action was performed.

The percent recovery values for the surrogate compound 2,4,6-tribromophenol exceeded MultiChem's upper advisory limit in the analysis of samples 909070-7 (MWSS111R2A), 909070-15 (MWCS114R2), the diluted reanalysis of sample 909070-7 (MWSS111R2A) and reextracted sample 909070-10 (MWCS151R3RE). MultiChem's standard operating procedure allows up to one surrogate compound per fraction (acid and/or base-neutral) to exceed established control limits before corrective action is required. Since percent recoveries of the other two surrogate compounds fell within the advisory limits in these analyses, the results were flagged "H" for reporting purposes, and no further corrective action was performed.

CONTINUED ON NEXT PAGE

Attachment 4 Revised Laboratory Forms

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWCS155R2

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909070-11

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1370

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 16 decanted: (Y/N) Y Date Extracted: 10/05/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/17/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	15	U	
106-46-7	1,4-Dichlorobenzene	15	U	
95-50-1	1,2-Dichlorobenzene	15	U	
120-82-1	1,2,4-Trichlorobenzene	15	U	
91-20-3	Naphthalene	770		
91-57-6	2-Methylnaphthalene	120		
131-11-3	Dimethylphthalate	48	U	
208-96-8	Acenaphthylene	270		
83-32-9	Acenaphthene	130		
132-64-9	Dibenzofuran	160	U	
84-66-2	Diethylphthalate	48	U	
86-73-7	Fluorene	98		
86-30-6	N-Nitrosodiphenylamine (1)	15	U	
85-01-8	Phenanthrene	550		
120-12-7	Anthracene	200		
84-74-2	Di-n-butylphthalate	48	U	
206-44-0	Fluoranthene	1000	D2	
129-00-0	Pyrene	640	D2	
85-68-7	Butylbenzylphthalate	190	UD2	
56-55-3	Benzo(a)anthracene	280	D2	
218-01-9	Chrysene	370	D2	
117-81-7	bis(2-Ethylhexyl)phthalate	190	UD2	
117-84-0	Di-n-octylphthalate	48	U	
205-99-2	Benzo(b)fluoranthene	330		
207-08-9	Benzo(k)fluoranthene	300		
50-32-8	Benzo(a)pyrene	320		
193-39-5	Indeno(1,2,3-cd)pyrene	65		L
53-70-3	Dibenzo(a,h)anthracene	63	U	
191-24-2	Benzo(g,h,i)perylene	92		L

(1) - Cannot be separated from Diphenylamine

D2 - Result reported from a 4 fold dilution (P1372.D)

TD/QBO 1/10/00
MK 10/28/99
PL 10/20/99

00437

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWCS114R2

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT ✓ Lab Sample ID: 909070-15 ✓

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1380 ✓

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 44 ✓ decanted: (Y/N) Y Date Extracted: 10/05/99 - OK

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/18/99 ✓

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
541-73-1	1,3-Dichlorobenzene	23	U
106-46-7	1,4-Dichlorobenzene	23	U ✓
95-50-1	1,2-Dichlorobenzene	23	U
120-82-1	1,2,4-Trichlorobenzene	23	U
91-20-3	Naphthalene	670	✓
91-57-6	2-Methylnaphthalene	260	✓
131-11-3	Dimethylphthalate	71	U
208-96-8	Acenaphthylene	800	✓
83-32-9	Acenaphthene	290	✓
132-64-9	Dibenzofuran	240	U
84-66-2	Diethylphthalate	71	U
86-73-7	Fluorene	310	✓
86-30-6	N-Nitrosodiphenylamine (1)	23	U
85-01-8	Phenanthrene	1200	✓
120-12-7	Anthracene	850	✓
84-74-2	Di-n-butylphthalate	71	U
206-44-0	Fluoranthene	2800	D3 ✓
129-00-0	Pyrene	4000	D3 ✓
85-68-7	Butylbenzylphthalate	360	UD3
56-55-3	Benzo(a)anthracene	1500	D3 ✓
218-01-9	Chrysene	1800	D3 ✓
117-81-7	bis(2-Ethylhexyl)phthalate	1000	D3 ✓ G
117-84-0	Di-n-octylphthalate	71	U
205-99-2	Benzo(b)fluoranthene	1700	✓
207-08-9	Benzo(k)fluoranthene	1100	✓
50-32-8	Benzo(a)pyrene	1500	✓
193-39-5	Indeno(1,2,3-cd)pyrene	380	✓
53-70-3	Dibenzo(a,h)anthracene	110	✓
191-24-2	Benzo(g,h,i)perylene	380	✓

(1) - Cannot be separated from Diphenylamine

D3 Result reported from a 5 fold dilution (P1395.D)

TP/QBD
11/10/00

PL 10/21/99

PES, 10/27/99

00467

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWCS157R2

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909070-16

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1383

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 48 decanted: (Y/N) Y Date Extracted: 10/05/99 OK

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/18/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	25	U	
106-46-7	1,4-Dichlorobenzene	25	U	
95-50-1	1,2-Dichlorobenzene	25	U	
120-82-1	1,2,4-Trichlorobenzene	25	U	
91-20-3	Naphthalene	1100		
91-57-6	2-Methylnaphthalene	400		
131-11-3	Dimethylphthalate	77	U	
208-96-8	Acenaphthylene	540		
83-32-9	Acenaphthene	450		
132-64-9	Dibenzofuran	320		
84-66-2	Diethylphthalate	77	U	
86-73-7	Fluorene	590		
86-30-6	N-Nitrosodiphenylamine (1)	25	U	
85-01-8	Phenanthrene	1500		
120-12-7	Anthracene	800		
84-74-2	Di-n-butylphthalate	77	U	
206-44-0	Fluoranthene	4800	D3	
129-00-0	Pyrene	4400	D3	
85-68-7	Butylbenzylphthalate	77	U	
56-55-3	Benzo(a)anthracene	1400		
218-01-9	Chrysene	1500		
117-81-7	bis(2-Ethylhexyl)phthalate	680		G
117-84-0	Di-n-octylphthalate	77	U	
205-99-2	Benzo(b)fluoranthene	1400	D3	
207-08-9	Benzo(k)fluoranthene	1400		
50-32-8	Benzo(a)pyrene	1600		
193-39-5	Indeno(1,2,3-cd)pyrene	420		
53-70-3	Dibenzo(a,h)anthracene	140		
191-24-2	Benzo(g,h,i)perylene	420		

(1) - Cannot be separated from Diphenylamine

D3 Result reported from a 5 fold dilution (P1396.D)

TD/QBD 11/10/00
DL 10/24/99
RS 10/27/99

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 0525

MWCS113R2B

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909070-18

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1384

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 49 decanted: (Y/N) Y Date Extracted: 10/05/99 - OK

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/18/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	25	U	
106-46-7	1,4-Dichlorobenzene	25	U	
95-50-1	1,2-Dichlorobenzene	35		
120-82-1	1,2,4-Trichlorobenzene	25	U	
91-20-3	Naphthalene	580		
91-57-6	2-Methylnaphthalene	280		
131-11-3	Dimethylphthalate	78	U	
208-96-8	Acenaphthylene	1200		
83-32-9	Acenaphthene	320		
132-64-9	Dibenzofuran	270		
84-66-2	Diethylphthalate	78	U	
86-73-7	Fluorene	520		
86-30-6	N-Nitrosodiphenylamine (1)	25	U	
85-01-8	Phenanthrene	1500		
120-12-7	Anthracene	1400		
84-74-2	Di-n-butylphthalate	78	U	
206-44-0	Fluoranthene	21000	D4	
129-00-0	Pyrene	14000	D4	
85-68-7	Butylbenzylphthalate	78	U	
56-55-3	Benzo(a)anthracene	5700	D4	
218-01-9	Chrysene	7400	D4	
117-81-7	bis(2-Ethylhexyl)phthalate	3000	D4	G
117-84-0	Di-n-octylphthalate	78	U	
205-99-2	Benzo(b)fluoranthene	3400	D4	
207-08-9	Benzo(k)fluoranthene	1800		
50-32-8	Benzo(a)pyrene	3000	D4	
193-39-5	Indeno(1,2,3-cd)pyrene	640		
53-70-3	Dibenzo(a,h)anthracene	240		
191-24-2	Benzo(g,h,i)perylene	590		

(1) - Cannot be separated from Diphenylamine

D4 Result reported from a 10 fold dilution (P1397.D)

TD/QBP 1/10/00

PL 10/21/99

PS 10/27/99

00228

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWCS151R3

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909070-10

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1385

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 32 decanted: (Y/N) Y Date Extracted: 10/05/99 OK

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/18/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	19	U	
106-46-7	1,4-Dichlorobenzene	19	U	
95-50-1	1,2-Dichlorobenzene	19	U	
120-82-1	1,2,4-Trichlorobenzene	19	U	
91-20-3	Naphthalene	1200		
91-57-6	2-Methylnaphthalene	640		
131-11-3	Dimethylphthalate	59	U	
208-96-8	Acenaphthylene	620		
83-32-9	Acenaphthene	420		
132-64-9	Dibenzofuran	390		
84-66-2	Diethylphthalate	59	U	
86-73-7	Fluorene	590		
86-30-6	N-Nitrosodiphenylamine (1)	19	U	
85-01-8	Phenanthrene	1100		
120-12-7	Anthracene	660		
84-74-2	Di-n-butylphthalate	59	U	
206-44-0	Fluoranthene	1800	D1	
129-00-0	Pyrene	1700	D1	
85-68-7	Butylbenzylphthalate	59	U	
56-55-3	Benzo(a)anthracene	600		
218-01-9	Chrysene	660		
117-81-7	bis(2-Ethylhexyl)phthalate	180		G
117-84-0	Di-n-octylphthalate	59	U	
205-99-2	Benzo(b)fluoranthene	980		
207-08-9	Benzo(k)fluoranthene	720		
50-32-8	Benzo(a)pyrene	760		
193-39-5	Indeno(1,2,3-cd)pyrene	200		
53-70-3	Dibenzo(a,h)anthracene	78	U	
191-24-2	Benzo(g,h,i)perylene	230		

(1) - Cannot be separated from Diphenylamine

D1 Result reported from a 2 fold dilution (P1403.D)

TO/QBO 11/10/00

PL 10/28/99

PL 10/28/99

00150

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.: MWCS137R2

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909070-8

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1421

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 43 decanted: (Y/N) Y Date Extracted: 10/05/99 OK

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/21/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	23	U	
106-46-7	1,4-Dichlorobenzene	23	U	
95-50-1	1,2-Dichlorobenzene	23	U	
120-82-1	1,2,4-Trichlorobenzene	23	U	
91-20-3	Naphthalene	670		
91-57-6	2-Methylnaphthalene	260		
131-11-3	Dimethylphthalate	70	U	
208-96-8	Acenaphthylene	480		
83-32-9	Acenaphthene	320		
132-64-9	Dibenzofuran	250		
84-66-2	Diethylphthalate	70	U	
86-73-7	Fluorene	380		
86-30-6	N-Nitrosodiphenylamine (1)	23	U	
85-01-8	Phenanthrene	1200		
120-12-7	Anthracene	760		
84-74-2	Di-n-butylphthalate	70	U	
206-44-0	Fluoranthene	3100	D3	
129-00-0	Pyrene	3900	D3	
85-68-7	Butylbenzylphthalate	350	UD3	
56-55-3	Benzo(a)anthracene	1200	D3	
218-01-9	Chrysene	1600	D3	
117-81-7	bis(2-Ethylhexyl)phthalate	1700	D3	6
117-84-0	Di-n-octylphthalate	350	UD3	
205-99-2	Benzo(b)fluoranthene	1100	D3	
207-08-9	Benzo(k)fluoranthene	1000	D3	
50-32-8	Benzo(a)pyrene	1400	D3	
193-39-5	Indeno(1,2,3-cd)pyrene	1100	D3	
53-70-3	Dibenzo(a,h)anthracene	460	UD3	
191-24-2	Benzo(g,h,i)perylene	1200	D3	

(1) - Cannot be separated from Diphenylamine

D3 Result reported from a 5 fold dilution (P1414.D)

TD/QBO 1/10/00

PS 10/29/99

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 00314

MWCS116R2RE

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909070-12

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1599

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 35 decanted: (Y/N) Y Date Extracted: 10/25/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/16/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	20	U	
106-46-7	1,4-Dichlorobenzene	20	U	
95-50-1	1,2-Dichlorobenzene	20	U	
120-82-1	1,2,4-Trichlorobenzene	20	U	
91-20-3	Naphthalene	270		
91-57-6	2-Methylnaphthalene	160		
131-11-3	Dimethylphthalate	62	U	
208-96-8	Acenaphthylene	570		
83-32-9	Acenaphthene	320		
132-64-9	Dibenzofuran	200	U	
84-66-2	Diethylphthalate	62	U	
86-73-7	Fluorene	340		
86-30-6	N-Nitrosodiphenylamine (1)	20	U	
85-01-8	Phenanthrene	2400	D3	
120-12-7	Anthracene	1000		
84-74-2	Di-n-butylphthalate	62	U	
206-44-0	Fluoranthene	5400	D3	
129-00-0	Pyrene	5900	D3	L
85-68-7	Butylbenzylphthalate	310	JD3	G
56-55-3	Benzo(a)anthracene	3100	D3	
218-01-9	Chrysene	3700	D3	
117-81-7	bis(2-Ethylhexyl)phthalate	2700	D3	
117-84-0	Di-n-octylphthalate	620	UD4	
205-99-2	Benzo(b)fluoranthene	2800	D4	
207-08-9	Benzo(k)fluoranthene	2400	D4	
50-32-8	Benzo(a)pyrene	2800	D4	
193-39-5	Indeno(1,2,3-cd)pyrene	600		
53-70-3	Dibenzo(a,h)anthracene	210		
191-24-2	Benzo(g,h,i)perylene	540		

(1) - Cannot be separated from Diphenylamine

D3 - Result reported from a 5 fold dilution (P1618.D)
D4 - Result reported from a 10 fold dilution (~~P1618~~ 1605.D)

TO/QBD 1/10/00
12/07/4

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 00125

MWCS113R2BRE

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909070-18RE

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J6375

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 49 decanted: (Y/N) Y Date Extracted: 11/03/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/29/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
108-95-2	Phenol	170		
100-51-6	Benzyl alcohol	52	U	
95-48-7	2-Methylphenol	26	U	
106-44-5	4-Methylphenol	690		
105-67-9	2,4-Dimethylphenol	19		
65-85-0	Benzoic acid	310	U	
87-86-5	Pentachlorophenol	120		E

ea/QBO 1/19/00

12/05/99

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWCS137R2RE

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909070-8RE

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5913

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 43 decanted: (Y/N) Y Date Extracted: 10/20/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/01/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	75	
100-51-6	Benzyl alcohol	47	U
95-48-7	2-Methylphenol	23	U
106-44-5	4-Methylphenol	140	
105-67-9	2,4-Dimethylphenol	12	U
65-85-0	Benzoic acid	280	U
87-86-5	Pentachlorophenol	53	

E

TD/QBP 1/10/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS151R3RE

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909070-10RE

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5914

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 32 decanted: (Y/N) Y Date Extracted:10/20/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/01/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
108-95-2	Phenol	61		E
100-51-6	Benzyl alcohol	39	U	
95-48-7	2-Methylphenol	20	U	
106-44-5	4-Methylphenol	68		
105-67-9	2,4-Dimethylphenol	24		
65-85-0	Benzoic acid	240	U	
87-86-5	Pentachlorophenol	20	U	

TDK BD 11/10/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS155R2RE

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909070-11RE

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5915

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 16 decanted: (Y/N) Y Date Extracted:10/20/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/01/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	35	
100-51-6	Benzyl alcohol	32	U
95-48-7	2-Methylphenol	16	U
106-44-5	4-Methylphenol	30	
105-67-9	2,4-Dimethylphenol	64	
65-85-0	Benzoic acid	190	U
87-86-5	Pentachlorophenol	16	U

E

TD/GBD
1/10/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS116R2RE

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909070-12RE

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5916

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 35 decanted: (Y/N) Y Date Extracted:10/20/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/01/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	83	
100-51-6	Benzyl alcohol	41	U
95-48-7	2-Methylphenol	20	U
106-44-5	4-Methylphenol	40	
105-67-9	2,4-Dimethylphenol	12	
65-85-0	Benzoic acid	450	
87-86-5	Pentachlorophenol	250	

E

RD/RBD 1/10/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
00093

MWCS112R2RE

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909070-14RE

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5917

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 46 decanted: (Y/N) Y Date Extracted:10/20/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/01/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	68	
100-51-6	Benzyl alcohol	49	U
95-48-7	2-Methylphenol	25	U
106-44-5	4-Methylphenol	68	
105-67-9	2,4-Dimethylphenol	12	U
65-85-0	Benzoic acid	300	U
87-86-5	Pentachlorophenol	31	

E

TD/QBD
1/10/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS157R2RE

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909070-16RE

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5965

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 48 decanted: (Y/N) Y Date Extracted: 10/20/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/04/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	140	
100-51-6	Benzyl alcohol	51	U
95-48-7	2-Methylphenol	49	
106-44-5	4-Methylphenol	210	
105-67-9	2,4-Dimethylphenol	65	
65-85-0	Benzoic acid	310	U
87-86-5	Pentachlorophenol	26	U

E

TD/QBD
1/10/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 10286

MWCS116R2

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909070-12

Sample wt/vol: 75.0 (g/mL) G Lab File ID:. P1371

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 35 decanted: (Y/N) Y Date Extracted:10/05/99 OK

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/17/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
541-73-1	1,3-Dichlorobenzene	20	U
106-46-7	1,4-Dichlorobenzene	20	U
95-50-1	1,2-Dichlorobenzene	20	U
120-82-1	1,2,4-Trichlorobenzene	20	U
91-20-3	Naphthalene	85	
91-57-6	2-Methylnaphthalene	82	U
131-11-3	Dimethylphthalate	62	U
208-96-8	Acenaphthylene	160	
83-32-9	Acenaphthene	98	
132-64-9	Dibenzofuran	200	U
84-66-2	Diethylphthalate	62	U
86-73-7	Fluorene	99	
86-30-6	N-Nitrosodiphenylamine (1)	20	U
85-01-8	Phenanthrene	620	
120-12-7	Anthracene	300	
84-74-2	Di-n-butylphthalate	62	U
206-44-0	Fluoranthene	1600	D3
129-00-0	Pyrene	1600	D3
85-68-7	Butylbenzylphthalate	310	UD3
56-55-3	Benzo(a)anthracene	760	D3
218-01-9	Chrysene	1000	D3
117-81-7	bis(2-Ethylhexyl)phthalate	740	D3
117-84-0	Di-n-octylphthalate	62	U
205-99-2	Benzo(b)fluoranthene	1000	
207-08-9	Benzo(k)fluoranthene	680	
50-32-8	Benzo(a)pyrene	720	
193-39-5	Indeno(1,2,3-cd)pyrene	160	
53-70-3	Dibenzo(a,h)anthracene	82	U
191-24-2	Benzo(g,h,i)perylene	130	

R

(1) - Cannot be separated from Diphenylamine

D3 Result reported from a 5 fold dilution (P1394.D)

TD/QBD 11/1/00

PL 10/21/99

PGS 10/26/99

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.: MWCS152R3RE

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909070-17RE

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5922

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 27 decanted: (Y/N) Y Date Extracted: 10/20/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/02/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
108-95-2	Phenol	18	U	
100-51-6	Benzyl alcohol	36	U	
95-48-7	2-Methylphenol	18	U	
106-44-5	4-Methylphenol	18	U	
105-67-9	2,4-Dimethylphenol	9.2	U	
65-85-0	Benzoic acid	220	U	E
87-86-5	Pentachlorophenol	18	U	

TD/QBD
1/10/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS114R2

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909070-15

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5714

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 44 decanted: (Y/N) Y Date Extracted: 10/05/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/16/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
108-95-2	Phenol	100		
100-51-6	Benzyl alcohol	48	U	
95-48-7	2-Methylphenol	24	U	
106-44-5	4-Methylphenol	120		
105-67-9	2,4-Dimethylphenol	12	U	
65-85-0	Benzoic acid	280	U	E
87-86-5	Pentachlorophenol	30		

TP/QBD
1/11/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 00038

MWCT136R2A

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909070-6

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5703

Level: (low/med) LOW Date Collected: 09/29/99

% Moisture: 28 decanted: (Y/N) Y Date Extracted:10/05/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/15/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
108-95-2	Phenol	30		L
100-51-6	Benzyl alcohol	37	U	
95-48-7	2-Methylphenol	18	U	
106-44-5	4-Methylphenol	78		
105-67-9	2,4-Dimethylphenol	9.3	U	
65-85-0	Benzoic acid	250		
87-86-5	Pentachlorophenol	18	U	E

TD/QBD
11/10/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 00045

MWCT136R2ARE

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909070-6RE

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5901

Level: (low/med) LOW Date Collected: 09/29/99

% Moisture: 28 decanted: (Y/N) Y Date Extracted:10/20/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/01/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
108-95-2	Phenol	18	U	R
100-51-6	Benzyl alcohol	37	U	
95-48-7	2-Methylphenol	18	U	
106-44-5	4-Methylphenol	38		
105-67-9	2,4-Dimethylphenol	9.3	U	
65-85-0	Benzoic acid	220	U	
87-86-5	Pentachlorophenol	18	U	

TO/QBD
1/10/00

FORM 1
PEST ORGANICS ANALYSIS DATA SHEET

Client SAMPLE NO.

MWCS127R2

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909070

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909070-9

Sample wt/vol: 30.0 (g/mL) G Lab File ID: RA181S15

% Moisture: 39 decanted: (Y/N) Y Date Collected: 09/30/99

Extraction: (SepF/Cont/Sonc) Date Extracted: 10/05/99

Concentrated Extract Volume: 10(mL) Date Analyzed: 10/18/99

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
72-55-9	4,4'-DDE	~~7.1~~	P	17.7
72-54-8	4,4'-DDD	5.5	U	
50-29-3	4,4'-DDT	5.5	U	

GC/GB1)
1/17/00

001 *

FORM 2
SEDIMENT PEST SURROGATE RECOVERY

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909070

GC Column(1): RTX-35 ID: 0.32 (mm) GC Column(2): RTX-CLP ID: 0.32 (mm)

	Client SAMPLE NO.	TCX 1 %REC	#	TCX 2 %REC	#	DCB 1 %REC	#	DCB 2 %REC	#	OTHER (1)	OTHER (2)	TOT OUT
01	A1005SBLK	87		75		64		60				0
02	A1005SBLKBS	84		68		62		58				0
03	A1005SBLKBS-	84		69		62		58				0
04	MWCT156R2A	~~75~~	S2	72		~~61~~	65	56				0
05	MWCT136R2A	~~68~~	77	61		~~53~~	60	~~51~~	58			0
06	MWCS111R2A	70		74		49		47				0
07	MWCS137R2	~~68~~	73	74		~~63~~	67	52				0
08	MWCS127R2	67		66		~~50~~	54	51				0
09	MWCS151R3	64		66		~~50~~	45	~~46~~	43			0
10	MWCS151R3MS	49		54		46		85				0
11	MWCS151R3MSD	63		63		49		46				0
12	MWCS155R2	67		68		48		50				0
13	MWCS116R2	62		60		52		45				0
14	MWCS112R2	75		80		59		57				0
15	MWCS114R2	68		63		46		45				0
16	MWCS157R2	53		61		53		46				0
17	MWCS152R3	64		63		50		50				0
18	MWCS113R2B	63		59		49		45				0
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												

		QC LIMITS
S1 (TCX)	= Tetrachloro-m-xylene	(20-123)
S2 (DCB)	= Decachlorobiphenyl	(41-144)

\# Column to be used to flag recovery values
* Values outside of QC limits
D Surrogate diluted out

Rec./GBD
11/7/00

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCT156R2A

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909070

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909070-5

% Solids: 72.9

Date Received: 09/29/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	3.7	U		P	G
7440-38-2	Arsenic	7.0			F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.37	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	60.7			P	G
7439-89-6	Iron				NR	
7439-92-1	Lead	38.5			P	G
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.17			CV	
7440-02-0	Nickel	7.0			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.73	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	67.1			P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

_____

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TD/QBD
1/18/00

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS111R2A

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909070

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909070-7

% Solids: 57.7

Date Received: 09/29/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	4.7	U		P	G
7440-38-2	Arsenic	7.3			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.47	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	143			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	49.2			P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.25			CV	
7440-02-0	Nickel	11.0			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.93	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	63.6			P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

TD/RBD
1/8/00

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS137R2

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909070

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909070-8

% Solids: 60.8

Date Received: 09/29/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	7.9			P	G
7440-38-2	Arsenic	50.8			F	L
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.89			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	348			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	366			P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	3.2			CV	
7440-02-0	Nickel	11.2			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	1.5			P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	455			P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

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TD/QBO
1/8/00

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS127R2

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909070

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909070-9

% Solids: 59.2

Date Received: 09/29/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	20.3			P	G
7440-38-2	Arsenic	212			F	L
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	2.5			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	1090			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	603			P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	4.3			CV	
7440-02-0	Nickel	10.0			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	6.1			P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	825			P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

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12/QBD
1/8/00

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS151R3

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909070

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909070-10

% Solids: 63.3

Date Received: 09/29/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	4.0	U		P	G
7440-38-2	Arsenic	20.0			F	L
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.50			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	123			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	105			P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	1.2			CV	
7440-02-0	Nickel	11.1			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.80	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	111			P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

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INORGANICS SW-846

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INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS155R2

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909070

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909070-11

% Solids: 74.3

Date Received: 09/29/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	8.0			P	G
7440-38-2	Arsenic	19.6			F	L
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.34	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	303			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	194			P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	1.6			CV	
7440-02-0	Nickel	11.2			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.69	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	149			P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

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FORM I - IN

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INORGANICS SW-846

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INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS116R2

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909070

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909070-12

% Solids: 64.0

Date Received: 09/29/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	26.1			P	G
7440-38-2	Arsenic	161			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.71			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	1590			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	563			P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	2.1			CV	
7440-02-0	Nickel	18.3			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	2.5			P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	1120			P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

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TD/QBD
1/8/00

INORGANICS SW-846

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CLIENT ID

INORGANIC ANALYSIS DATA SHEET

MWCS126R2

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909070

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909070-13

% Solids: 51.7

Date Received: 09/29/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	10.0			P	G
7440-38-2	Arsenic	60.9			F	L
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	1.2			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	436			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	481			P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	4.9			CV	
7440-02-0	Nickel	12.0			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	2.4			P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	452			P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

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1/8/00

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INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS112R2

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909070

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909070-14

% Solids: 53.3

Date Received: 09/29/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	10.0			P	G
7440-38-2	Arsenic	105			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.74			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	517			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	225			P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	1.5			CV	
7440-02-0	Nickel	14.3			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	1.0			P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	666			P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

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INORGANICS SW-846

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INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS114R2

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909070

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909070-15

% Solids: 53.6

Date Received: 09/29/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	4.8	U		P	G
7440-38-2	Arsenic	18.1			F	L
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.48	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	206			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	96.1			P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.83			CV	
7440-02-0	Nickel	10.6			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.96	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	213			P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

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INORGANICS SW-846

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INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS157R2

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909070

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909070-16

% Solids: 52.1

Date Received: 09/29/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	6.0			P	G
7440-38-2	Arsenic	75.3			F	L
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	1.5			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	635			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	466			P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	8.1			CV	
7440-02-0	Nickel	13.2			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	1.9			P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	368			P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

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INORGANICS SW-846

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INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS152R3

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909070

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909070-17

% Solids: 68.3

Date Received: 09/29/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	4.0	U		P	G
7440-38-2	Arsenic	3.8			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.40	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	88.6			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	12.0			P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.15	U		CV	
7440-02-0	Nickel	8.7			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.80	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	29.8			P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

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1/18/00

INORGANICS SW-846

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CLIENT ID

INORGANIC ANALYSIS DATA SHEET

MWCS113R2B

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909070

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909070-18

% Solids: 50.1

Date Received: 09/29/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	12.7			P	G
7440-38-2	Arsenic	115			F	L
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	1.1			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	569			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	554			P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	2.8			CV	
7440-02-0	Nickel	14.9			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	3.0			P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	733			P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

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1/8/00

Quality By Design

Laboratory Quality Assurance Consulting

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Suite 101
Hilo, Hawaii 96720

Phone: (808) 969-9424
Fax: (808) 969-9094
e-mail: qbdhilo@gte.net

EPA Level 2
DATA VALIDATION REPORT

Project Name: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 29, 1999
SDG: 909071

Prepared for

Foster Wheeler Environmental
10900 NE 8th St.
Bellevue, WA 98004

Purchase Order No. 022828
QBD Job No. 270H

Reviewed and approved,

Lorraine Davis 1/17/00

Lorraine L. Davis, Owner Date

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Attachments

Attachment 1 Data Flag Definitions
Attachment 2 Summary Table of Data Qualifier Flags
Attachment 3 Revised Laboratory Forms

A. Introduction

Laboratory Sciences, Inc., d.b.a. *Quality by Design* (QBD), has completed an EPA Level 2 Data Validation on the submitted data packages in accordance with P.O. Number 022828.

The reporting format and criteria for recommending data qualifying flags for this data set are described in the EPA *"Functional Guidelines for Evaluating Organics Analyses"* and *"Functional Guidelines for Evaluating Inorganics Analyses,"* as revised, 1994; and *"Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound"* ("PSEP Protocols"), May, 1997, or using criteria listed in the method referenced. Data may be qualified for any of the following reasons:

1. By the laboratory prior to receipt by the reviewer
2. Because of laboratory deviation from the designated method
3. Because the data may not meet the criteria listed in the reference above
4. By the professional judgment of the reviewer.

The data set consists of several data packages from Multichem Analytical Services in Renton, Washington, and contains data for the samples shown in Table 1. The data reviewers and senior reviewers are shown in Table 2.

Each data set includes an analytical data package for each sample, copies of the completed chain-of-custody (COC) forms, and a quality control (QC) data package. The analytical data package includes analytical results, blank sample results, both laboratory and client sample identifications, appropriate dates but not times, method reporting limits, method references, surrogate recoveries as appropriate, the laboratory's name and address, and the initials of the person releasing the data. The custody forms include the receipt of the sample but not the laboratory's internal tracking. The QC data package includes a tabular list of the laboratory's sample identification, spiking concentrations, recoveries, percentage calculations, and acceptance windows.

Raw data were provided which includes chromatograms, instrument print outs, injection logs, digestion/preparation logs.

This data validation report consists of several sections, each of which are formatted to follow Functional Guidelines, but which also include subsections discussing QBD contacts with the laboratory, other comments, and a summary table of data qualifiers.

Table 1. Sample Identification and Analysis

Sample Identification	Laboratory Identification	Methods 8081/8082	Method 8270	Method 6010/7000	Method 9060	Grain Size	Conventionals
MWSB146R1	990971-3		X				
MWSS111R1A	909071-5	X	X	X	X	X	
MWCS105S2	909070-17			X		X	

Key:
Method 8270 = Semivolatile organic compounds by gas chromatography/mass spectroscopy
Method 8081/8082 = Pesticides and polychlorinated biphenyls (PCB) by gas chromatography
Method 6010 & 7000 = Metals by inductively coupled plasma (ICP) and cold vapor atomic absorption (CVAA)
Method 9060 = Total organic carbon (TOC)
Conventionals = Sulfide, ammonia, and percent moisture

Table 2. Data Package, Reviewer, and Senior Reviewer

Analysis	Number of Pages	Reviewer	Senior Reviewer
Pest/PCB	398	Randi Schneider	Lorraine L. Davis
SVOC	177	Melinda Jacobson	Lorraine L. Davis
Metals	151	Lorraine L. Davis	Thomas S. Davis
Conventionals	21	Lorraine L. Davis	Thomas S. Davis

B. Chain-of-Custody

The analytical data package was reviewed and compared against the chain-of-custody (COC) form. No data are missing from the COC forms and no transcription errors in accuracy were found. All tests requested on the COC were performed.

Discussion: The grain size analysis was subcontracted to Rosa Environmental and Geotechnical Laboratory in Seattle, Washington.

C. Review of GC/MS Semivolatiles Analyses

EPA Method 8270

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. GC/MS Tuning

All decafluorotriphenylphosphine (DFTPP) tune criteria were met for the initial and continuing calibration for all dates of sample analysis.

3. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No target compound list (TCL) analytes had percent relative standard deviations (%RSD) greater than allowed by the method for the initial calibration or percent difference for the continuing calibration checks. All system performance check compound (SPCC) and calibration check compound (CCC) criteria were met, except as noted below.

Table 3. SVOC Data Qualifiers Due to Calibration Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSS111R1A	Fluoranthene	Continuing Calibration % D >20%	6400 L
MWSS111R1A	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20%	460 G
MWSS111R1A	Dibenzo(a,h)anthracene	Continuing Calibration % D >20%	150 G

Discussion: The continuing calibration for several target compounds had percent differences out of the criteria of <20 percent. The associated results in Sample MWSS111R1A have been flagged appropriately. If the results indicated a high bias, the results were flagged with "L" or "UL" to indicate that the value is less than the maximum shown and if the results indicated a low bias, the results were flagged with "G" and "UG" to indicate the reporting limit is greater than the minimum shown. When other QC checks indicated both a high and low bias, the

results were flagged with "E" to indicate an estimated value or "UE" to indicate an estimated reporting limit.

4. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

5. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria, except as noted below.

Discussion: The surrogate percent recovery for 2-fluorophenol and 2,4,6-tribromophenol were out of the acceptance criteria for the blank associated with the data. In another blank, 2,4,6-tribromophenol was also out of criteria. No data qualifier flags are recommended because the surrogates were acceptable in the samples.

In Sample MWSB146R1 a single surrogate was out of criteria. No data qualifier flags are recommended because all other surrogates were in criteria.

6. Laboratory Control Standards

The laboratory analyzed a second source sample with the analytical batch. The laboratory referred to this sample as a blank spike/blank spike duplicate (BS/BSD) rather than a laboratory control standard (LCS). Any anomalies or comments regarding the second source results are addressed in the next section.

7. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and relative percent differences (RPD) were within laboratory or method criteria, except as noted below.

Discussion: N-nitrosodiphenylamine was out of the acceptance criteria of 50 to 150 percent at 37 percent in the BS. Since the recovery was acceptable in the MS/MSD, no data qualifier flags are recommended.

Several target compounds were out of criteria in the MS/MSD pair. Since the MS/MSD was performed on a project sample within another SDG and since the recoveries for the same compounds were acceptable in the BS/BSD, no data qualifier flags are recommended.

The percent recovery for 2-methylphenol, 4-methylphenol, 2,4-dimethylphenol and benzoic acid were out of criteria in the BS. Since the recovery of these

compounds were acceptable in the MS/MSD, no data qualifier flags are recommended.

8. Internal Standards Performance for Samples

All internal standard areas were within the required control limits, except as noted below.

Table 4. SVOC Data Qualifiers Due to Internal Standard Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSS111R1A	di-n-Octylphthalate	Internal Standard	77 UG
MWSS111R1A	Indeno(1,2,3-cd)pyrene	Internal Standard	460 G
MWSS111R1A	Benzo(b)fluoranthene	Internal Standard	1700 G
MWSS111R1A	Benzo(k)fluoranthene	Internal Standard	1800 G
MWSS111R1A	Benzo(g,h,i)perylene	Internal Standard	480 G
MWSS111R1A	Benzo(a)pyrene	Internal Standard	1900 G
MWSS111R1A	Dibenzo(a,h)anthracene	Internal Standard	150 G

Discussion: The internal standard chrysene and perylene-d_{12} was out of the acceptance criteria of –50 to +100 percent. The associated results have been "G" to indicate that the value is greater than the minimum shown.

9. Field Duplicates

No field duplicates were identified with this group of samples.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

11. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

12. TCL Compound Identification

All target compound identifications met the criteria for retention times and peak identification of the referenced method.

13. Tentatively Identified Compounds

No TICs were reported with this data set.

14. Laboratory Contact

There was no verbal or written communication with the laboratory.

15. Other Comments

None.

16. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

D. Review of Pesticides/PCBs Analyses

EPA Method 8081/8082

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The analysis of the target compounds hexachlorobenzene and hexachlorobutadiene was performed using Method 8081 instead of the requested Method 8270. No data qualifier flags are recommended since the method utilized is an approved method by PSEP.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No TCL analytes had %RSD greater than that allowed for the initial calibration or percent difference for the continuing calibration checks, except as noted below.

Table 5. Pesticide/PCB Data Qualifiers Due to Calibration Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSS111R1A	4,4'-DDT	Continuing Calibration %D >15	6.4 UG

Discussion: The continuing calibration for the target compound 4,4'-DDT had percent difference of 37.9 and 41.5, which is out of the criteria of 15 percent. The associated result in Sample MWSS111R1A has been flagged with "UG" to indicate the value is greater than the minimum shown.

The continuing calibration for the target compound for hexachlorobutadiene (HCBD) was out of criteria. Since the HCBD recovery exceeded the acceptance criteria, indicating a high bias, and since the associated samples were non-detect, no data qualifier flags are recommended.

The continuing calibration for the target compound Aroclor 1016 was out of criteria. The continuing calibration verification for the second column was acceptable, so no data qualifier flags are recommended.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSDs were analyzed as required by the referenced method and all percent recoveries and RPD were within laboratory or method criteria.

6. Field Duplicates

No field duplicates were identified with this group of samples.

7. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

8. TCL Compound Identification

No target compounds were detected.

9. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards or external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

10. Laboratory Contact

There was no verbal or written communication with the laboratory.

11. Other Comments

None.

12. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

E. Review of Metals Analyses

EPA Method 6010/7000

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. Initial and Continuing Calibration

All initial and continuing calibration Quality Control criteria were met. No TCL analytes had correlation coefficients greater than allowed by the method, and all percent differences for the continuing calibration verifications were acceptable.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. ICP Interference Check Standard

An interference check sample (ICS) was analyzed at a frequency required by the referenced method and was within established criteria.

5. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within laboratory or method criteria.

Discussion: Antimony and nickel were out of the method criteria of 90 to 110 percent recovery for the LCS. However, PSDDA allows 80 to 120 percent recovery of a second source check sample. Both analytes were within PSDDA acceptance criteria. Therefore, no data qualifier flags are recommended.

6. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MSs were analyzed as required by the referenced method and all percent recoveries and RPD were within laboratory or method criteria, except as noted below.

Table 6. Metal Data Qualifiers Due to Duplicate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSS111R1A	Antimony	MS	23.6 UG

Discussion: The post digestion spike recovery for lead was out of the criteria of 75 to 125 percent at 146 percent. Since the MS was in criteria, no data qualifier flags are recommended.

Arsenic was out of the criteria of 75 to 125 percent at 72.9 percent for the matrix spike. Since the sample spiked was not in this SDG and the BS was acceptable, no data qualifier flags are recommended.

Antimony was low and out of criteria for accuracy (percent recovery) for the MS with a 20.8 percent recovery. Normally, the associated samples would be flagged "R" because the percent recovery was less than 30%, but because the LCS was acceptable, the only sample that would be associated with this MS is the sample that was spiked. However, all of the matrix spikes in all of the SDGs for this project have been out of criteria, some of which have been above 30% and some of which have been less than 30%. In a telephone conversation with Foster Wheeler, it was noted that some of the analyte was recovered from the spike (i.e, the percent recovery was not zero) and that a low percent recovery may imply a higher detection limit. In keeping with the recommendations in *Functional Guidelines*, it was agreed that samples with positive results would be flagged "G" to indicate that the value was greater than the minimum shown. It was also agreed that the detection limit for non-detect samples would be increased proportional to the spike recovery and flagged "UE", to indicate that the detection limit is estimated.

7. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWCS105S2 and MWCS105R2 were identified as field duplicates. Test results were reviewed, and where positive results were found, the relative percent difference (RPD) was calculated. Since MWCS105R2 is from SDG 909070, the results are discussed in that report.

8. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPD were within laboratory or method criteria, except as noted below.

Table 7. Metal Data Qualifiers Due to Duplicate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSS111R1A	Arsenic	Precision	6.3 E
MWSS111R1A	Mercury	Precision	0.54 E

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS105S2	Mercury	Precision	1.0 E

Discussion: Arsenic and mercury were out of the criteria of less than 20 percent at 25.5 and 47.8, respectively, in the sample duplicate set. The associated positive results for Samples MWSS111R1A and MWCS105S2 have been flagged "E" to indicate an estimated value.

9. ICP Serial Dilution

Samples that were a factor of 50 above the instrument detection limit (IDL) for the analyte were diluted five-fold and were within criteria required by the referenced method, except as noted below.

Table 8. Metals Data Qualifiers Due to ICP Serial Dilution Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSS111R1A	Lead	Serial Dilution	172 E
MWSS111R1A	Zinc	Serial Dilution	102 E

Discussion: A serial dilution of lead and zinc had percent differences greater than the acceptance criteria of ±10 percent. The associated results for Sample MWSS111R1A have been flagged "E" to indicate an estimated value.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract, except as noted below.

Discussion: The reporting limit for lead failed to meet the requirement of 0.5 mg/kg that was listed in the QAPP. However, most field samples had positive results. For samples that were non-detect, the laboratory's reporting limit of 1.5 mg/kg was less than the Sediment Quality Standard Criteria of 450 mg/kg and the Sediment Impact Zone and Clean-up Criteria of 530 mg/kg, and no data qualifier flags are recommended.

11. Graphite Furnace Atomic Absorption Analysis

All special criteria for graphite furnace atomic absorption (GFAA) analysis were performed at a frequency required by the referenced method and was within established criteria.

12. Laboratory Contact

There was no verbal or written communication with the laboratory.

13. Other Comments

None.

14. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

F. Review of Conventional Analyses

EPA Method 9060

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met, including the number of standards used and the correlation coefficients. All continuing calibration criteria, including frequency of analysis and percent recovery were met.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within laboratory or method criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MSs were analyzed as required by the referenced method and all percent recoveries and RPD were within laboratory or method criteria.

6. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and RPD were within laboratory or method criteria.

7. Field Duplicates

No field duplicates were identified with this group of samples.

8. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

9. Laboratory Contact

There was no verbal or written communication with the laboratory.

10. Other Comments

None.

11. Data Use and Overall Assessment

The data are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

Attachment 1 Puget Sound Estuary Program Data Qualifier Definitions

Used for both organics and inorganic analyses

B = Analyte detected in samples and in method blank

C = Combined with unresolved substances

E = Estimated

G = Value greater than minimum shown

K = Detected at less than the maximum shown

L = Value less than the maximum shown

M = Value is a mean

Q = Questionable value

R = Rejected or unusable value

T = Detected below the quantification limit shown

U = Undetected at the detection limit shown

Z = Blank corrected

Attachment 2 Summary Table of Data Qualifier Flags

Foster Wheeler Environmental
Project: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 29, 1999

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWSS111R1A	Fluoranthene	Continuing Calibration % D >20%	6400 L
MWSS111R1A	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20%	460 G
MWSS111R1A	Dibenzo(a,h)anthracene	Continuing Calibration % D >20%	150 G
MWSS111R1A	di-n-Octylphthalate	Internal Standard	77 UG
MWSS111R1A	Indeno(1,2,3-cd)pyrene	Internal Standard	460 G
MWSS111R1A	Benzo(b)fluoranthene	Internal Standard	1700 G
MWSS111R1A	Benzo(k)fluoranthene	Internal Standard	1800 G
MWSS111R1A	Benzo(g,h,i)perylene	Internal Standard	480 G
MWSS111R1A	Benzo(a)pyrene	Internal Standard	1900 G
MWSS111R1A	Dibenzo(a,h)anthracene	Internal Standard	150 G
MWSS111R1A	4,4'-DDT	Continuing Calibration %D >15	6.4 UG
MWSS111R1A	Antimony	MS	23.6 UG
MWSS111R1A	Arsenic	Precision	6.3 E
MWSS111R1A	Mercury	Precision	0.54 E
MWCS105S2	Mercury	Precision	1.0 E
MWSS111R1A	Lead	Serial Dilution	172 E
MWSS111R1A	Zinc	Serial Dilution	102 E

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
00018
MWSS111R1A

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909071

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909071-5

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1663

Level: (low/med) LOW Date Collected: 09/29/99

% Moisture: 48 decanted: (Y/N) Y Date Extracted: 10/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/23/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
541-73-1	1,3-Dichlorobenzene	25	U
106-46-7	1,4-Dichlorobenzene	25	U
95-50-1	1,2-Dichlorobenzene	25	U
120-82-1	1,2,4-Trichlorobenzene	25	U
91-20-3	Naphthalene	2200	D3
91-57-6	2-Methylnaphthalene	940	
131-11-3	Dimethylphthalate	77	U
208-96-8	Acenaphthylene	1800	
83-32-9	Acenaphthene	1100	
132-64-9	Dibenzofuran	610	
84-66-2	Diethylphthalate	77	U
86-73-7	Fluorene	1400	
86-30-6	N-Nitrosodiphenylamine (1)	25	U
85-01-8	Phenanthrene	3900	D3
120-12-7	Anthracene	1900	
84-74-2	Di-n-butylphthalate	77	U
206-44-0	Fluoranthene	6400	D3
129-00-0	Pyrene	5000	D3
85-68-7	Butylbenzylphthalate	380	UD3
56-55-3	Benzo(a)anthracene	2200	D3
218-01-9	Chrysene	2400	D3
117-81-7	bis(2-Ethylhexyl)phthalate	380	UD3
117-84-0	Di-n-octylphthalate	77	U
205-99-2	Benzo(b)fluoranthene	1700	
207-08-9	Benzo(k)fluoranthene	1800	
50-32-8	Benzo(a)pyrene	1900	
193-39-5	Indeno(1,2,3-cd)pyrene	460	
53-70-3	Dibenzo(a,h)anthracene	150	
191-24-2	Benzo(g,h,i)perylene	480	

(1) - Cannot be separated from Diphenylamine

D3 - Result reported from a 5 fold dilution (P1634.D)

12/14/99
4/17/00

FORM 1
PEST ORGANICS ANALYSIS DATA SHEET

Client SAMPLE NO.

MWSS111R1A

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909071

Matrix: (soil/water) SEDIMENT Lab Sample ID: 909071-5

Sample wt/vol: 30.0 (g/mL) G Lab File ID: RA191S11

% Moisture: 48 decanted: (Y/N) Y Date Collected: 09/29/99

Extraction: (SepF/Cont/Sonc) Date Extracted: 10/06/99

Concentrated Extract Volume: 10(mL) Date Analyzed: 10/19/99

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
72-55-9	4,4'-DDE	6.4	U
72-54-8	4,4'-DDD	6.4	U
50-29-3	4,4'-DDT	6.4	U
118-74-1	Hexachlorobenzene	3.2	U
87-68-3	Hexachlorobutadiene	3.2	U

G

LC /QBD
1/17/00

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWSS111R1A

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909071

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909071-5

% Solids: 52.7

Date Received: 10/21/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	23.6 ~~4.9~~	U		P	G
7440-38-2	Arsenic	6.3			F	E
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.86			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	143			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	172		E [illegible]	P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.54		*	CV	E
7440-02-0	Nickel	14.7			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	1.1			P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	102		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

_____

_____

_____

_____

RL/QBD
1/17/00

INORGANICS SW-846

00002

1

CLIENT ID

INORGANIC ANALYSIS DATA SHEET

MWCS105S2

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 909071

Matrix (soil/water): SEDIMENT

Lab Sample ID: 909071-17

% Solids: 55.3

Date Received: 10/21/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper	684			P
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	1.0		*	CV E
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

Quality By Design

Laboratory Quality Assurance Consulting

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EPA Level 2
DATA VALIDATION REPORT

Project Name: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 30, 1999
SDG: 910001

Prepared for

Foster Wheeler Environmental
10900 NE 8th St.
Bellevue, WA 98004

Purchase Order No. 022828
QBD Job No. 270I

Reviewed and approved,

Lorraine Davis 1/19/00

Lorraine L. Davis Date

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Attachments

Attachment 1 Data Flag Definitions
Attachment 2 Summary Table of Data Qualifier Flags
Attachment 3 Revised Laboratory Forms

A. Introduction

Laboratory Sciences, Inc., d.b.a. *Quality by Design* (QBD), has completed an EPA Level 2 Data Validation on the submitted data packages in accordance with P.O. Number 022828.

The reporting format and criteria for recommending data qualifying flags for this data set are described in the EPA *"Functional Guidelines for Evaluating Organics Analyses"* and *"Functional Guidelines for Evaluating Inorganics Analyses,"* as revised, 1994; and *"Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound"* ("PSEP Protocols"), May 1997; or using criteria listed in the method referenced. Data may be qualified for any of the following reasons:

1. By the laboratory prior to receipt by the reviewer
2. Because of laboratory deviation from the designated method
3. Because the data may not meet the criteria listed in the reference above
4. By the professional judgment of the reviewer.

The data set consists of several data packages from Multichem Analytical Services in Renton, Washington, and contains data for the samples shown in Table 1. The data reviewers and senior reviewers are shown in Table 2.

Each data set includes an analytical data package for each sample, copies of the completed chain-of-custody (COC) forms, and a quality control (QC) data package. The analytical data package includes analytical results, blank sample results, both laboratory and client sample identifications, appropriate dates but not times, method reporting limits, method references, surrogate recoveries as appropriate, the laboratory's name and address, and the initials of the person releasing the data. The custody forms include the receipt of the sample but not the laboratory's internal tracking. The QC data package includes a tabular list of the laboratory's sample identification, spiking concentrations, recoveries, percentage calculations, and acceptance windows.

Raw data were provided which includes chromatograms, instrument print outs, injection logs, digestion/preparation logs.

This data validation report consists of several sections, each of which are formatted to follow Functional Guidelines, but which also include subsections discussing QBD contacts with the laboratory, other comments, and a summary table of data qualifiers.

Table 1. Sample Identification and Analysis

Sample Identification	Laboratory Identification	Methods 8081/8082	Method 8270	Method 6010/7000	Method 9060	Grain Size	Conventionals
MWSS129R1	910001-1		X	X	X		X
MWSB131R1	910001-2		X	X	X		X
MWST140R1	910001-3		X		X		X
MWSB130R1	910001-4		X	X	X		X
MWSB133 R1	910001-5	X			X		X
MWSB134R1	910001-6	X			X		X
MWSB134S1	910001-7	X			X		X
MWCS127S2	910001-8	X	X	X	X		
MWCS158R1	910001-25			X			
MWCS158R2	910001-26			X			
MWCS158R3	910001-27			X			
MWCS158R4	910001-28			X			
MWCS158R5	910001-29			X			
MWCS158R6	910001-30			X			
MWCS158R7	910001-31			X			
MWCS158R8	910001-32			X			
MWCS158R9	910001-33			X			
MWCS158R10	910001-34			X			
MWCS158R14	910001-35			X			
MWCS158R18	910001-36			X			
MWCS158R22	910001-37			X			
MWCS158R28	910001-38			X			
MWCS158R34	910001-39			X			
MWCS158R39	910001-40			X			

Sample Identification	Laboratory Identification	Methods 8081/8082	Method 8270	Method 6010/7000	Method 9060	Grain Size	Conventionals
MWCS158R45	910001-41			X			
MWCS158R52	910001-42			X			
MWCS158R60	910001-43						
MWCS158R61	910001-44		X	X			
MWCS158R62	910001-45		X	X			
MWCT159R1	910001-46			X			
MWCT159R2	910001-47			X			
MWCT159R3	910001-48			X			
MWCT159R4	910001-49			X			
MWCT159R5	910001-50			X			
MWCT159R6	910001-51			X			
MWCT159R7	910001-52			X			
MWCT159R8	910001-53			X			
MWCT159R9	910001-54			X			
MWCT159R10	910001-55			X			
MWCT159R13	910001-56			X			
MWCT159R16	910001-57			X			
MWCT159R19	910001-58			X			
MWCT159R24	910001-59			X			
MWCT159R29	910001-60			X			
MWCT159R34	910001-61			X			
MWCT159R45	910001-62			X			
MWCT159R56	910001-63			X			
MWCT159R58	910001-64			X			
MWCT159R57	910001-65			X			
MWCT159R59	910001-66			X			

Sample Identification	Laboratory Identification	Methods 8081/8082	Method 8270	Method 6010/7000	Method 9060	Grain Size	Conventionals
MWCT151R2	910001-70	X	X	X	X		

Key: Method 8270 = Semivolatile organic compounds by gas chromatography/mass spectroscopy
Method 8081/8082 = Pesticides and polychlorinated biphenyls (PCB) by gas chromatography
Method 6010 & 7000 = Metals by inductively coupled plasma (ICP) and cold vapor atomic absorption (CVAA)
Method 9060 = Total organic carbon (TOC)
Conventionals = Sulfide, ammonia, and percent moisture

Table 2. Data Package, Reviewer, and Senior Reviewer

Analysis	Number of Pages	Reviewer	Senior Reviewer
SVOC	407	Melinda Jacobson	Thomas S. Davis
Pest/PCB	566	Randi Schneider	Lorraine L. Davis
Conventionals	35	Lorraine L. Davis	Thomas S. Davis
Metals	242	Lorraine L. Davis	Thomas S. Davis

B. Chain-of-Custody

The analytical data package was reviewed and compared against the chain-of-custody (COC) form. No data are missing from the COC forms and no transcription errors in accuracy were found. All tests requested on the COC were performed.

Discussion: The grain size analysis was subcontracted to Rosa Environmental and Geotechnical Laboratory in Seattle, Washington. The sulfide analysis was subcontracted to Columbia Analytical Services, Inc. in Kelso, Washington.

The COCs for SDG 910001 contained 18 samples which were archived by the laboratory at the request of Foster Wheeler. Additional analyses were later added for ten of these samples. The laboratory assigned those analyses to a new SDG 910059 and the evaluation of those results are found in the report for SDG 910059.

The laboratory identification for the samples didn't match the electronic data base. For ease of reporting, the ID's listed in hard copy have not been changed, but rather the electronic data base has been changed to reflect the laboratory report hard copy.

C. Review of GC/MS Semivolatiles Analyses

EPA Method 8270

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Table 3. SVOC Data Qualifiers Due to Holding Time Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS158R61	Naphthalene	Holding Time	66 UE
MWCS158R61	2-Methylnaphthalene	Holding Time	66 UE
MWCS158R61	Acenaphthylene	Holding Time	66 UE
MWCS158R61	Acenaphthene	Holding Time	66 UE
MWCS158R61	Fluorene	Holding Time	66 UE
MWCS158R61	Phenanthrene	Holding Time	66 UE
MWCS158R61	Anthracene	Holding Time	66 UE
MWCS158R61	Fluoranthene	Holding Time	66 UG
MWCS158R61	Pyrene	Holding Time	66 UE
MWCS158R61	Benzo(a)anthracene	Holding Time	66 UE
MWCS158R61	Chrysene	Holding Time	66 UE
MWCS158R61	Benzo(b)fluoranthene	Holding Time	66 UE
MWCS158R61	Benzo(k)fluoranthene	Holding Time	66 UE
MWCS158R61	Benzo(a)pyrene	Holding Time	66 UE
MWCS158R61	Indeno(1,2,3-cd)pyrene	Holding Time	66 UL
MWCS158R61	Dibenzo(a,h)anthracene	Holding Time	66 UL
MWCS158R61	Benzo(g,h,i)perylene	Holding Time	66 UL
MWCS158R62	Naphthalene	Holding Time	65 UE
MWCS158R62	2-Methylnaphthalene	Holding Time	65 UE
MWCS158R62	Acenaphthylene	Holding Time	65 UE
MWCS158R62	Acenaphthene	Holding Time	65 UE
MWCS158R62	Fluorene	Holding Time	65 UE
MWCS158R62	Phenanthrene	Holding Time	65 UE
MWCS158R62	Anthracene	Holding Time	65 UE
MWCS158R62	Fluoranthene	Holding Time	65 UG

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS158R62	Pyrene	Holding Time	65 UE
MWCS158R62	Benzo(a)anthracene	Holding Time	65 UE
MWCS158R62	Chrysene	Holding Time	65 UE
MWCS158R62	Benzo(b)fluoranthene	Holding Time	65 UE
MWCS158R62	Benzo(k)fluoranthene	Holding Time	65 UE
MWCS158R62	Benzo(a)pyrene	Holding Time	65 UE
MWCS158R62	Indeno(1,2,3-cd)pyrene	Holding Time	65 UL
MWCS158R62	Dibenzo(a,h)anthracene	Holding Time	65 UL
MWCS158R62	Benzo(g,h,i)perylene	Holding Time	65 UL

Discussion: The analysis of Samples MWCS158R61and MWCS158R62 exceeded the holding time of 14 days by 13 days. Since there were no frozen samples available, as noted by the laboratory, all positive results have been flagged appropriately. If the results of other QC checks indicated a high bias, the results were flagged with "L" or "UL" to indicate that the value is less than the maximum shown. If the results indicated a low bias, the results were flagged with "G" and "UG" to indicate the reporting limit is greater than the minimum shown. When other QC checks indicated both a high and low bias, the results were flagged with "E" or "UE" to indicate an estimated value.

2. GC/MS Tuning

All decafluorotriphenylphosphine (DFTPP) tune criteria were met for the initial and continuing calibration for all dates of sample analysis.

3. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No target compound list (TCL) analytes had percent relative standard deviations (%RSD) greater than allowed by the method for the initial calibration or percent difference for the continuing calibration checks. All system performance check compound (SPCC) and calibration check compound (CCC) criteria were met, except as noted below.

Table 4. SVOC Data Qualifiers Due to Calibration Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSS129R1	Fluoranthene	Continuing Calibration %D >20	2800 G
MWSS129R1	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	320 L
MWSS129R1	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	120 L

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSS129R1	Benzo(g,h,i)perylene	Continuing Calibration %D >20	290 L
MWSB131R1	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	110 L
MWSB131R1	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	340 L
MWSB131R1	Benzo(g,h,i)perylene	Continuing Calibration %D >20	110 L
MWSB130R1	Fluoranthene	Continuing Calibration %D >20	2900 G
MWSB130R1	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	440 L
MWSB130R1	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	150 L
MWSB130R1	Benzo(g,h,i)perylene	Continuing Calibration %D >20	400 L
MWCS127S2	Fluoranthene	Continuing Calibration %D >20	2800 G
MWCS127S2	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	380 L
MWCS127S2	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	150 L
MWCS127S2	Benzo(g,h,i)perylene	Continuing Calibration %D >20	340 L
MWCS158R61	Fluoranthene	Continuing Calibration %D >20	66 UG
MWCS158R61	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	66 UL
MWCS158R61	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	66 UL
MWCS158R61	Benzo(g,h,i)perylene	Continuing Calibration %D >20	66 UL
MWCS158R62	Fluoranthene	Continuing Calibration %D >20	65 UG
MWCS158R62	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	65 UL
MWCS158R62	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	65 UL
MWCS158R62	Benzo(g,h,i)perylene	Continuing Calibration %D >20	65 UL
MWCS151R2	Fluoranthene	Continuing Calibration %D >20	2600 G
MWCS151R2	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	290 L

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS151R2	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	110 L

Discussion: The continuing calibration for several target compounds had percent differences out of the criteria of <20 percent. The associated results in Samples MWSS129R1, MWSB131R1, MWSB130R1, MWCS127S2, MWCS158R61, MWCS158R62, and MWCS151R2 have been flagged appropriately. If the results indicated a high bias, the results were flagged with "L" or "UL" to indicate that the value is less than the maximum shown and if the results indicated a low bias, the results were flagged with "G" and "UG" to indicate the reporting limit is greater than the minimum shown. When other QC checks indicated both a high and low bias, the results were flagged with "E" to indicate an estimated value or "UE" to indicate an estimated reporting limit.

4. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

5. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria, except as noted below.

Table 5. SVOC Data Qualifiers Due to Surrogate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWST140R1	Pentachlorophenol	Surrogate	270 L

Discussion: In Sample MWSB130R1 a single surrogate was out of criteria. No data qualifier flags are recommended because all other surrogates were in criteria.

In Samples MWST140R1, the surrogates phenol-d_6 and 2,4,6-tribromophenol were out of criteria. The associated results have been flagged with "L" to indicate that the value is less than the maximum shown.

6. Laboratory Control Standards

The laboratory analyzed a second source sample with the analytical batch. The laboratory referred to this sample as a blank spike/blank spike duplicate (BS/BSD) rather than a laboratory control standard (LCS). Any anomalies or comments regarding the second source results are addressed in the next section.

7. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

Matrix spike (MS) and matrix spike duplicates (MSD) were analyzed as required by the referenced method and all percent recoveries and relative percent differences (RPD) were within QAPP criteria, except as noted below.

Discussion: The BS recovery for n-nitrosodiphenylamine, benzoic acid, 2-methylphenol, 4-methylphenol and 2,4-dimethylphenol was out of the acceptance criteria of 50 to 150 percent. Since the recovery of these analytes was acceptable in the MS/MSD, no data qualifier flags are recommended.

1,3-Dichlorobenzene, 1,4-dichlorobenzene, and 1,2-dichlorobenzene were out of criteria for accuracy in the MS/MSD. Since these analytes were not reported for the analysis of Sample MWSS129R1, and the recovery for these analytes were acceptable in the MS/MSD, no data qualifier flags are recommended.

For several of the target compounds, the MS and MSD recoveries were out of criteria due to high concentrations of analytes in the original sample. Since all other QC checks were in criteria, no data qualifier flags are recommended.

8. Internal Standards Performance for Samples

All internal standard areas were within the required control limits and had acceptable retention times, except as noted below.

Table 6. SVOC Data Qualifiers Due to Internal Standard Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSB131R1	Benzo(a)anthracene	Internal Standard	220 L
MWSB131R1	Chrysene	Internal Standard	290 L
MWCS151R2	di-n-Octylphthalate	Internal Standard	140 UL
MWCS151R2	Benzo(b)fluoranthene	Internal Standard	1600 L
MWCS151R2	Benzo(k)fluoranthene	Internal Standard	1200 L
MWCS151R2	Benzo(g,h,i) perylene	Internal Standard	300 L
MWCS151R2	Benzo(a)pyrene	Internal Standard	1200 L
MWCS151R2	Dibenzo(a,h)anthracene	Internal Standard	110 L

Discussion: The internal standards chrysene-d_{12} and perylene-d_{12} were out of criteria for the continuing calibration check associated with Samples MWSS131R1, and MWCS151R2. The associated results have been flagged with "L" or "UL" to indicate that the value is less than the maximum shown.

9. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWSB134R1 and MWSB134S1 were identified as field duplicates. This analyses was not performed on these samples.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards or external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

11. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

12. TCL Compound Identification

All target compound identifications met the criteria for retention times and peak identification of the referenced method.

13. Tentatively Identified Compounds

No TICs were reported with this data set.

14. Laboratory Contact

There was no verbal or written communication with the laboratory.

15. Other Comments

None.

16. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

D. Review of Pesticides/PCBs Analyses

EPA Method 8081/8082

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The analysis of the target compounds hexachlorobenzene and hexachlorobutadiene was performed using Method 8081 instead of the requested Method 8270. No data qualifier flags are recommended since the method utilized is an approved method by PSEP.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No TCL analytes had %RSD greater than that allowed for the initial calibration or percent difference for the continuing calibration checks, except as noted below.

Discussion: The continuing calibration for the target compounds hexachlorobutadiene, 4,4'-DDD, 4,4'-DDT, and Aroclor 1016 had percent differences exceeding the criteria of 15 percent. Since the samples were non-detect, and since all other associated QC checks were in criteria, no data qualifier flags are recommended.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria, except as noted below.

Discussion: In Samples MWSB134R1 and MWSB134S1, a single surrogate was out of criteria. No data qualifier flags are recommended because all other surrogates were in criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria.

6. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWSB134R1 and MWSB134S1 were identified as field duplicates. Test results were reviewed, and where positive results were found, the relative percent difference (RPD) was calculated. All analytes, except those listed in the table below, were reported as non-detect.

Table 7. Pesticide/PCB Field Duplicates and RPD

Compound	MWSB134R1 Result	MWSB134S1Result	RPD
Aroclor 1260	63	96	41.5
Total Aroclors	63	96	41.5

Discussion: The high RPD for this analysis may be due to sample inhomogeniety or special circumstances during the sampling process. Because the person who performed the sampling has information that is not available to the data validator, such as sampling conditions or problems with the sampling equipment, the client typically performs any flagging and data qualification based upon field duplicates.

7. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

8. TCL Compound Identification

All target compound identifications met the criteria for retention times and peak identification of the referenced method.

9. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

10. Laboratory Contact

There was no verbal or written communication with the laboratory.

11. Other Comments

None.

13. Data Use and Overall Assessment

The data are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results.

E. Review of Metals Analyses

EPA Method 6010/7000

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

2. Initial and Continuing Calibration

All initial and continuing calibration Quality Control criteria were met. No TCL analytes had correlation coefficients greater than allowed by the method, and all percent differences for the continuing calibration verifications were acceptable.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit, except as noted below.

Discussion: Zinc was detected in the method blank associated with Samples MWSB130R1, SWSB131R1, MWSS129R1, MWCS127S2, and MWCS151R2. Since the concentration of zinc in the samples was greater than five times the concentration of the zinc in the method blank, no data qualifier flags are recommended.

4. ICP Interference Check Standard

An interference check sample (ICS) was analyzed at a frequency required by the referenced method and was within established criteria.

5. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within QAPP criteria, except as noted below.

Discussion: Antimony, nickel, silver, and zinc were out of the method criteria of 90 to 110 percent recovery for the LCS. However, PSDDA allows 80 to 120% recovery of a second source check sample. Since all four analytes were within PSDDA acceptance criteria, not data qualifier flags are recommended.

6. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MSs were analyzed as required by the referenced method and all percent recoveries were within QAPP criteria, except as noted below.

Table 8. Metal Data Qualifiers Due to MS Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS127S2	Antimony	MS	25.2 G
MWCS151R2	Antimony	MS	5.8 G
MWSB131R1	Antimony	MS	3.7 G
MWSS129R1	Antimony	MS	47.1 G
MWSB130R1	Antimony	MS	14.2 G

Discussion: MS recoveries for arsenic, copper, lead and zinc were out of criteria due to high concentrations of analytes in the original sample. Since all other QC checks were in criteria, no data qualifier flags are recommended.

Antimony was low and out of criteria for accuracy (percent recovery) for the MS with a 4.8 % recovery. Normally, the associated samples would be flagged "R" because the percent recovery was less than 30%, but because the LCS was acceptable, the only sample that would be associated with this MS is the sample that was spiked. However, all of the matrix spikes in all of the SDGs for this project have been out of criteria, some of which have been above 30% and some of which have been less than 30%. In a telephone conversation with Foster Wheeler, it was noted that some of the analyte was recovered from the spike (i.e, the percent recovery was not zero) and that a low percent recovery may imply a higher detection limit. In keeping with the recommendations in *Functional Guidelines*, it was agreed that samples with positive results would be flagged "G" to indicate that the value was greater than the minimum shown. It was also agreed that the detection limit for non-detect samples would be increased proportional to the spike recovery and flagged "UE", to indicate that the detection limit is estimated.

7. Field Duplicates

Samples MWCS127R2 and MWCS127S2 were identified as field duplicates. Sample MWCS127S2 was analyzed in this SDG, but is a field duplicate of Sample MSCS127R2, which was analyzed in SDG 909070. Both samples are evaluated in the report for SDG 909070.

8. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPD were within QAPP criteria, except as noted below.

Table 9. Metal Data Qualifiers Due to Duplicate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS127S2	Mercury	Precision	3.6 E
MWCS127S2	Nickel	Precision	10.9 E
MWCS151R2	Mercury	Precision	1.9 E
MWCS151R2	Nickel	Precision	16.3 E
MWCS158R1	Mercury	Precision	0.97 E
MWCS158R10	Mercury	Precision	0.71 E
MWCS158R14	Mercury	Precision	0.99 E
MWCS158R18	Mercury	Precision	0.98 E
MWCS158R2	Mercury	Precision	0.60 E
MWCS158R22	Mercury	Precision	1.0 E
MWCS158R28	Mercury	Precision	0.92 E
MWCS158R3	Mercury	Precision	0.65 E
MWCS158R34	Mercury	Precision	0.52 E
MWCS158R4	Mercury	Precision	0.65 E
MWCS158R45	Mercury	Precision	0.26 E
MWCS158R5	Mercury	Precision	0.55 E
MWCS158R6	Mercury	Precision	0.61 E
MWCS158R7	Mercury	Precision	0.67 E
MWCS158R8	Mercury	Precision	0.69 E
MWCS158R9	Mercury	Precision	0.67 E
MWCT159R1	Mercury	Precision	0.20 E
MWCT159R10	Mercury	Precision	0.18 E
MWCT159R13	Mercury	Precision	0.23 E
MWCT159R16	Mercury	Precision	0.20 E
MWCT159R2	Mercury	Precision	0.20 E
MWCT159R24	Mercury	Precision	0.15 E
MWCT159R3	Mercury	Precision	0.16 E
MWCT159R4	Mercury	Precision	0.18 E
MWCT159R6	Mercury	Precision	0.27 E
MWCT159R7	Mercury	Precision	0.19 E
MWCT159R8	Mercury	Precision	0.15 E
MWCT159R9	Mercury	Precision	0.17 E
MWSB130R1	Mercury	Precision	0.44 E
MWSB130R1	Nickel	Precision	20.5 E
MWSB131R1	Mercury	Precision	0.28 E
MWSB131R1	Nickel	Precision	24.5 E
MWSS129R1	Mercury	Precision	0.52 E

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSS129R1	Nickel	Precision	29.0 E

Discussion: Mercury was out of the criteria of <20 RPD in the sample duplicate set. The associated results for all samples have been flagged "E" to indicate an estimated value.

Nickel was out of the criteria of <20 RPD in the sample duplicate set. The associated results in Samples MWCS127S2, MWCS151R2, SWSB120R1, MWSB131R1, and MWSS129R1 have also been flagged "E" to indicate an estimated value.

9. ICP Serial Dilution

Samples that were a factor of 50 above the instrument detection limit (IDL) for the analyte were diluted five-fold and were within criteria required by the referenced method.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract, except as noted below.

Discussion: The reporting limits for lead failed to meet the CRDL of 0.5 mg/kg listed in the QAPP. However, most field samples had positive results. For samples that were non-detect, the laboratory's reporting limit of 1.5 mg/kg was less than the Sediment Quality Standard Criteria of 450 mg/kg and the Sediment Impact Zone and Clean-up of 530 mg/kg, and no data qualifier flags are recommended.

11. Graphite Furnace Atomic Absorption Analysis

All special criteria for graphite furnace atomic absorption (GFAA) analysis were performed at a frequency required by the referenced method and was within established criteria.

12. Laboratory Contact

There was no verbal or written communication with the laboratory.

13. Other Comments

None.

14. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

F. Review of Conventional Analyses

EPA Method 9060, Grain Size, Percent Moisture, and PSEP Sulfides

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met, including the number of standards used and the correlation coefficients. All continuing calibration criteria, including frequency of analysis and percent recovery were met.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within laboratory or method criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and RPD were within laboratory or method criteria.

6. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPD were within laboratory or method criteria.

7. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWSB134R1 & MWSB134S1 and MWCS127R2 & MWCS127S2 were identified as field duplicates. Test results

were reviewed, and where positive results were found, the relative percent difference (RPD) was calculated. All analytes, except those listed in the table below, were reported as non-detect.

Table 10. Inorganic Field Duplicates and RPD

Compound	MWSB134R1 Result	MWSB134S1 Result	RPD
Total Organic Carbon	28300	35100	21.4

Compound	MWCS127R2 Result	MWCS127S2 Result	RPD
Total Organic Carbon	31200	32500	4.1
Total Solids	41	42	2.4

8. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

9. Laboratory Contact

There was no verbal or written communication with the laboratory.

10. Other Comments

None.

11. Data Use and Overall Assessment

The data are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results.

Attachment 1 Puget Sound Estuary Program Data Qualifier Definitions

Used for both organics and inorganic analyses

B = Analyte detected in samples and in method blank

C = Combined with unresolved substances

E = Estimated

G = Value greater than minimum shown

K = Detected at less than the maximum shown

L = Value less than the maximum shown

M = Value is a mean

Q = Questionable value

R = Rejected or unusable value

T = Detected below the quantification limit shown

U = Undetected at the detection limit shown

Z = Blank corrected

Attachment 2 Summary Table of Data Qualifier Flags

Foster Wheeler Environmental

Project: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 30, 1999

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCS158R61	Naphthalene	Holding Time	66 UE
MWCS158R61	2-Methylnaphthalene	Holding Time	66 UE
MWCS158R61	Acenaphthylene	Holding Time	66 UE
MWCS158R61	Acenaphthene	Holding Time	66 UE
MWCS158R61	Fluorene	Holding Time	66 UE
MWCS158R61	Phenanthrene	Holding Time	66 UE
MWCS158R61	Anthracene	Holding Time	66 UE
MWCS158R61	Fluoranthene	Holding Time	66 UE
MWCS158R61	Pyrene	Holding Time	66 UE
MWCS158R61	Benzo(a)anthracene	Holding Time	66 UE
MWCS158R61	Chrysene	Holding Time	66 UE
MWCS158R61	Benzo(b)fluoranthene	Holding Time	66 UE
MWCS158R61	Benzo(k)fluoranthene	Holding Time	66 UE
MWCS158R61	Benzo(a)pyrene	Holding Time	66 UE
MWCS158R61	Indeno(1,2,3-cd)pyrene	Holding Time	66 UE
MWCS158R61	Dibenzo(a,h)anthracene	Holding Time	66 UE
MWCS158R61	Benzo(g,h,i)perylene	Holding Time	66 UE
MWCS158R62	Naphthalene	Holding Time	65 UE
MWCS158R62	2-Methylnaphthalene	Holding Time	65 UE
MWCS158R62	Acenaphthylene	Holding Time	65 UE
MWCS158R62	Acenaphthene	Holding Time	65 UE
MWCS158R62	Fluorene	Holding Time	65 UE
MWCS158R62	Phenanthrene	Holding Time	65 UE
MWCS158R62	Anthracene	Holding Time	65 UE
MWCS158R62	Fluoranthene	Holding Time	65 UE
MWCS158R62	Pyrene	Holding Time	65 UE
MWCS158R62	Benzo(a)anthracene	Holding Time	65 UE
MWCS158R62	Chrysene	Holding Time	65 UE
MWCS158R62	Benzo(b)fluoranthene	Holding Time	65 UE

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCS158R62	Benzo(k)fluoranthene	Holding Time	65 UE
MWCS158R62	Benzo(a)pyrene	Holding Time	65 UE
MWCS158R62	Indeno(1,2,3-cd)pyrene	Holding Time	65 UE
MWCS158R62	Dibenzo(a,h)anthracene	Holding Time	65 UE
MWCS158R62	Benzo(g,h,i)perylene	Holding Time	65 UE
MWSS129R1	Fluoranthene	Continuing Calibration %D >20	2800 G
MWSS129R1	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	320 L
MWSS129R1	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	120 L
MWSS129R1	Benzo(g,h,i)perylene	Continuing Calibration %D >20	290 L
MWSB131R1	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	110 L
MWSB131R1	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	340 L
MWSB131R1	Benzo(g,h,i)perylene	Continuing Calibration %D >20	110 L
MWSB130R1	Fluoranthene	Continuing Calibration %D >20	2900 G
MWSB130R1	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	440 L
MWSB130R1	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	150 L
MWSB130R1	Benzo(g,h,i)perylene	Continuing Calibration %D >20	400 L
MWCS127S2	Fluoranthene	Continuing Calibration %D >20	2800 G
MWCS127S2	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	380 L
MWCS127S2	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	150 L
MWCS127S2	Benzo(g,h,i)perylene	Continuing Calibration %D >20	340 L
MWCS158R61	Fluoranthene	Continuing Calibration %D >20	66 UG
MWCS158R61	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	66 UG
MWCS158R61	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	66 UG
MWCS158R61	Benzo(g,h,i)perylene	Continuing Calibration %D >20	66 UG
MWCS158R62	Fluoranthene	Continuing Calibration %D >20	65 UG
MWCS158R62	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	65 UG
MWCS158R62	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	65 UG
MWCS158R62	Benzo(g,h,i)perylene	Continuing Calibration %D >20	65 UG
MWCS151R2	Fluoranthene	Continuing Calibration %D >20	2600 G
MWCS151R2	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	290 L
MWCS151R2	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	110 L
MWST140R1	Pentachlorophenol	Surrogate	270 L
MWSB131R1	Benzo(a)anthracene	Internal Standard	220 L
MWSB131R1	Chrysene	Internal Standard	290 L
MWCS151R2	di-n-Octylphthalate	Internal Standard	140 UL
MWCS151R2	Benzo(b)fluoranthene	Internal Standard	1600 L
MWCS151R2	Benzo(k)fluoranthene	Internal Standard	1200 L
MWCS151R2	Benzo(g,h,i) perylene	Internal Standard	300 L

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCS151R2	Benzo(a)pyrene	Internal Standard	1200 L
MWCS151R2	Dibenzo(a,h)anthracene	Internal Standard	110 L
MWCS127S2	Antimony	MS	25.2 G
MWCS151R2	Antimony	MS	5.8 G
MWSB131R1	Antimony	MS	3.7 G
MWSS129R1	Antimony	MS	47.1 G
MWSB130R1	Antimony	MS	14.2 G
MWCS127S2	Mercury	Precision	3.6 E
MWCS127S2	Nickel	Precision	10.9 E
MWCS151R2	Mercury	Precision	1.9 E
MWCS151R2	Nickel	Precision	16.3 E
MWCS158R1	Mercury	Precision	0.97 E
MWCS158R10	Mercury	Precision	0.71 E
MWCS158R14	Mercury	Precision	0.99 E
MWCS158R18	Mercury	Precision	0.98 E
MWCS158R2	Mercury	Precision	0.60 E
MWCS158R22	Mercury	Precision	1.0 E
MWCS158R28	Mercury	Precision	0.92 E
MWCS158R3	Mercury	Precision	0.65 E
MWCS158R34	Mercury	Precision	0.52 E
MWCS158R4	Mercury	Precision	0.65 E
MWCS158R45	Mercury	Precision	0.26 E
MWCS158R5	Mercury	Precision	0.55 E
MWCS158R6	Mercury	Precision	0.61 E
MWCS158R7	Mercury	Precision	0.67 E
MWCS158R8	Mercury	Precision	0.69 E
MWCS158R9	Mercury	Precision	0.67 E
MWCT159R1	Mercury	Precision	0.20 E
MWCT159R10	Mercury	Precision	0.18 E
MWCT159R13	Mercury	Precision	0.23 E
MWCT159R16	Mercury	Precision	0.20 E
MWCT159R2	Mercury	Precision	0.20 E
MWCT159R24	Mercury	Precision	0.15 E
MWCT159R3	Mercury	Precision	0.16 E
MWCT159R4	Mercury	Precision	0.18 E
MWCT159R6	Mercury	Precision	0.27 E
MWCT159R7	Mercury	Precision	0.19 E
MWCT159R8	Mercury	Precision	0.15 E

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCT159R9	Mercury	Precision	0.17 E
MWSB130R1	Mercury	Precision	0.44 E
MWSB130R1	Nickel	Precision	20.5 E
MWSB131R1	Mercury	Precision	0.28 E
MWSB131R1	Nickel	Precision	24.5 E
MWSS129R1	Mercury	Precision	0.52 E
MWSS129R1	Nickel	Precision	29.0 E

Attachment 3 Revised Laboratory Forms

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWSS129R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910001

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910001-1

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1660

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 26 decanted: (Y/N) Y Date Extracted: 10/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/23/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
91-20-3	Naphthalene	74	
91-57-6	2-Methylnaphthalene	72	U
208-96-8	Acenaphthylene	750	
83-32-9	Acenaphthene	84	
86-73-7	Fluorene	72	U
85-01-8	Phenanthrene	850	
120-12-7	Anthracene	560	
206-44-0	Fluoranthene	2800	D3
129-00-0	Pyrene	1700	D3
56-55-3	Benzo(a)anthracene	1100	D3
218-01-9	Chrysene	1600	D3
205-99-2	Benzo(b)fluoranthene	1200	D3
207-08-9	Benzo(k)fluoranthene	980	D3
50-32-8	Benzo(a)pyrene	1000	D3
193-39-5	Indeno(1,2,3-cd)pyrene	320	JD3
53-70-3	Dibenzo(a,h)anthracene	120	JD3
191-24-2	Benzo(g,h,i)perylene	290	JD3

(1) - Cannot be separated from Diphenylamine

D3 - Result reported from a 5 fold dilution (P1635.D)

RCS/QBD
1/13/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 00044

MWSB131R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910001

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910001-2

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1654

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 22 decanted: (Y/N) Y Date Extracted: 10/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/22/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
91-20-3	Naphthalene	68	U	
91-57-6	2-Methylnaphthalene	68	U	
208-96-8	Acenaphthylene	72		
83-32-9	Acenaphthene	68	U	
86-73-7	Fluorene	68	U	
85-01-8	Phenanthrene	410		
120-12-7	Anthracene	110		
206-44-0	Fluoranthene	480		
129-00-0	Pyrene	490		
56-55-3	Benzo(a)anthracene	220		L
218-01-9	Chrysene	290		L
205-99-2	Benzo(b)fluoranthene	210	JD3	
207-08-9	Benzo(k)fluoranthene	180	JD3	
50-32-8	Benzo(a)pyrene	260	JD3	
193-39-5	Indeno(1,2,3-cd)pyrene	110	JD3	L
53-70-3	Dibenzo(a,h)anthracene	340	UD3	L
191-24-2	Benzo(g,h,i)perylene	110	JD3	L

(1) - Cannot be separated from Diphenylamine

D3 - Result reported from a 5 fold dilution (P1636.D)

RCS/QBD
1/13/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWSB130R1 ✓

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910001

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910001-4 ✓

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1659 ✓

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 28 ✓ decanted: (Y/N) Y Date Extracted: 10/27/99 ✓

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/23/99 ✓

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y ✓ pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG ✓	Q	
91-20-3	Naphthalene	180		✓
91-57-6	2-Methylnaphthalene	120		
208-96-8	Acenaphthylene	270		✓
83-32-9	Acenaphthene	91		
86-73-7	Fluorene	140		✓
85-01-8	Phenanthrene	1100		
120-12-7	Anthracene	440		
206-44-0	Fluoranthene	2900	D3	✓ G
129-00-0	Pyrene	1800	D3	✓
56-55-3	Benzo(a)anthracene	1100	D3	
218-01-9	Chrysene	1300	D3	✓
205-99-2	Benzo(b)fluoranthene	1200	D3	
207-08-9	Benzo(k)fluoranthene	950	D3	
50-32-8	Benzo(a)pyrene	1100	D3	
193-39-5	Indeno(1,2,3-cd)pyrene	440	D3	L
53-70-3	Dibenzo(a,h)anthracene	150	JD3	✓ L
191-24-2	Benzo(g,h,i)perylene	400	D3	L

(1) - Cannot be separated from Diphenylamine

D3 - Result reported from a 5 fold dilution (P1639.D) ✓

JWS 12-4-01
RCS/QBD
1/13/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 00100

MWCS127S2

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910001

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910001-8

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1658

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 37 decanted: (Y/N) Y Date Extracted: 10/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/23/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
91-20-3	Naphthalene	580		
91-57-6	2-Methylnaphthalene	180		
208-96-8	Acenaphthylene	400		
83-32-9	Acenaphthene	240		
86-73-7	Fluorene	280		
85-01-8	Phenanthrene	1300		
120-12-7	Anthracene	560		
206-44-0	Fluoranthene	2800	D3	G
129-00-0	Pyrene	2800	D3	
56-55-3	Benzo(a)anthracene	1100	D3	
218-01-9	Chrysene	1300	D3	
205-99-2	Benzo(b)fluoranthene	1100	D3	
207-08-9	Benzo(k)fluoranthene	1000	D3	
50-32-8	Benzo(a)pyrene	1200	D3	
193-39-5	Indeno(1,2,3-cd)pyrene	380	JD3	L
53-70-3	Dibenzo(a,h)anthracene	150	JD3	L
191-24-2	Benzo(g,h,i)perylene	340	JD3	L

(1) - Cannot be separated from Diphenylamine

D3 - Result reported from a 5 fold dilution (P1640.D)

RCS/QBD
1/13/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWCS158R61 ✓

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910001

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910001-44

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1632 ✓

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 20 ✓ decanted: (Y/N) Y ✓ Date Extracted: 10/27/99 ✓

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/21/99 ✓

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y ✓ pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG ✓	Q	
91-20-3	Naphthalene	66	U ✓	E
91-57-6	2-Methylnaphthalene	66	U	
208-96-8	Acenaphthylene	66	U	
83-32-9	Acenaphthene	66	U	
86-73-7	Fluorene	66	U	
85-01-8	Phenanthrene	66	U	
120-12-7	Anthracene	66	U	
206-44-0	Fluoranthene	66	U	G
129-00-0	Pyrene	66	U	E
56-55-3	Benzo(a)anthracene	66	U	
218-01-9	Chrysene	66	U	
205-99-2	Benzo(b)fluoranthene	66	U	
207-08-9	Benzo(k)fluoranthene	66	U	
50-32-8	Benzo(a)pyrene	66	U	
193-39-5	Indeno(1,2,3-cd)pyrene	66	U	L
53-70-3	Dibenzo(a,h)anthracene	66	U	L
191-24-2	Benzo(g,h,i)perylene	66	U	L

(1) - Cannot be separated from Diphenylamine

12/4/99

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWCS158R62 ✓

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910001

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910001-45 ✓

Sample wt/vol: 75.0 (g/mL) G ✓ Lab File ID: P1633 ✓

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 19 decanted: (Y/N) Y Date Extracted: 10/27/99 ✓

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/22/99 ✓

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y ✓ pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG ✓	Q	
91-20-3	Naphthalene	65	U ✓	E
91-57-6	2-Methylnaphthalene	65	U	
208-96-8	Acenaphthylene	65	U	
83-32-9	Acenaphthene	65	U	
86-73-7	Fluorene	65	U	
85-01-8	Phenanthrene	65	U	
120-12-7	Anthracene	65	U	
206-44-0	Fluoranthene	65	U	G
129-00-0	Pyrene	65	U	E
56-55-3	Benzo(a)anthracene	65	U	
218-01-9	Chrysene	65	U	
205-99-2	Benzo(b)fluoranthene	65	U	
207-08-9	Benzo(k)fluoranthene	65	U	
50-32-8	Benzo(a)pyrene	65	U	L
193-39-5	Indeno(1,2,3-cd)pyrene	65	U	L
53-70-3	Dibenzo(a,h)anthracene	65	U	L
191-24-2	Benzo(g,h,i)perylene	65	U	

(1) - Cannot be separated from Diphenylamine

1/13/00

00134

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS151R2

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910001

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910001-70

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1664

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 44 decanted: (Y/N) Y Date Extracted: 10/27/99

Concentrated Extract Volume: 2000(uL) Date Analyzed: 11/23/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
541-73-1	1,3-Dichlorobenzene	46	U
106-46-7	1,4-Dichlorobenzene	46	U
95-50-1	1,2-Dichlorobenzene	46	U
120-82-1	1,2,4-Trichlorobenzene	46	U
91-20-3	Naphthalene	740	
91-57-6	2-Methylnaphthalene	240	
131-11-3	Dimethylphthalate	140	U
208-96-8	Acenaphthylene	460	
83-32-9	Acenaphthene	240	
132-64-9	Dibenzofuran	480	U
84-66-2	Diethylphthalate	140	U
86-73-7	Fluorene	360	
86-30-6	N-Nitrosodiphenylamine (1)	230	UD3
85-01-8	Phenanthrene	1100	D3
120-12-7	Anthracene	650	JD3
84-74-2	Di-n-butylphthalate	710	UD3
206-44-0	Fluoranthene	2600	D3
129-00-0	Pyrene	2500	D3
85-68-7	Butylbenzylphthalate	710	UD3
56-55-3	Benzo(a)anthracene	1100	D3
218-01-9	Chrysene	1400	D3
117-81-7	bis(2-Ethylhexyl)phthalate	960	D3
117-84-0	Di-n-octylphthalate	140	U
205-99-2	Benzo(b)fluoranthene	1600	
207-08-9	Benzo(k)fluoranthene	1200	
50-32-8	Benzo(a)pyrene	1200	
193-39-5	Indeno(1,2,3-cd)pyrene	290	
53-70-3	Dibenzo(a,h)anthracene	110	J
191-24-2	Benzo(g,h,i)perylene	300	

(1) - Cannot be separated from Diphenylamine

CR/QA01
1/13/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 20021

MWST140R1

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 910001

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910001-3

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J5881

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 44 decanted: (Y/N) Y Date Extracted: 10/06/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/29/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
87-86-5	Pentachlorophenol	270		L

FORM I SV

RCS/QAD
1/13/00

INORGANICS SW-846

1
INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS127S2

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-8

% Solids: 57.7

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	25.2			P	G
7440-38-2	Arsenic	242			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	2.4			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	996			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	649			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	3.6		*	CV	E
7440-02-0	Nickel	10.9		*	P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	5.2			P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	1070			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

TD/QBD
1/11/00

00002

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS151R2

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-70

% Solids: 53.7

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	5.8			P	G
7440-38-2	Arsenic	50.1			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	1.8			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	338			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	385			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	1.9		*	CV	E
7440-02-0	Nickel	16.3		*	P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	2.1			P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	300			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

TV/QBD 1/11/00

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS158R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-25

% Solids: 57.5

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.97		*	CV E
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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INORGANICS SW-846

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CLIENT ID

INORGANIC ANALYSIS DATA SHEET

MWCS158R10

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-34

% Solids: 48.4

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.71		[illegible]	CV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

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Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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INORGANICS SW-846

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INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS158R14

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-35

% Solids: 49.9

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.99		→ S [illegible]	CV E
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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INORGANICS SW-846

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INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS158R18

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-36

% Solids: 52.0

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.98		* [illegible]	CV E
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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INORGANICS SW-846

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CLIENT ID

INORGANIC ANALYSIS DATA SHEET

MWCS158R2

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT Lab Sample ID: 910001-26

% Solids: 58.3 Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic				NR	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.60		*	CV	E
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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INORGANICS SW-846

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CLIENT ID

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INORGANIC ANALYSIS DATA SHEET

MWCS158R22

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-37

% Solids: 50.2

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	1.0		[illegible]	CV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

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Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS158R28

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-38

% Solids: 52.8

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.92		[illegible]	CV E
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS158R3

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-27

% Solids: 58.0

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic				NR	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.65		*	CV	E
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

INORGANICS SW-846

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INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS158R34

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-39

% Solids: 66.2

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.52		→ 5 11/1/99	CV E
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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CLIENT ID

INORGANIC ANALYSIS DATA SHEET

MWCS158R5

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT Lab Sample ID: 910001-29

% Solids: 54.4 Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.55		*	CV E
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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INORGANICS SW-846

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INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS158R6

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-30

% Solids: 54.1

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic				NR	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.61		*	CV	E
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

INORGANICS SW-846

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INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS158R7

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-31

% Solids: 54.9

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.67		*	CV E
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

INORGANICS SW-846

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INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS158R8

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-32

% Solids: 53.4

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic				NR	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.69		*	CV	E
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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INORGANICS SW-846

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INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS158R9

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-33

% Solids: 53.6

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic				NR	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.67		*	CV	E
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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INORGANICS SW-846

00324

CLIENT ID

MWCT159R1

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INORGANIC ANALYSIS DATA SHEET

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-46

% Solids: 62.2

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic				NR	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.20		11/1/99	CV	E
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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CLIENT ID

MWCT159R10

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INORGANIC ANALYSIS DATA SHEET

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-55

% Solids: 65.6

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.18		* [illegible]	CV E
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCT159R13

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-56

% Solids: 67.9

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.23			CV E
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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CLIENT ID

MWCT159R16

1

INORGANIC ANALYSIS DATA SHEET

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-57

% Solids: 67.5

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20			CV E
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCT159R2

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-47

% Solids: 63.7

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20		+	CV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

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Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCT159R24

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-59

% Solids: 69.3

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.15		+	CV E
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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INORGANICS SW-846

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INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCT159R3

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-48

% Solids: 65.7

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic				NR	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.16		[illegible]	CV	E
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCT159R4

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-49

% Solids: 66.9

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic				NR	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.18		→ 11/4/99	CV	E
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCT159R6

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-51

% Solids: 65.4

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic				NR	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.27		→ 11/16/99	CV	E
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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00014

CLIENT ID

MWCS158R4

1

INORGANIC ANALYSIS DATA SHEET

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-28

% Solids: 58.0

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic				NR	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.65		*	CV	E
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS158R45

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-41

% Solids: 77.0

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic				NR	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.26			CV	E
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

00041

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1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCT159R7

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-52

% Solids: 66.8

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.19		→ 10/29	CV E
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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CLIENT ID

MWCT159R8

1

INORGANIC ANALYSIS DATA SHEET

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-53

% Solids: 67.1

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.15		[illegible]	CV E
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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00043

CLIENT ID

MWCT159R9

1

INORGANIC ANALYSIS DATA SHEET

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-54

% Solids: 68.4

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.17		→	CV E
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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INORGANICS SW-846

1
INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWSB130R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-4

% Solids: 72.1

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	14.2			P	6
7440-38-2	Arsenic	67.7			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.36	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	272			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	210			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.44		*	CV	E
7440-02-0	Nickel	20.5		*	P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.71	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	284			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

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INORGANICS SW-846 00046

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INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWSS129R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT Lab Sample ID: 910001-1

% Solids: 76.0 Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	47.1			P	6
7440-38-2	Arsenic	597			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	4.3			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	1240			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	536			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.52		*	CV	E
7440-02-0	Nickel	29.0		*	P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	2.0			P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	4810			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

TD/GBD 1/11/00

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWSB131R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910001

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910001-2

% Solids: 77.8

Date Received: 10/01/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	3.7			P	G
7440-38-2	Arsenic	20.5			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.33	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	191			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	8290			P	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.28		*	CV	E
7440-02-0	Nickel	24.5		*	P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.66	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	382			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

TD/QBD
1/11/00

Quality By Design

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EPA Level 2
DATA VALIDATION REPORT

Project Name: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: October 2, 1999
SDG: 910006

Prepared for

Foster Wheeler Environmental
10900 NE 8th St.
Bellevue, WA 98004

Purchase Order No. 022828
QBD Job No. 270J

Reviewed and approved,

Lorraine Davis 1/19/00

Lorraine L. Davis, Owner — Date

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Attachments

Attachment 1 Data Flag Definitions
Attachment 2 Summary Table of Data Qualifier Flags
Attachment 3 Revised Laboratory Forms

A. Introduction

Laboratory Sciences, Inc., d.b.a. *Quality by Design* (QBD), has completed an EPA Level 2 Data Validation on the submitted data packages in accordance with P.O. Number 022828.

The reporting format and criteria for recommending data qualifying flags for this data set are described in the EPA *"Functional Guidelines for Evaluating Organics Analyses"* and *"Functional Guidelines for Evaluating Inorganics Analyses,"* as revised, 1994; and *"Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound"* ("PSEP Protocols"), May 1997; or using criteria listed in the method referenced. Data may be qualified for any of the following reasons:

1. By the laboratory prior to receipt by the reviewer
2. Because of laboratory deviation from the designated method
3. Because the data may not meet the criteria listed in the reference above
4. By the professional judgment of the reviewer.

The data set consists of one data package from Multichem Analytical Services in Renton, Washington, and contains data for the samples shown in Table 1. The data reviewer and senior reviewers are shown in Table 2.

Each data set includes an analytical data package for each sample, copies of the completed chain-of-custody (COC) forms, and a quality control (QC) data package. The analytical data package includes analytical results, blank sample results, both laboratory and client sample identifications, appropriate dates but not times, method reporting limits, method references, surrogate recoveries as appropriate, the laboratory's name and address, and the initials of the person releasing the data. The custody forms include the receipt of the sample but not the laboratory's internal tracking. The QC data package includes a tabular list of the laboratory's sample identification, spiking concentrations, recoveries, percentage calculations, and acceptance windows.

Raw data were provided which includes chromatograms, instrument print outs, injection logs, digestion/preparation logs.

This data validation report consists of several sections, each of which are formatted to follow Functional Guidelines, but which also include subsections discussing QBD contacts with the laboratory, other comments, and a summary table of data qualifiers.

Table 1. Sample Identification and Analysis

Sample Identification	Laboratory Identification	Methods 8081/8082	Method 8270	Method 6010/7000	Method 9060	Grain Size	Conventionals
MWCS152R2	910006-1	X	X	X	X	X	
MWCS152S2	910006-1	X	X	X	X	X	
MWSS112R1	910006-1	X	X	X	X	X	

Key:
Method 8270 = Semivolatile organic compounds by gas chromatography/mass spectroscopy
Method 8081/8082 = Pesticides and polychlorinated biphenyls (PCB) by gas chromatography
Method 6010 & 7000 = Metals by inductively coupled plasma (ICP) and cold vapor atomic absorption (CVAA)
Method 9060 = Total organic carbon (TOC)
Conventionals = Sulfide, ammonia, and percent moisture

Table 2. Data Package, Reviewer, and Senior Reviewer

Analysis	Number of Pages	Reviewer	Senior Reviewer
Pest/PCB	415	Randi Schneider	Lorraine L. Davis
SVOC	324	Debbie Copsey Melinda Jacobson	Thomas S. Davis
Metals	136	Lorraine L. Davis	Thomas S. Davis
Conventionals	20	Lorraine L. Davis	Thomas S. Davis

B. Chain-of-Custody

The analytical data package was reviewed and compared against the chain-of-custody (COC) forms. No data are missing from the COC forms and no transcription errors in accuracy were found. All tests requested on the COC were performed.

C. Review of GC/MS Semivolatiles Analyses

EPA Method 8270

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The base neutral fraction analyses were added to the work order after the samples had been logged into the laboratory system, and the extraction for this analyses occurred after the 14-day holding time. As stated in the case narrative, the samples were frozen upon receipt and then thawed and extracted. PSDDA recognizes a holding time of one year for sediments which have been frozen. When the samples are thawed, Method 8270 recognizes a 14-day holding time to extraction. Since the request for analysis occurred during the analytical process for the SDG and since the samples were frozen until extraction, no data qualifier flags are recommended.

2. GC/MS Tuning

All decafluorotriphenylphosphine (DFTPP) tune criteria were met for the initial and continuing calibration for all dates of sample analysis.

3. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No target compound list (TCL) analytes had percent relative standard deviations (%RSD) greater than allowed by the method for the initial calibration or percent difference for the continuing calibration checks. All system performance check compound (SPCC) and calibration check compound (CCC) criteria were met, except as noted below.

Table 3. SVOC Data Qualifiers Due to Calibration Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS152R2	1,2,4-Trichlorobenzene	Continuing Calibration %D >20	21 UG

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS152R2	di-n-Butylphthalate	Continuing Calibration %D >20	66 UG
MWCS152R2	di-n-Octylphthalate	Continuing Calibration %D >20	330 UG
MWCS152R2	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	430 UE
MWCS152R2	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	430 UE
MWCS152S2	1,2,4-Trichlorobenzene	Continuing Calibration %D >20	21 UG
MWCS152S2	Fluoranthene	Continuing Calibration %D >20	2000 G
MWCS152S2	bis(2-Ethylhexyl)phthalate	Continuing Calibration %D >20	320 UG
MWCS152S2	di-n-Octylphthalate	Continuing Calibration %D >20	320 UG
MWCS152S2	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	430 UE
MWCS152S2	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	430 UE
MWCS152S2	Benzo(g,h,i)perylene	Continuing Calibration %D >20	430 UE
MWSS112R1	1,2,4-Trichlorobenzene	Continuing Calibration %D >20	24 UG
MWSS112R1	Diethylphthalate	Continuing Calibration %D >20	75 UG
MWSS112R1	di-n-Butylphthalate	Continuing Calibration %D >20	75 UG
MWSS112R1	Fluoranthene	Continuing Calibration %D >20	1900 G
MWSS112R1	Pyrene	Continuing Calibration %D >20	860 L
MWSS112R1	di-n-Octylphthalate	Continuing Calibration %D >20	75 UG
MWSS112R1	Benzo(b)fluoranthene	Continuing Calibration %D >20	640 G
MWSS112R1	Benzo(k)fluoranthene	Continuing Calibration %D >20	560 G

Discussion: The continuing calibration for several target compounds had percent differences which were out of the criteria of <20 percent. The associated results in Samples MWCS152R2, MWCS152S2, and MWSS112R1 have been flagged appropriately. If the results indicated a high bias, the results were flagged with "L" or "UL" to indicate that the value is less than the maximum shown and if the results indicated a low bias, the results were flagged with "G" and "UG" to indicate the reporting

limit is greater than the minimum shown. When other QC checks indicated both a high and low bias, the results were flagged with "E" to indicate an estimated value or "UE" to indicate an estimated reporting limit.

The continuing calibration for the target compound pentachlorophenol had a percent difference of 22.0, which is out of the criteria of <20 percent. Since the only samples associated with this CCV were QC check samples, no data qualifier flags are recommended.

4. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

5. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria, except as noted below.

Discussion: In sample MWSS112R1, a single surrogate was out of criteria. No data qualifier flags are recommended because all other surrogates were in criteria.

6. Laboratory Control Standards

The laboratory analyzed a second source sample with the analytical batch. The laboratory referred to this sample as a blank spike/blank spike duplicate (BS/BSD) rather than a laboratory control standard (LCS). Any anomalies or comments regarding the second source results are addressed in the next section.

7. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

Matrix spike (MS) and matrix spike duplicates (MSD) were analyzed as required by the referenced method and all percent recoveries and relative percent differences (RPD) were within QAPP criteria, except as noted below.

Discussion: A single blank spike for n-nitrosodiphenylamine was out of criteria, but all other accuracy measurements (e.g., MS, surrogates and calibration verifications) were acceptable and no data qualifying flags are recommended.

MS and MSD recoveries for several analytes were out of criteria due to high concentrations of analytes in the original sample or due to significant matrix interferences that were obvious on the chromatogram. Since all other QC checks were in criteria and since the sample spiked was a project sample, but not part of this SDG, no data qualifier flags are recommended.

The BS/BSD recovery for 2-methylphenol, 4-methylphenol, 2,4-dimethylphenol and benzoic acid were out of acceptance criteria of 50 to 150 percent. Since the recovery of these analytes in the associated MS/MSD were acceptable, no data qualifier flags are recommended.

8. Internal Standards Performance for Samples

All internal standard areas were within the required control limits, except as noted below.

Discussion: Chrysene-d_{12} and perylene-d_{12} were out of the acceptance criteria of –50 to +100 percent for all three undiluted samples. A review of the chromatograms showed considerable matrix interference. The laboratory appropriately diluted and re-analyzed the samples with acceptable internal standard recoveries. Individual analyte results were reported as appropriate from each dilution and no data qualifier flags are recommended.

9. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWCS152R2 and MWCS152S2 were identified as field duplicates. Test results were reviewed, and where positive results were found, the RPD was calculated. All analytes, except those listed in the table below, were reported as non-detect.

Table 4. SVOC Field Duplicates and RPD

Compound	MWCS152R2 Result	MWCS152S2 Result	RPD
1,2,4-Trichlorobenzene	21 U	21	NC
Naphthalene	1000	690	36.7
2-Methylnaphthalene	390	270	36.4
Acenaphthylene	940	810	14.9
Acenaphthene	420	270	43.5
Dibenzofuran	350	230	41.4
Fluorene	600	410	37.6
Phenanthrene	1900	1200	45.2
Anthracene	1200	1100	8.7
Fluoranthene	2500	2000	22.2
Pyrene	3000	2600	14.3
Benzo(a)anthracene	990	1100	10.5
Chrysene	1100	1900	53.3
bis(2-Ethylhexyl)phthalate	420	320 U	NC
Benzo(b)fluoranthene	950	1500	44.9
Benzo(k)fluoranthene	1000	1700	51.9

Compound	MWCS152R2 Result	MWCS152S2 Result	RPD
Benzo(a)pyrene	1300	2100	47.1

Key: NC = Not Calculable

Discussion: The high RPD for this analysis may be due to sample inhomogeniety or special circumstances during the sampling process. Because the person who performed the sampling has information that is not available to the data validator, such as sampling conditions or problems with the sampling equipment, the client typically performs any flagging and data qualification based upon field duplicates.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found, except as noted below. The reporting limits meet the requirements of the contract.

Table 5. SVOC Data Qualifiers Due to Compound Quantitation Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS152R2	Indeno(1,2,3-cd)pyrene	Calculation Error	430 U
MWCS152R2	Dibenzo(a,h)anthracene	Calculation Error	430 U
MWCS152R2	Benzo(g,h,i)perylene	Calculation Error	430 U
MWCS152S2	Indeno(1,2,3-cd)pyrene	Calculation Error	430 U
MWCS152S2	Dibenzo(a,h)anthracene	Calculation Error	430 U
MWCS152S2	Benzo(g,h,i)perylene	Calculation Error	430 U

Discussion: Calculation errors were found in determining the final result from the dilutions for Samples MWCS152R2 and MWCS152S2. The laboratory observed trace amounts of the three analytes in the diluted samples which should have been reported as non-detect. Corrected values are listed in the summary table and on the laboratory final report forms.

11. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

12. TCL Compound Identification

All target compound identifications met the criteria for retention times and peak identification of the referenced method.

13. Tentatively Identified Compounds

No TICs were reported with this data set.

14. Laboratory Contact

There was no verbal or written communication with the laboratory.

15. Other Comments

None.

16. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

D. Review of Pesticides/PCBs Analyses

EPA Method 8081/8082

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The analysis of the target compounds hexachlorobenzene and hexachlorobutadiene was performed using Method 8081 instead of the requested Method 8270. No data qualifier flags are recommended since the method utilized is an approved method by PSEP.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No TCL analytes had percent %RSD greater than that allowed for the initial calibration or percent difference for the continuing calibration checks, except as noted below.

Table 6. Pesticide/PCB Data Qualifiers Due to Calibration Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS152R2	4,4'-DDT	Continuing Calibration % D>15	5.5 UL
MWCS152S2	4,4'-DDT	Continuing Calibration % D>15	5.3 UL
MWSS112R1	4,4'-DDT	Continuing Calibration % D>15	6.3 UL

Discussion: The continuing calibrations for the target compound 4,4'-DDT had percent differences which exceeded the criteria of 15 percent. The associated results in Samples MWCS152R2, MWCS152S2, and MWSS112R1 have been flagged "UL" to indicate the reporting limit value is less than the maximum shown.

The continuing calibration for the target compounds 4,4'-DDD and hexachlorobutadiene out of the criteria of 15 percent. No data qualifier flags are recommended since the CCVs were high and the associated sample results were below the reporting limit.

The continuing calibration for the target compounds Aroclor 1016 has a percent difference which exceeds the criteria of 15 percent on one GC column only. Since the second GC column had acceptable recovery, no data qualifier flags are recommended.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria.

6. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWCS152R2 and MWCS152S2 were identified as field duplicates. Test results were reviewed, and where positive results were found, the RPD was calculated. All analytes, except those listed in the table below, were reported as non-detect.

Table 7. Pesticide/PCB Field Duplicates and RPD

Compound	MWCS152R2 Result	MWCS152S2 Result	RPD
Aroclor 1254	51 J	61	17.9
Total Aroclor	51.J	61	17.9

7. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

8. TCL Compound Identification

No target compounds were detected.

9. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards or external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

10. Laboratory Contact

There was no verbal or written communication with the laboratory.

11. Other Comments

None.

12. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

E. Review of Metals Analyses

EPA Method 6010/7000

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. Initial and Continuing Calibration

All initial and continuing calibration Quality Control criteria were met. No target compound list (TCL) analytes had correlation coefficients greater than allowed by the method, and all percent differences for the continuing calibration verifications were acceptable.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. ICP Interference Check Standard

An interference check sample (ICS) was analyzed at a frequency required by the referenced method and was within established criteria.

5. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within QAPP criteria, except as noted below.

Discussion: Arsenic, antimony, cadmium, lead, nickel, and zinc were out of the method criteria of 90 to 110 percent for the LCS. However, PSDDA allows 80 to 120 percent recovery of a second source sample. Since all five analytes were within PSDDA acceptance criteria, no data qualifier flags are recommended.

6. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MSs were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria, except as noted below.

Table 8. Metal Data Qualifiers Due to Duplicate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS152R2	Antimony	MS	22.1 UE
MWCS152S2	Antimony	MS	19.7 UE
MWCS112R1	Antimony	MS	26.4 UE

Discussion: The post digestion spike for lead was high and out of criteria, but since the MS was acceptable, no data qualifier flags are recommended.

MS and MSD recoveries for arsenic were out of criteria due to high concentrations of analytes in the original sample. Since all other QC checks were in criteria, no data qualifier flags are recommended.

Antimony was low and out of criteria for accuracy (percent recovery) for the MS with a 20.8 percent recovery. Normally, the associated samples would be flagged "R" because the percent recovery was less than 30%, and because the LCS was acceptable, the only sample that would be associated with this MS is the sample that was spiked. However, all of the matrix spikes in all of the SDGs for this project have been out of criteria, some of which have been above 30% and some of which have been less than 30%. In a telephone conversation with Foster Wheeler, it was noted that some of the analyte was recovered from the spike (i.e., the percent recovery was not zero) and that a low percent recovery may imply a higher detection limit. In keeping with the recommendations in *Functional Guidelines*, it was agreed that samples with positive results would be flagged "G" to indicate that the value was greater than the minimum shown. It was also agreed that the detection limit for non-detect samples would be increased proportional to the spike recovery and flagged "UE", to indicate that the detection limit is estimated.

7. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWCS152R2 and MWCS152S2 were identified as field duplicates. Test results were reviewed, and where positive results were found, the RPD was calculated. All analytes, except those listed in the table below, were reported as non-detect.

Table 9. Metal Field Duplicates and RPD

Compound	MWCS152R2 Result	MWCS152S2 Result	RPD
Arsenic	12.8	19.2	40.0
Cadmium	0.46 U	0.57	NC
Copper	5580	1150	132
Lead	112	123	9.4
Mercury	0.81	0.64	23.4

Compound	MWCS152R2 Result	MWCS152S2 Result	RPD
Nickel	13.4	11.3	17.0
Zinc	114	99.6	13.5

Key: NC = Not calculable

Discussion: The high RPD for this analysis may be due to sample inhomogeniety or special circumstances during the sampling process. Because the person who performed the sampling has information that is not available to the data validator, such as sampling conditions or problems with the sampling equipment, the client typically performs any flagging and data qualification based upon field duplicates.

8. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPD were within QAPP criteria, except as noted below.

Table 10. Metal Data Qualifiers Due to Duplicate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS152R2	Mercury	Precision	0.81 E
MWCS152S2	Mercury	Precision	0.64 E
MWSS112R1	Mercury	Precision	0.60 E

Discussion: Mercury was out of the criteria of less than 20 percent at 47.8 in the sample duplicate set. The associated positive results for Samples MWCS152R2, MWCS152S2, and MWSS112R1 have been flagged "E" to indicate an estimated value.

9. ICP Serial Dilution

Samples that were a factor of 50 above the instrument detection limit (IDL) for the analyte were diluted five-fold and were within criteria required by the referenced method, except as noted below.

Table 11. Metal Data Qualifiers Due to ICP Serial Dilution Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS152R2	Lead	Serial Dilution	112 E
MWCS152R2	Zinc	Serial Dilution	114 E
MWCS152S2	Lead	Serial Dilution	123 E
MWCS152S2	Zinc	Serial Dilution	99.6 E
MWSS112R1	Lead	Serial Dilution	84.9 E

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWSS112R1	Zinc	Serial Dilution	143 E

Discussion: A serial dilution of lead and zinc has a percent differences greater than the acceptance criteria of ±10 percent at 13.6 and 13.1 percent, respectively. The associated results for Samples MWCW152R2, MWCS152S2, and MWSS112R1 have been flagged "E" to indicate an estimated value.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract, except as noted below.

Discussion: The reporting limits for lead failed to meet the requirement of 0.5 mg/kg that was listed in the QAPP. However, most field samples had positive results. For samples that were non-detect, the laboratory's reporting limit of 1.5 mg/kg was less than the Sediment Quality Standard Criteria of 450 mg/kg and the Sediment Impact Zone and Clean-up Criteria of 530 mg/kg, and no data qualifier flags are recommended.

11. Graphite Furnace Atomic Absorption Analysis

All special criteria for graphite furnace atomic absorption (GFAA) analysis were performed at a frequency required by the referenced method and were within established criteria.

12. Laboratory Contact

There was no verbal or written communication with the laboratory.

13. Other Comments

None.

14. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

F. Review of Conventional Analyses

EPA 9060

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No target compound list (TCL) analytes had correlation coefficients greater than allowed by the method, and all percent differences for the continuing calibration verifications were acceptable.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within laboratory or method criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MSs were analyzed as required by the referenced method and all percent recoveries were within laboratory or method criteria.

6. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPD were within laboratory criteria.

7. Field Duplicates

Field duplicates were collected and analyzed as required by the QAPP. Samples MWCS152R2 and MWCS152S2 were identified as field duplicates. Test results were reviewed, and where

positive results were found, the RPD was calculated. All analytes, except those listed in the table below, were reported as non-detect.

Table 12. Inorganic Field Duplicates and RPD

Compound	MWCS152R2 Result	MWCS152S2 Result	RPD
Total Organic Carbon	24700	21200	15.2

8. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate number of standards. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

9. Laboratory Contact

There was no verbal or written communication with the laboratory.

10. Other Comments

None.

11. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

Attachment 1 Puget Sound Estuary Program Data Qualifier Definitions

Used for both organics and inorganic analyses

B = Analyte detected in samples and in method blank

C = Combined with unresolved substances

E = Estimated

G = Value greater than minimum shown

K = Detected at less than the maximum shown

L = Value less than the maximum shown

M = Value is a mean

Q = Questionable value

R = Rejected or unusable value

T = Detected below the quantification limit shown

U = Undetected at the detection limit shown

Z = Blank corrected

Attachment 2 Summary Table of Data Qualifier Flags

Foster Wheeler Environmental
Project: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: October 2, 1999

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCS152R2	1,2,4-Trichlorobenzene	Continuing Calibration %D >20	21 UG
MWCS152R2	di-n-Butylphthalate	Continuing Calibration %D >20	66 UG
MWCS152R2	di-n-Octylphthalate	Continuing Calibration %D >20	330 UG
MWCS152R2	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	430 UE
MWCS152R2	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	430 UE
MWCS152S2	1,2,4-Trichlorobenzene	Continuing Calibration %D >20	21 UG
MWCS152S2	Fluoranthene	Continuing Calibration %D >20	2000 G
MWCS152S2	bis(2-Ethylhexyl)phthalate	Continuing Calibration %D >20	320 UG
MWCS152S2	di-n-Octylphthalate	Continuing Calibration %D >20	320 UG
MWCS152S2	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	430 UE
MWCS152S2	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	430 UE
MWCS152S2	Benzo(g,h,i)perylene	Continuing Calibration %D >20	430 UE
MWSS112R1	1,2,4-Trichlorobenzene	Continuing Calibration %D >20	24 UG
MWSS112R1	Diethylphthalate	Continuing Calibration %D >20	75 UG
MWSS112R1	di-n-Butylphthalate	Continuing Calibration %D >20	75 UG
MWSS112R1	Fluoranthene	Continuing Calibration %D >20	1900 G
MWSS112R1	Pyrene	Continuing Calibration %D >20	860 L
MWSS112R1	di-n-Octylphthalate	Continuing Calibration %D >20	75 UG
MWSS112R1	Benzo(b)fluoranthene	Continuing Calibration %D >20	640 G
MWSS112R1	Benzo(k)fluoranthene	Continuing Calibration %D >20	560 G
MWCS152R2	Indeno(1,2,3-cd)pyrene	Calculation Error	430 U
MWCS152R2	Dibenzo(a,h)anthracene	Calculation Error	430 U
MWCS152R2	Benzo(g,h,i)perylene	Calculation Error	430 U
MWCS152S2	Indeno(1,2,3-cd)pyrene	Calculation Error	430 U
MWCS152S2	Dibenzo(a,h)anthracene	Calculation Error	430 U
MWCS152S2	Benzo(g,h,i)perylene	Calculation Error	430 U
MWCS152R2	4,4'-DDT	Continuing Calibration % D>15	5.5 UL
MWCS152S2	4,4'-DDT	Continuing Calibration % D>15	5.3 UL
MWSS112R1	4,4'-DDT	Continuing Calibration % D>15	6.3 UL

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCS152R2	Antimony	MS	22.1 UE
MWCS152S2	Antimony	MS	19.7 UE
MWCS112R1	Antimony	MS	26.4 UE
MWCS152R2	Mercury	Precision	0.81 E
MWCS152S2	Mercury	Precision	0.64 E
MWSS112R1	Mercury	Precision	0.60 E
MWCS152R2	Lead	Serial Dilution	112 E
MWCS152R2	Zinc	Serial Dilution	114 E
MWCS152S2	Lead	Serial Dilution	123 E
MWCS152S2	Zinc	Serial Dilution	99.6 E
MWSS112R1	Lead	Serial Dilution	84.9 E
MWSS112R1	Zinc	Serial Dilution	143 E

Attachment 3 Revised Laboratory Forms

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
00021
MWCS152R2

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910006

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910006-1

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1661

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 39 decanted: (Y/N) Y Date Extracted: 10/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/23/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	21	U	
106-46-7	1,4-Dichlorobenzene	21	U	
95-50-1	1,2-Dichlorobenzene	21	U	
120-82-1	1,2,4-Trichlorobenzene	21	U	G
91-20-3	Naphthalene	1000		
91-57-6	2-Methylnaphthalene	390		
131-11-3	Dimethylphthalate	66	U	
208-96-8	Acenaphthylene	940		
83-32-9	Acenaphthene	420		
132-64-9	Dibenzofuran	350		
84-66-2	Diethylphthalate	66	U	
86-73-7	Fluorene	600		
86-30-6	N-Nitrosodiphenylamine (1)	21	U	
85-01-8	Phenanthrene	1900	D3	
120-12-7	Anthracene	1200		
84-74-2	Di-n-butylphthalate	66	U	G
206-44-0	Fluoranthene	2500	D3	
129-00-0	Pyrene	3000	D3	
85-68-7	Butylbenzylphthalate	330	UD3	
56-55-3	Benzo(a)anthracene	990	D3	
218-01-9	Chrysene	1100	D3	
117-81-7	bis(2-Ethylhexyl)phthalate	420	D3	
117-84-0	Di-n-octylphthalate	330	UD3	G
205-99-2	Benzo(b)fluoranthene	950	D3	
207-08-9	Benzo(k)fluoranthene	1000	D3	
50-32-8	Benzo(a)pyrene	1300	D3	
193-39-5	Indeno(1,2,3-cd)pyrene	~~270~~	JD3	430 UE
53-70-3	Dibenzo(a,h)anthracene	~~93~~	JD3	
191-24-2	Benzo(g,h,i)perylene	~~250~~	JD3	

(1) - Cannot be separated from Diphenylamine

D3 - Result reported from a 5 fold dilution (P1642.D)

TD/QBD
1/10/00
12/14/99

00049

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS152S2

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910006

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910006-2

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1662

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 37 decanted: (Y/N) Y Date Extracted: 10/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/23/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
541-73-1	1,3-Dichlorobenzene	21	U	
106-46-7	1,4-Dichlorobenzene	21	U	
95-50-1	1,2-Dichlorobenzene	21	U	
120-82-1	1,2,4-Trichlorobenzene	21	U	G
91-20-3	Naphthalene	690		
91-57-6	2-Methylnaphthalene	270		
131-11-3	Dimethylphthalate	63	U	
208-96-8	Acenaphthylene	810		
83-32-9	Acenaphthene	270		
132-64-9	Dibenzofuran	230		
84-66-2	Diethylphthalate	63	U	
86-73-7	Fluorene	410		
86-30-6	N-Nitrosodiphenylamine (1)	21	U	
85-01-8	Phenanthrene	1200		
120-12-7	Anthracene	1100		
84-74-2	Di-n-butylphthalate	63	U	
206-44-0	Fluoranthene	2000	D3	G
129-00-0	Pyrene	2600	D3	G
85-68-7	Butylbenzylphthalate	320	UD3	
56-55-3	Benzo(a)anthracene	1100	D3	
218-01-9	Chrysene	1900	D3	
117-81-7	bis(2-Ethylhexyl)phthalate	320	UD3	G
117-84-0	Di-n-octylphthalate	320	UD3	G
205-99-2	Benzo(b)fluoranthene	1500	D3	
207-08-9	Benzo(k)fluoranthene	1700	D3	
50-32-8	Benzo(a)pyrene	2100	D3	
193-39-5	Indeno(1,2,3-cd)pyrene	~~410~~	JD3	430 UE
53-70-3	Dibenzo(a,h)anthracene	~~160~~	JD3	
191-24-2	Benzo(g,h,i)perylene	~~330~~	JD3	

(1) - Cannot be separated from Diphenylamine

D3 - Result reported from a 5 fold dilution (P1643.D)

4M/QBD 1/10/2 12/14/99

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO: 0678

MWSS112R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910006

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910006-10

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1682

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 47 decanted: (Y/N) Y Date Extracted: 10/27/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/25/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG		Q
541-73-1	1,3-Dichlorobenzene	24	U	
106-46-7	1,4-Dichlorobenzene	24	U	
95-50-1	1,2-Dichlorobenzene	24	U	
120-82-1	1,2,4-Trichlorobenzene	24	U	G
91-20-3	Naphthalene	170		
91-57-6	2-Methylnaphthalene	100	U	
131-11-3	Dimethylphthalate	75	U	
208-96-8	Acenaphthylene	220		
83-32-9	Acenaphthene	100		
132-64-9	Dibenzofuran	250	U	
84-66-2	Diethylphthalate	75	U	G
86-73-7	Fluorene	140		
86-30-6	N-Nitrosodiphenylamine (1)	24	U	
85-01-8	Phenanthrene	500		
120-12-7	Anthracene	330		
84-74-2	Di-n-butylphthalate	75	U	G
206-44-0	Fluoranthene	1900		G
129-00-0	Pyrene	860		L
85-68-7	Butylbenzylphthalate	75	U	
56-55-3	Benzo(a)anthracene	480		
218-01-9	Chrysene	680		
117-81-7	bis(2-Ethylhexyl)phthalate	180		
117-84-0	Di-n-octylphthalate	75	U	G
205-99-2	Benzo(b)fluoranthene	640		G
207-08-9	Benzo(k)fluoranthene	560		G
50-32-8	Benzo(a)pyrene	520		
193-39-5	Indeno(1,2,3-cd)pyrene	100	U	E
53-70-3	Dibenzo(a,h)anthracene	100	U	E
191-24-2	Benzo(g,h,i)perylene	100	U	E

(1) - Cannot be separated from Diphenylamine

4D/GBD 11/10/00

FORM 1
PEST ORGANICS ANALYSIS DATA SHEET

Client SAMPLE NO. 39

MWSS112R1

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910006

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910006-10

Sample wt/vol: 30.0 (g/mL) G Lab File ID: RA191S29

% Moisture: 47 decanted: (Y/N) Y Date Collected: 10/02/99

Extraction: (SepF/Cont/Sonc) Date Extracted: 10/06/99

Concentrated Extract Volume: 10(mL) Date Analyzed: 10/20/99

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
72-55-9	4,4'-DDE	6.3	U
72-54-8	4,4'-DDD	6.3	U
50-29-3	4,4'-DDT	6.3	U
118-74-1	Hexachlorobenzene	3.1	U
87-68-3	Hexachlorobutadiene	3.1	U

FORM I Pest

LL/QGD
1/17/00

FORM 1
PEST ORGANICS ANALYSIS DATA SHEET

Client SAMPLE NO.: MWCS152S2

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910006

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910006-2

Sample wt/vol: 30.0 (g/mL) G Lab File ID: RA191S28

% Moisture: 37 decanted: (Y/N) Y Date Collected: 10/02/99

Extraction: (SepF/Cont/Sonc) Date Extracted: 10/06/99

Concentrated Extract Volume: 10(mL) Date Analyzed: 10/20/99

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
72-55-9	4,4'-DDE	5.3	U
72-54-8	4,4'-DDD	5.3	U
50-29-3	4,4'-DDT	5.3	U
118-74-1	Hexachlorobenzene	2.6	U
87-68-3	Hexachlorobutadiene	2.6	U

RC/QSD
1/17/00

FORM 1
PEST ORGANICS ANALYSIS DATA SHEET

Client SAMPLE NO.

MWCS152R2

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910006

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910006-1

Sample wt/vol: 30.0 (g/mL) G Lab File ID: RA191S25

% Moisture: 39 decanted: (Y/N) Y Date Collected: 10/02/99

Extraction: (SepF/Cont/Sonc) Date Extracted: 10/06/99

Concentrated Extract Volume: 10(mL) Date Analyzed: 10/20/99

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
72-55-9	4,4'-DDE	5.5	U
72-54-8	4,4'-DDD	5.5	U
50-29-3	4,4'-DDT	5.5	U
118-74-1	Hexachlorobenzene	2.7	U
87-68-3	Hexachlorobutadiene	2.7	U

QA/QC
1/17/02

INORGANICS SW-846

00001

1
INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS152R2

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910006

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910006-1

% Solids: 57.4

Date Received: 10/04/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	~~4.6~~	~~U~~		P	22.1 UE
7440-38-2	Arsenic	12.8			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.46	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	5580			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	112		E SPMTKG	P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.81		*	CV	E
7440-02-0	Nickel	13.4			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.91	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	114		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

TD/GBP
1/18/00

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS152S2

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910006

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910006-2

% Solids: 64.0

Date Received: 10/04/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	~~4.1~~	U		P	19.7 UE
7440-38-2	Arsenic	19.2			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.57			P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	1550			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	123		E spikings	P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.64		*	CV	E
7440-02-0	Nickel	11.3			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	1.0			P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	99.6		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

TO/GBD
1/8/00

INORGANICS SW-846

00003

CLIENT ID

1

INORGANIC ANALYSIS DATA SHEET

MWSS112R1

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910006

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910006-10

% Solids: 47.9

Date Received: 10/04/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	~~5.5~~	U		P	26.4 UE
7440-38-2	Arsenic	20.9		~~W~~	F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.55	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	275			P	
7439-89-6	Iron				NR	
7439-92-1	Lead	84.9		E 8 10/29/99	P	E
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.60		*	CV	E
7440-02-0	Nickel	12.2			P	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	1.1	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	143		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

TD/QBD
1/8/00

Quality By Design

Laboratory Quality Assurance Consulting

29 Shipman Street
Suite 101
Hilo, Hawaii 96720

Phone: (808) 969-9424
Fax: (808) 969-9094
e-mail: qbdhilo@gte.net

EPA Level 2
DATA VALIDATION REPORT

Project Name: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 30, 1999
SDG: 910059

Prepared for

Foster Wheeler Environmental
10900 NE 8th St.
Bellevue, WA 98004

Purchase Order No. 022828
QBD Job No. 270M

Reviewed and approved,

Lorraine Davis 11/19/00

Lorraine L. Davis, Owner Date

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Attachments

Attachment 1 Data Flag Definitions
Attachment 2 Summary Table of Data Qualifier Flags
Attachment 3 Revised Laboratory Forms

A. Introduction

Laboratory Sciences, Inc., d.b.a. *Quality by Design* (QBD), has completed an EPA Level 2 Data Validation on the submitted data packages in accordance with P.O. Number 022828.

The reporting format and criteria for recommending data qualifying flags for this data set are described in the EPA *"Functional Guidelines for Evaluating Organics Analyses"* and *"Functional Guidelines for Evaluating Inorganics Analyses,"* as revised, 1994; and *"Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound"* ("PSEP Protocols"), May, 1997, or using criteria listed in the method referenced. Data may be qualified for any of the following reasons:

1. By the laboratory prior to receipt by the reviewer
2. Because of laboratory deviation from the designated method
3. Because the data may not meet the criteria listed in the reference above
4. By the professional judgment of the reviewer.

The data set consists of several data packages from Multichem Analytical Services in Renton, Washington, and contains data for the samples shown in Table 1. The data reviewers and senior reviewers are shown in Table 2.

Each data set includes an analytical data package for each sample, copies of the completed chain-of-custody (COC) forms, and a quality control (QC) data package. The analytical data package includes analytical results, blank sample results, both laboratory and client sample identifications, appropriate dates but not times, method reporting limits, method references, surrogate recoveries as appropriate, the laboratory's name and address, and the initials of the person releasing the data. The custody forms include the receipt of the sample but not the laboratory's internal tracking. The QC data package includes a tabular list of the laboratory's sample identification, spiking concentrations, recoveries, percentage calculations, and acceptance windows.

Raw data were provided which includes chromatograms, instrument print outs, injection logs, digestion/preparation logs.

This data validation report consists of several sections, each of which are formatted to follow Functional Guidelines, but which also include subsections discussing QBD contacts with the laboratory, other comments, and a summary table of data qualifiers.

Table 1. Sample Identification and Analysis

Sample Identification	Laboratory Identification	Methods 8081/8082	Method 8270	Method 6010/7000	Method 9060	Grain Size	Conventionals
MWCS137R3	91009-1		X	X			
MWCS137R4	91009-2		X	X			
MWCS151R4	91009-3		X	X			
MWCS116R3	91009-4		X	X			
MWCS127R4	91009-5	X	X	X			
MWCS127R3	91009-6	X	X	X			
MWCS155R3	91009-7			X			
MWCS116R4	91009-8		X	X			
MWCS126R3	91009-9		X	X			
MWCS126R4	91009-10		X	X			

Key:
Method 8270 = Semivolatile organic compounds by gas chromatography/mass spectroscopy
Method 8081/8082 = Pesticides and polychlorinated biphenyls (PCB) by gas chromatography
Method 6010 & 7000 = Metals by inductively coupled plasma (ICP) and cold vapor atomic absorption (CVAA)
Method 9060 = Total organic carbon (TOC)
Conventionals = Sulfide, ammonia, and percent moisture

Table 2. Data Package, Reviewer, and Senior Reviewer

Analysis	Number of Pages	Reviewer	Senior Reviewer
Pest/PCB	148	Melinda Jacobson	Thomas S. Davis
SVOC	436	Melinda Jacobson	Thomas S. Davis
Metals	172	Lorraine L. Davis	Thomas S. Davis

B. Chain-of-Custody

The analytical data package was reviewed and compared against the chain-of-custody (COC) form. No data are missing from the COC forms and no transcription errors in accuracy were found. All tests requested on the COC were performed.

Discussion: These samples were collected and archived on September 30, 1999 as SDG 910001. A change order was made on October 25, 1999 authorizing the analyses. The samples were then re-accessioned as SDG 910059.

C. Review of GC/MS Semivolatiles Analyses

EPA Method 8270

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The analyses were added to the work order after the samples had been logged into the laboratory system, and the extraction for this analyses occurred after the 14-day holding time. As stated in the case narrative, the samples were frozen upon receipt, then thawed, and extracted. PSDDA recognizes a holding time of one year for sediments which have been frozen. When the samples are thawed, Method 8270 recognizes a 14-day holding time to extraction. Since the request for analysis occurred during the analytical process for the SDG and since the samples were frozen until extraction, no data qualifier flags are recommended.

2. GC/MS Tuning

All decafluorotriphenylphosphine (DFTPP) tune criteria were met for the initial and continuing calibration for all dates of sample analysis.

3. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No target compound list (TCL) analytes had percent relative standard deviations (%RSD) greater than allowed by the method for the initial calibration or percent difference for the continuing calibration checks. All system performance check compound (SPCC) and calibration check compound (CCC) criteria were met, except as noted below.

Table 3. SVOC Data Qualifiers Due to Calibration Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS151R4	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	130 UE
MWCS151R4	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	130 UE

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS151R4	Benzo(g,h,i)perylene	Continuing Calibration % D >20	130 UE
MWCS126R4	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	140 UE
MWCS126R4	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	140 UE
MWCS126R4	Benzo(g,h,i)perylene	Continuing Calibration % D >20	140 UE
MWCS127R4	Fluoranthene	Continuing Calibration % D >20	710 G
MWCS127R4	Pyrene	Continuing Calibration % D >20	560 G
MWCS127R4	Benzo(b)fluoranthene	Continuing Calibration % D >20	310 G
MWCS127R4	Benzo(k)fluoranthene	Continuing Calibration % D >20	280 G
MWCS127R4	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	140 UE
MWCS127R4	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	140 UE
MWCS127R4	Benzo(g,h,i)perylene	Continuing Calibration % D >20	140 UE
MWCS137R3	Fluoranthene	Continuing Calibration % D >20	8800 G
MWCS137R3	Pyrene	Continuing Calibration % D >20	4600 G
MWCS137R3	Benzo(b)fluoranthene	Continuing Calibration % D >20	2800 G
MWCS137R3	Benzo(k)fluoranthene	Continuing Calibration % D >20	2600 G
MWCS127R3	Fluoranthene	Continuing Calibration % D >20	6600 G
MWCS127R3	Pyrene	Continuing Calibration % D >20	5600 G
MWCS127R3	Benzo(b)fluoranthene	Continuing Calibration % D >20	4100 G
MWCS127R3	Benzo(k)fluoranthene	Continuing Calibration % D >20	3300 G
MWCS137R4	Fluoranthene	Continuing Calibration % D >20	58000 G
MWCS137R4	Benzo(b)fluoranthene	Continuing Calibration % D >20	16000 G
MWCS137R4	Benzo(k)fluoranthene	Continuing Calibration % D >20	18000 G
MWCS151R4	Pyrene	Continuing Calibration % D >20	140 UL

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS126R4	Pyrene	Continuing Calibration % D >20	130 UE

Discussion: The continuing calibration for seven of the target compounds were out of the criteria of <20 percent. The associated results in Samples MWCS151R4, MWCS126R4, MWCS127R4, MWCS137R3, MWCS127R3, MWCS137R4, MWCS151R4, and MWCS126R4 have been flagged appropriately. If the results indicated a high bias, the results were flagged with "L" or "UL" to indicate that the value is less than the maximum shown and if the results indicated a low bias, the results were flagged with "G" and "UG" to indicate the reporting limit is greater than the minimum shown. When other QC checks indicated both a high and low bias, the results were flagged with "E" to indicate an estimated value or "UE" to indicate an estimated reporting limit.

4. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

5. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria, except as noted below.

Table 4. SVOC Data Qualifiers Due to Surrogate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS127R3	Naphthalene	Surrogate	2000 G
MWCS127R3	2-Methylnaphthalene	Surrogate	780 G
MWCS127R3	Acenaphthylene	Surrogate	1200 G
MWCS127R3	Acenaphthene	Surrogate	940 G
MWCS127R3	Fluorene	Surrogate	1200 G
MWCS127R3	Phenanthrene	Surrogate	3400 G
MWCS127R3	Anthracene	Surrogate	2100 G
MWCS127R3	Fluoranthene	Surrogate	6600 G
MWCS127R3	Pyrene	Surrogate	5600 G
MWCS127R3	Benzo(a)anthracene	Surrogate	2400 G
MWCS127R3	Chrysene	Surrogate	3000 G
MWCS127R3	Benzo(b)fluoranthene	Surrogate	4100 G
MWCS127R3	Benzo(k)fluoranthene	Surrogate	3300 G
MWCS127R3	Benzo(a)pyrene	Surrogate	3200 G

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS127R3	Indeno(1,2,3-cd)pyrene	Surrogate	550 E
MWCS127R3	Dibenzo(a,h)anthracene	Surrogate	200 E
MWCS127R3	Benzo(g,h,i)perylene	Surrogate	470 E
MWCS126R3	Naphthalene	Surrogate	750 G
MWCS126R3	2-Methylnaphthalene	Surrogate	240 G
MWCS126R3	Acenaphthylene	Surrogate	330 G
MWCS126R3	Acenaphthene	Surrogate	270 G
MWCS126R3	Fluorene	Surrogate	330 G
MWCS126R3	Phenanthrene	Surrogate	1100 G
MWCS126R3	Anthracene	Surrogate	750 G
MWCS126R3	Fluoranthene	Surrogate	2000 G
MWCS126R3	Pyrene	Surrogate	1800 G
MWCS126R3	Benzo(a)anthracene	Surrogate	680 G
MWCS126R3	Chrysene	Surrogate	720 G
MWCS126R3	Benzo(b)fluoranthene	Surrogate	970 G
MWCS126R3	Benzo(k)fluoranthene	Surrogate	760 G
MWCS126R3	Benzo(a)pyrene	Surrogate	850 G
MWCS151R4	Phenol	Surrogate	24 E

Discussion: In Sample MWCS137R4, a single surrogate was out of QAPP criteria. No data qualifier flags are recommended because all other surrogates were in criteria.

The surrogate recoveries for nitrobenzene-d_5, 2-fluorobiphenyl, and terphenyl-d_{14} were out of QAPP criteria for Samples MWCS137R4DL5 and MWCS126R3DL due to large dilutions. Since the samples had been diluted, no data qualifier flags are recommended.

In Samples MWCS126R3 and MWCS127R3, two of the three surrogates were out of criteria. The associated results have been flagged with "G" and "UG" to indicate that the value is greater than the minimum shown. In the case of indeno(1,2,3-pyrene), dibenzo(a,h)anthracene, and benzo(g,h,i)perylene, the values are flagged "E" to indicate that the values are estimated. "G" and "L" flags could not be applied because the continuing calibration suggested lesser values but the matrix spike and surrogate results suggested greater values.

The surrogate recoveries for phenol-d_6 and 2-fluorophenol were out of acceptance criteria in the MS/MSD and BS/BSD. No data qualifier flags are recommended because the surrogates were acceptable in the samples.

The surrogate recovery for phenol-d_6 was out of acceptance criteria for the blank associated with the data. No data qualifier flags are recommended because the surrogates were acceptable in the samples.

In Sample MWCS116R3, a single surrogate was out of criteria. No data qualifier flags are recommended because all other surrogates were in criteria.

In Sample MWCS151R4, the surrogates phenol-d_6 and 2-fluorophenol were out of criteria. The associated results have been flagged with "E" to indicate an estimated value.

6. Laboratory Control Standards

The laboratory analyzed a second source sample with the analytical batch. The laboratory referred to this sample as a blank spike/blank spike duplicate (BS/BSD) rather than a laboratory control standard (LCS). Any anomalies or comments regarding the second source results are addressed in the next section.

7. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

Matrix spike (MS) and matrix spike duplicates (MSD) were analyzed as required by the referenced method and all percent recoveries and relative percent differences (RPD) were within QAPP criteria, except as noted below.

Table 5. SVOC Data Qualifiers Due to MS/MSD Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS137R3	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	400 E
MWCS137R3	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	160 UE
MWCS137R3	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	340 E
MWCS137R4	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	4200 E
MWCS137R4	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	1800 E
MWCS137R4	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	3400 E
MWCS151R4	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	130 UE
MWCS151R4	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	130 UE
MWCS151R4	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	130 UE
MWCS127R4	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	140 UE
MWCS127R4	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	140 UE
MWCS127R4	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	140 UE
MWCS127R3	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	550 E
MWCS127R3	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	200 E
MWCS127R3	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	470 E
MWCS126R3	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	150 UE
MWCS126R3	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	150 UE
MWCS126R3	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	150 UE
MWCS126R4	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	140 UE

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS126R4	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	140 UE
MWCS126R4	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	140 UE
MWCS151R4	Phenol	BS/BSD	24 E
MWCS151R4	2-Methylphenol	BS/BSD	17 UE
MWCS151R4	4-Methylphenol	BS/BSD	17 UE
MWCS151R4	2,4-Dimethylphenol	BS/BSD, MS/MSD	8.4 UE
MWCS116R3	Phenol	BS/BSD	96 E
MWCS116R3	2-Methylphenol	BS/BSD	79 E
MWCS116R3	4-Methylphenol	BS/BSD	18 UE
MWCS116R3	2,4-Dimethylphenol	BS/BSD, MS/MSD	310 E
MWCS116R4	Phenol	BS/BSD	26 E
MWCS116R4	2-Methylphenol	BS/BSD	17 UE
MWCS116R4	4-Methylphenol	BS/BSD	17 UE
MWCS116R4	2,4-Dimethylphenol	BS/BSD, MS/MSD	91 E

Discussion: A single MSD for pyrene and benzo(b)fluoranthene was out of criteria but all other accuracy measurements (e.g., the other MS, BS/BSD surrogates and calibration verifications) were acceptable and no data qualifying flags are recommended.

Indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene were out of QAPP criteria for accuracy in both the MS/MSD and BS/BSD pairs. In this case, the associated results in Samples MWCS137R3, MWCS137R4, MWCS151R4, MWCS127R4, MWCS127R3, MWCS126R3, and MWCS126R4 have been flagged "E" and "UE" to indicate that the values are estimated. "G" and "L" values could not be applied because the continuing calibration suggested lesser values but the matrix spike results suggested greater values.

Phenol, 2-methylphenol and 4-methylphenol were out of criteria in the BS/BSD pair. The associated results for Samples MWCS151R4, MWCS116R3, and MWCS116R4 have been flagged with "E" and "UE"

The percent recovery for 2,4-dimethylphenol was out of criteria at zero percent in the BS/BSD. The laboratory had previously noted this problem and found the root cause to be the medium used for the blank spike (Ottawa sand). Given that this has been identified as a historical issue, the reviewer concurs with the laboratory's action to use the MS/MSD results as their QC check for precision and accuracy. However, the MS/MSD results were also out of criteria and the associated results in Samples MWCS151R4, MWCS116R3, and MWCS116R4 have been flagged "E" and "UE" to indicate an estimated value.

A single BSD and MS for benzoic acid was out of criteria but all other accuracy measurements (e.g., the other matrix spike, the other BS, the other MSD,

surrogates and calibration verifications) were acceptable and no data qualifying flags are recommended.

2,4-Dimethylphenol was out of criteria for accuracy for the MS/MSD pair. The associated results for Samples MWCS151R4, MWCS116R3, and MWCS116R4 have been flagged "E" and "UE" to indicate and estimated value.

The RPD in the MS/MSD pair for benzoic acid and pentachlorophenol were out of criteria. Since the RPD of these compounds were acceptable in the BS/BSD, no data qualifier flags are recommended.

8. Internal Standards Performance for Samples

All internal standard areas were within the required control limits, except as noted below.

Discussion: The laboratory had several samples for which the internal standards were out of criteria on the first analysis. The laboratory should be commended for diluting and reanalyzing these samples so as to obtain acceptable results.

9. Field Duplicates

No field duplicates were identified with this group of samples.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards. Quantitation was reviewed against contract requirements to determine that results were reported on a dry weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. Quantitation from the primary and confirmatory columns was reviewed, and the proper result was reported. Except as noted below, no errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract, except as noted below.

Discussion: The laboratory noted a series of operation errors in the clean-up of samples by gel permeation chromatography that resulted in the raising of the reporting limits. The reviewer concurs that the reporting limits were raised appropriately, and does not recommend additional data qualifier flags because the increased limits are about one-third less than the "Low Soil/Solid" EQLs listed in Table 2 of the QAPP.

11. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing, except as noted below.

Table 6. SVOC Data Qualifiers Due to System Performance Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS151R4	Benzyl alcohol	More technically sound values available	33 UR
MWCS151R4	4-Methylphenol	More technically sound values available	17 UR
MWCS116R3	Benzyl alcohol	More technically sound values available	37 UR
MWCS116R3	4-Methylphenol	More technically sound values available	79 UR
MWCS116R4	Benzyl alcohol	More technically sound values available	33 UR
MWCS116R4	4-Methylphenol	More technically sound values available	17 UR

Discussion: As reported by the laboratory, after the analysis of the continuing calibration, a significant retention time shift affected the analysis of benzyl alcohol and 4-methylphenol. The laboratory reanalyzed the samples and QC checks. The laboratory reported results for both analyses. These results were condensed into one result per analyte per sample. Therefore, the original sample results should not be used because more technically reliable data is available. Samples MWCS151R4, MWCS116R3, and MWCS116R4 have been flagged "R" to indicate the data is unusable.

12. TCL Compound Identification

All target compound identifications met the criteria for retention times, peak identification, and mass spectral fit of the referenced method.

13. Tentatively Identified Compounds

No TICs were reported with this data set.

14. Laboratory Contact

There was no verbal or written communication with the laboratory.

15. Other Comments

None.

16. Data Use and Overall Assessment

The analytes qualified with an "R" are unusable. All other data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

D. Review of Pesticides/PCBs Analyses

EPA Method 8081/8082

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The analyses were added to the work order after the samples had been logged into the laboratory system, and the extraction for this analyses occurred after the 14-day holding time. As stated in the case narrative, the samples were frozen upon receipt, then thawed, and extracted. PSDDA recognizes a holding time of one year for sediments which have been frozen. When the samples are thawed, Method 8082 recognizes a 14-day holding time to extraction. Since the request for analysis occurred during the analytical process for the SDG and since the samples were frozen until extraction, no data qualifier flags are recommended.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No TCL analytes had %RSD greater than that allowed for the initial calibration or percent difference for the continuing calibration checks.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria.

6. Field Duplicates

No field duplicates were identified with this group of samples.

7. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

8. TCL Compound Identification

No target compounds were detected.

9. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards or external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

10. Laboratory Contact

There was no verbal or written communication with the laboratory.

11. Other Comments

None.

12. Data Use and Overall Assessment

The data are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results.

E. Review of Metals Analyses

EPA Method 6010/7000

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The analyses were added to the work order after the samples had been logged into the laboratory system, and the analyses occurred after the 28-day holding time. As stated in the case narrative, the samples were frozen upon receipt, then thawed, and extracted. PSDDA recognizes a holding time of one year for sediments which have been frozen. When the samples are thawed, Method 7471 recognizes a 28-day holding time to analysis. Since the request for analysis occurred during the analytical process for the SDG and since the samples were frozen until analysis, no data qualifier flags are recommended.

2. Initial and Continuing Calibration

All initial and continuing calibration Quality Control criteria were met. No TCL analytes had correlation coefficients greater than allowed by the method, and all percent differences for the continuing calibration verifications were acceptable.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit, except as noted below.

Discussion: Mercury was detected at 0.3 mg/kg in the method blank associated with Samples MWCS127R3. However, the sample result was greater than five times the blank contamination and no data qualifier flags are recommended.

4. ICP Interference Check Standard

An interference check sample (ICS) was analyzed at a frequency required by the referenced method and was within established criteria.

5. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within QAPP criteria, except as noted below.

Table 7. Metal Data Qualifiers Due to LCS Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS113R3B	Antimony	LCS	28.5 G
MWCS116R3	Antimony	LCS	27.8 G
MWCS116R4	Antimony	LCS	3.2 UG
MWCS126R3	Antimony	LCS	4.6 G
MWCS126R4	Antimony	LCS	3.5 UG
MWCS127R3	Antimony	LCS	5.3 G
MWCS127R4	Antimony	LCS	3.6 UG
MWCS137R3	Antimony	LCS	11.6 G
MWCS137R4	Antimony	LCS	12.8 G

Discussion: Antimony was out the criteria of 80 to 120 percent recovery at 77.6 percent in the LCS. All associated samples have been flagged "G" or "UG" to indicate that the value is greater than the minimum shown.

Cadmium, copper, nickel, and zinc were out of the method criteria of 90 to 110 percent recovery for the LCS. However, PSDDA allows 80 to 120 percent recovery of a second source check sample. All four analytes were within PSDDA acceptance criteria. Therefore, no data qualifier flags are recommended.

6. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MSs were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria, except as noted below.

Table 8. Metal Data Qualifiers Due to MS/MSD Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS113R3B	Antimony	MS/MSD	28.5 G
MWCS116R3	Antimony	MS/MSD	27.8 G
MWCS116R4	Antimony	MS/MSD	3.2 UG
MWCS126R3	Antimony	MS/MSD	4.6 G
MWCS126R4	Antimony	MS/MSD	3.5 UG
MWCS127R3	Antimony	MS/MSD	5.3 G
MWCS127R4	Antimony	MS/MSD	3.6 UG
MWCS137R3	Antimony	MS/MSD	11.6 G

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS137R4	Antimony	MS/MSD	12.8 G

Discussion: Antimony was out of the acceptance criteria of 75 to 125 percent at 52.0 percent in the MS. Because the LCS was also low and out of criteria, all the associated samples have been flagged "G" and "UG" to indicate that the value is greater than the minimum shown.

The post digestion spike for nickel was out of criteria, but since the MS was acceptable, no data qualifier flags are recommended.

MS recoveries for arsenic and mercury were out of criteria due to high concentrations of analytes in the original sample. Since all other QC checks were in criteria, no data qualifier flags are recommended.

7. Field Duplicates

No field duplicates were identified with this group of samples.

8. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPD were within QAPP criteria, except as noted below.

Table 9. Metal Data Qualifiers Due to Duplicate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS113R3B	Antimony	Precision	28.5 G
MWCS116R3	Antimony	Precision	27.8 G
MWCS126R3	Antimony	Precision	4.6 G
MWCS127R3	Antimony	Precision	5.3 G
MWCS137R3	Antimony	Precision	11.6 G
MWCS137R4	Antimony	Precision	12.8 G

Discussion: Antimony was out of the criteria of less than 20 percent at 36.6 percent in the sample duplicate set. The associated positive results for Samples MWCS113R3B, MWCS116R3, MWCS126R3, MWCS127R3, MWCS137R4, and MWCS137R4 have been flagged "G" to indicate the value is greater than the amount shown.

9. ICP Serial Dilution

Samples that were a factor of 50 above the instrument detection limit (IDL) for the analyte were diluted five-fold and were within criteria required by the referenced method, except as noted below.

Table 10. Metal Data Qualifiers Due to ICP Serial Dilution Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS113R3B	Antimony	Serial Dilution	28.5 G
MWCS113R3B	Cadmium	Serial Dilution	2.5 E
MWCS113R3B	Nickel	Serial Dilution	17.4 E
MWCS113R3B	Zinc	Serial Dilution	954 E
MWCS116R3	Antimony	Serial Dilution	27.8 G
MWCS116R3	Cadmium	Serial Dilution	0.82 E
MWCS116R3	Nickel	Serial Dilution	14.9 E
MWCS116R3	Zinc	Serial Dilution	580 E
MWCS116R4	Cadmium	Serial Dilution	0.32 E
MWCS116R4	Nickel	Serial Dilution	6.6 E
MWCS116R4	Zinc	Serial Dilution	21.1 E
MWCS126R3	Antimony	Serial Dilution	4.6 G
MWCS126R3	Cadmium	Serial Dilution	0.41 E
MWCS126R3	Nickel	Serial Dilution	9.5 E
MWCS126R3	Zinc	Serial Dilution	102 E
MWCS126R4	Cadmium	Serial Dilution	0.35 E
MWCS126R4	Nickel	Serial Dilution	7.5 E
MWCS126R4	Zinc	Serial Dilution	28.4 E
MWCS127R3	Antimony	Serial Dilution	5.3 G
MWCS127R3	Cadmium	Serial Dilution	0.95 E
MWCS127R3	Nickel	Serial Dilution	12.9 E
MWCS127R3	Zinc	Serial Dilution	198 E
MWCS127R4	Cadmium	Serial Dilution	0.36 E
MWCS127R4	Nickel	Serial Dilution	8.8 E
MWCS127R4	Zinc	Serial Dilution	40.6 E
MWCS137R3	Antimony	Serial Dilution	11.6 G
MWCS137R3	Cadmium	Serial Dilution	1.1 E
MWCS137R3	Nickel	Serial Dilution	13.6 E
MWCS137R3	Zinc	Serial Dilution	311 E
MWCS137R4	Antimony	Serial Dilution	12.8 G
MWCS137R4	Cadmium	Serial Dilution	0.44 E
MWCS137R4	Nickel	Serial Dilution	11.3 E
MWCS137R4	Zinc	Serial Dilution	135 E

Discussion: A serial dilution of antimony, cadmium, nickel, and zinc had percent differences greater than the acceptance criteria of ±10 percent. The associated positive results for all samples have been flagged appropriately. If the results indicated a high bias, the results were flagged with "L" or "UL" to indicate that the value is less than the

maximum shown and if the results indicated a low bias, the results were flagged with "G" and "UG" to indicate the reporting limit is greater than the minimum shown. When other QC checks indicated both a high and low bias, the results were flagged with "E" to indicate an estimated value or "UE" to indicate an estimated reporting limit.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract, except as noted below.

Discussion: The reporting limit for lead failed to meet the requirement of 0.5 mg/kg that was listed in the QAPP. However, most field samples had positive results. For samples that were non-detect, the laboratory's reporting limit of 1.5 mg/kg was less than the Sediment Quality Standard Criteria of 450 mg/kg and the Sediment Impact Zone and Clean-up Criteria of 530 mg/kg, and no data qualifier flags are recommended.

11. Graphite Furnace Atomic Absorption Analysis

All special criteria for graphite furnace atomic absorption (GFAA) analysis were performed at a frequency required by the referenced method and was within established criteria.

12. Laboratory Contact

There was no verbal or written communication with the laboratory.

13. Other Comments

None.

14. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

Attachment 1 Puget Sound Estuary Program Data Qualifier Definitions

Used for both organics and inorganic analyses

B = Analyte detected in samples and in method blank

C = Combined with unresolved substances

E = Estimated

G = Value greater than minimum shown

K = Detected at less than the maximum shown

L = Value less than the maximum shown

M = Value is a mean

Q = Questionable value

R = Rejected or unusable value

T = Detected below the quantification limit shown

U = Undetected at the detection limit shown

Z = Blank corrected

Attachment 2 Summary Table of Data Qualifier Flags

Foster Wheeler Environmental
Project: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 30, 1999

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCS151R4	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	130 UE
MWCS151R4	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	130 UE
MWCS151R4	Benzo(g,h,i)perylene	Continuing Calibration % D >20	130 UE
MWCS126R4	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	140 UE
MWCS126R4	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	140 UE
MWCS126R4	Benzo(g,h,i)perylene	Continuing Calibration % D >20	140 UE
MWCS127R4	Fluoranthene	Continuing Calibration % D >20	710 G
MWCS127R4	Pyrene	Continuing Calibration % D >20	560 G
MWCS127R4	Benzo(b)fluoranthene	Continuing Calibration % D >20	310 G
MWCS127R4	Benzo(k)fluoranthene	Continuing Calibration % D >20	280 G
MWCS127R4	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	140 UE
MWCS127R4	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	140 UE
MWCS127R4	Benzo(g,h,i)perylene	Continuing Calibration % D >20	140 UE
MWCS137R3	Fluoranthene	Continuing Calibration % D >20	8800 G
MWCS137R3	Pyrene	Continuing Calibration % D >20	4600 G
MWCS137R3	Benzo(b)fluoranthene	Continuing Calibration % D >20	2800 G
MWCS137R3	Benzo(k)fluoranthene	Continuing Calibration % D >20	2600 G
MWCS127R3	Fluoranthene	Continuing Calibration % D >20	6600 G
MWCS127R3	Pyrene	Continuing Calibration % D >20	5600 G
MWCS127R3	Benzo(b)fluoranthene	Continuing Calibration % D >20	4100 G
MWCS127R3	Benzo(k)fluoranthene	Continuing Calibration % D >20	3300 G
MWCS137R4	Fluoranthene	Continuing Calibration % D >20	58000 G
MWCS137R4	Benzo(b)fluoranthene	Continuing Calibration % D >20	16000 G
MWCS137R4	Benzo(k)fluoranthene	Continuing Calibration % D >20	18000 G
MWCS151R4	Pyrene	Continuing Calibration % D >20	130 UE
MWCS126R4	Pyrene	Continuing Calibration % D >20	140 UL
MWCS127R3	Naphthalene	Surrogate	2000 G
MWCS127R3	2-Methylnaphthalene	Surrogate	780 G
MWCS127R3	Acenaphthylene	Surrogate	1200 G

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCS127R3	Acenaphthene	Surrogate	940 G
MWCS127R3	Fluorene	Surrogate	1200 G
MWCS127R3	Phenanthrene	Surrogate	3400 G
MWCS127R3	Anthracene	Surrogate	2100 G
MWCS127R3	Fluoranthene	Surrogate	6600 G
MWCS127R3	Pyrene	Surrogate	5600 G
MWCS127R3	Benzo(a)anthracene	Surrogate	2400 G
MWCS127R3	Chrysene	Surrogate	3000 G
MWCS127R3	Benzo(b)fluoranthene	Surrogate	4100 G
MWCS127R3	Benzo(k)fluoranthene	Surrogate	3300 G
MWCS127R3	Benzo(a)pyrene	Surrogate	3200 G
MWCS127R3	Indeno(1,2,3-cd)pyrene	Surrogate	550 E
MWCS127R3	Dibenzo(a,h)anthracene	Surrogate	200 E
MWCS127R3	Benzo(g,h,i)perylene	Surrogate	470 E
MWCS126R3	Naphthalene	Surrogate	750 G
MWCS126R3	2-Methylnaphthalene	Surrogate	240 G
MWCS126R3	Acenaphthylene	Surrogate	330 G
MWCS126R3	Acenaphthene	Surrogate	270 G
MWCS126R3	Fluorene	Surrogate	330 G
MWCS126R3	Phenanthrene	Surrogate	1100 G
MWCS126R3	Anthracene	Surrogate	750 G
MWCS126R3	Fluoranthene	Surrogate	2000 G
MWCS126R3	Pyrene	Surrogate	1800 G
MWCS126R3	Benzo(a)anthracene	Surrogate	680 G
MWCS126R3	Chrysene	Surrogate	720 G
MWCS126R3	Benzo(b)fluoranthene	Surrogate	970 G
MWCS126R3	Benzo(k)fluoranthene	Surrogate	760 G
MWCS126R3	Benzo(a)pyrene	Surrogate	850 G
MWCS151R4	Phenol	Surrogate	24 E
MWCS137R3	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	400 E
MWCS137R3	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	160 UE
MWCS137R3	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	340 E
MWCS137R4	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	4200 E
MWCS137R4	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	1800 E
MWCS137R4	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	3400 E
MWCS151R4	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	130 UE
MWCS151R4	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	130 UE
MWCS151R4	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	130 UE
MWCS127R4	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	140 UE

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCS127R4	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	140 UE
MWCS127R4	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	140 UE
MWCS127R3	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	550 E
MWCS127R3	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	200 E
MWCS127R3	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	470 E
MWCS126R3	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	150 UE
MWCS126R3	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	150 UE
MWCS126R3	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	150 UE
MWCS126R4	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	140 UE
MWCS126R4	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	140 UE
MWCS126R4	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	140 UE
MWCS151R4	Phenol	BS/BSD	24 E
MWCS151R4	2-Methylphenol	BS/BSD	17 UE
MWCS151R4	4-Methylphenol	BS/BSD	17 UE
MWCS151R4	2,4-Dimethylphenol	BS/BSD, MS/MSD	8.4 UE
MWCS116R3	Phenol	BS/BSD	96 E
MWCS116R3	2-Methylphenol	BS/BSD	18 UE
MWCS116R3	4-Methylphenol	BS/BSD	79 E
MWCS116R3	2,4-Dimethylphenol	BS/BSD, MS/MSD	310 E
MWCS116R4	Phenol	BS/BSD	26 E
MWCS116R4	2-Methylphenol	BS/BSD	17 UE
MWCS116R4	4-Methylphenol	BS/BSD	17 UE
MWCS116R4	2,4-Dimethylphenol	BS/BSD, MS/MSD	91 E
MWCS151R4	Benzyl alcohol	More technically sound values available	33 UR
MWCS151R4	4-Methylphenol	More technically sound values available	17 UR
MWCS116R3	Benzyl alcohol	More technically sound values available	37 UR
MWCS116R3	4-Methylphenol	More technically sound values available	79 UR
MWCS116R4	Benzyl alcohol	More technically sound values available	33 UR
MWCS116R4	4-Methylphenol	More technically sound values available	17 UR
MWCS113R3B	Antimony	LCS	28.5 G
MWCS116R3	Antimony	LCS	27.8 G
MWCS116R4	Antimony	LCS	3.2 UG
MWCS126R3	Antimony	LCS	4.6 G
MWCS126R4	Antimony	LCS	3.5 UG
MWCS127R3	Antimony	LCS	5.3 G

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCS127R4	Antimony	LCS	3.6 UG
MWCS137R3	Antimony	LCS	11.6 G
MWCS137R4	Antimony	LCS	12.8 G
MWCS113R3B	Antimony	MS/MSD	28.5 G
MWCS116R3	Antimony	MS/MSD	27.8 G
MWCS116R4	Antimony	MS/MSD	3.2 UG
MWCS126R3	Antimony	MS/MSD	4.6 G
MWCS126R4	Antimony	MS/MSD	3.5 UG
MWCS127R3	Antimony	MS/MSD	5.3 G
MWCS127R4	Antimony	MS/MSD	3.6 UG
MWCS137R3	Antimony	MS/MSD	11.6 G
MWCS137R4	Antimony	MS/MSD	12.8 G
MWCS113R3B	Antimony	Precision	28.5 G
MWCS116R3	Antimony	Precision	27.8 G
MWCS126R3	Antimony	Precision	4.6 G
MWCS127R3	Antimony	Precision	5.3 G
MWCS137R3	Antimony	Precision	11.6 G
MWCS137R4	Antimony	Precision	12.8 G
MWCS113R3B	Antimony	Serial Dilution	28.5 G
MWCS113R3B	Cadmium	Serial Dilution	2.5 E
MWCS113R3B	Nickel	Serial Dilution	17.4 E
MWCS113R3B	Zinc	Serial Dilution	954 E
MWCS116R3	Antimony	Serial Dilution	27.8 G
MWCS116R3	Cadmium	Serial Dilution	0.82 E
MWCS116R3	Nickel	Serial Dilution	14.9 E
MWCS116R3	Zinc	Serial Dilution	580 E
MWCS116R4	Cadmium	Serial Dilution	0.32 E
MWCS116R4	Nickel	Serial Dilution	6.6 E
MWCS116R4	Zinc	Serial Dilution	21.1 E
MWCS126R3	Antimony	Serial Dilution	4.6 G
MWCS126R3	Cadmium	Serial Dilution	0.41 E
MWCS126R3	Nickel	Serial Dilution	9.5 E
MWCS126R3	Zinc	Serial Dilution	102 E
MWCS126R4	Cadmium	Serial Dilution	0.35 E
MWCS126R4	Nickel	Serial Dilution	7.5 E
MWCS126R4	Zinc	Serial Dilution	28.4 E
MWCS127R3	Antimony	Serial Dilution	5.3 G
MWCS127R3	Cadmium	Serial Dilution	0.95 E
MWCS127R3	Nickel	Serial Dilution	12.9 E

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCS127R3	Zinc	Serial Dilution	198 E
MWCS127R4	Cadmium	Serial Dilution	0.36 E
MWCS127R4	Nickel	Serial Dilution	8.8 E
MWCS127R4	Zinc	Serial Dilution	40.6 E
MWCS137R3	Antimony	Serial Dilution	11.6 G
MWCS137R3	Cadmium	Serial Dilution	1.1 E
MWCS137R3	Nickel	Serial Dilution	13.6 E
MWCS137R3	Zinc	Serial Dilution	311 E
MWCS137R4	Antimony	Serial Dilution	12.8 G
MWCS137R4	Cadmium	Serial Dilution	0.44 E
MWCS137R4	Nickel	Serial Dilution	11.3 E
MWCS137R4	Zinc	Serial Dilution	135 E

Attachment 3 Revised Laboratory Forms

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 0004

MWCS151R4

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910059

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910059-3

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1690

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 20 decanted: (Y/N) Y Date Extracted: 11/08/99

Concentrated Extract Volume: 4000(uL) Date Analyzed: 11/26/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG		Q
91-20-3	Naphthalene	130	U	
91-57-6	2-Methylnaphthalene	130	U	
208-96-8	Acenaphthylene	130	U	
83-32-9	Acenaphthene	130	U	
86-73-7	Fluorene	130	U	
85-01-8	Phenanthrene	130	U	
120-12-7	Anthracene	130	U	
206-44-0	Fluoranthene	130	U	
129-00-0	Pyrene	130	U	E
56-55-3	Benzo(a)anthracene	130	U	
218-01-9	Chrysene	130	U	
205-99-2	Benzo(b)fluoranthene	130	U	
207-08-9	Benzo(k)fluoranthene	130	U	
50-32-8	Benzo(a)pyrene	130	U	
193-39-5	Indeno(1,2,3-cd)pyrene	130	U	E
53-70-3	Dibenzo(a,h)anthracene	130	U	E
191-24-2	Benzo(g,h,i)perylene	130	U	E

TD/QBO
11/10/00

12/5/99

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWCS126R4

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910059

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910059-10

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1695

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 25 decanted: (Y/N) Y Date Extracted: 11/08/99

Concentrated Extract Volume: 2000(uL) Date Analyzed: 11/26/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG		Q
91-20-3	Naphthalene	140	U	
91-57-6	2-Methylnaphthalene	140	U	
208-96-8	Acenaphthylene	140	U	
83-32-9	Acenaphthene	140	U	
86-73-7	Fluorene	140	U	
85-01-8	Phenanthrene	140	U	
120-12-7	Anthracene	140	U	
206-44-0	Fluoranthene	140	U	
129-00-0	Pyrene	140	U	L
56-55-3	Benzo(a)anthracene	140	U	
218-01-9	Chrysene	140	U	
205-99-2	Benzo(b)fluoranthene	140	U	
207-08-9	Benzo(k)fluoranthene	140	U	
50-32-8	Benzo(a)pyrene	140	U	
193-39-5	Indeno(1,2,3-cd)pyrene	140	U	E
53-70-3	Dibenzo(a,h)anthracene	140	U	E
191-24-2	Benzo(g,h,i)perylene	140	U	E

TO/QBD
1/10/00

JWS 12/5/99

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 00107

MWCS127R4

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910059

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910059-5

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1697

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 25 decanted: (Y/N) Y Date Extracted: 11/08/99

Concentrated Extract Volume: 2000(uL) Date Analyzed: 11/26/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
91-20-3	Naphthalene	300		
91-57-6	2-Methylnaphthalene	140	U	
208-96-8	Acenaphthylene	140	U	
83-32-9	Acenaphthene	140	U	
86-73-7	Fluorene	140	U	
85-01-8	Phenanthrene	400		
120-12-7	Anthracene	190		
206-44-0	Fluoranthene	710		G
129-00-0	Pyrene	560		G
56-55-3	Benzo(a)anthracene	220		
218-01-9	Chrysene	250		
205-99-2	Benzo(b)fluoranthene	310		G
207-08-9	Benzo(k)fluoranthene	280		G
50-32-8	Benzo(a)pyrene	280		
193-39-5	Indeno(1,2,3-cd)pyrene	140	U	E
53-70-3	Dibenzo(a,h)anthracene	140	U	E
191-24-2	Benzo(g,h,i)perylene	140	U	E

TD/QBD
1/10/00

1/15/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
00020
MWCS137R3

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910059

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910059-1

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1721

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 33 decanted: (Y/N) Y Date Extracted: 11/08/99

Concentrated Extract Volume: 2000(uL) Date Analyzed: 11/28/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
91-20-3	Naphthalene	390		
91-57-6	2-Methylnaphthalene	190		
208-96-8	Acenaphthylene	390		
83-32-9	Acenaphthene	490		
86-73-7	Fluorene	530		
85-01-8	Phenanthrene	2600		
120-12-7	Anthracene	1100		
206-44-0	Fluoranthene	8800	D3	G
129-00-0	Pyrene	4600	D3	G
56-55-3	Benzo(a)anthracene	2600	D3	
218-01-9	Chrysene	2800	D3	
205-99-2	Benzo(b)fluoranthene	2800	D3	G
207-08-9	Benzo(k)fluoranthene	2600	D3	G
50-32-8	Benzo(a)pyrene	2600		
193-39-5	Indeno(1,2,3-cd)pyrene	400		G
53-70-3	Dibenzo(a,h)anthracene	160	U	
191-24-2	Benzo(g,h,i)perylene	340		↓

D3 - Result reported from a 5 fold dilution (P1698.D)

ec/QEO
1/13/99

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

00121 | MWCS127R3

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910059

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910059-6

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1722

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 43 decanted: (Y/N) Y Date Extracted: 11/08/99

Concentrated Extract Volume: 2000(uL) Date Analyzed: 11/28/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
91-20-3	Naphthalene	2000		G
91-57-6	2-Methylnaphthalene	780		
208-96-8	Acenaphthylene	1200		
83-32-9	Acenaphthene	940		
86-73-7	Fluorene	1200		
85-01-8	Phenanthrene	3400		
120-12-7	Anthracene	2100		
206-44-0	Fluoranthene	6600	D3	
129-00-0	Pyrene	5600	D3	
56-55-3	Benzo(a)anthracene	2400	D3	
218-01-9	Chrysene	3000	D3	
205-99-2	Benzo(b)fluoranthene	4100	D3	
207-08-9	Benzo(k)fluoranthene	3300	D3	
50-32-8	Benzo(a)pyrene	3200		
193-39-5	Indeno(1,2,3-cd)pyrene	550		E
53-70-3	Dibenzo(a,h)anthracene	200		E
191-24-2	Benzo(g,h,i)perylene	470		E

D3 - Results reported from a 5 fold dilution (P1699.D)

TO/QBD
1/10/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
00052
MWCS137R4

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910059

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910059-2

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1724

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 24 decanted: (Y/N) Y Date Extracted: 11/08/99

Concentrated Extract Volume: 2000(uL) Date Analyzed: 11/28/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
91-20-3	Naphthalene	1200		
91-57-6	2-Methylnaphthalene	580		
208-96-8	Acenaphthylene	1800		
83-32-9	Acenaphthene	3500	D3	
86-73-7	Fluorene	4400	D3	
85-01-8	Phenanthrene	21000	D4	
120-12-7	Anthracene	8600	D3	
206-44-0	Fluoranthene	58000	D6	G
129-00-0	Pyrene	35000	D6	
56-55-3	Benzo(a)anthracene	23000	D4	
218-01-9	Chrysene	27000	D4	
205-99-2	Benzo(b)fluoranthene	16000	D6	G
207-08-9	Benzo(k)fluoranthene	18000	D6	G
50-32-8	Benzo(a)pyrene	19000	D6	
193-39-5	Indeno(1,2,3-cd)pyrene	4200	D3	E
53-70-3	Dibenzo(a,h)anthracene	1800		
191-24-2	Benzo(g,h,i)perylene	3400	D3	↓

D3 - Result reported from a 5 fold dilution (P1719.D)
D4 - Result reported from a 10 fold dilution (P1718.D)
D6 - Result reported from a 50 fold dilution (P1787.D)

ed/QBO
1/13/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
00151
MWCS126R3

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910059

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910059-9

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1723

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 29 decanted: (Y/N) Y Date Extracted: 11/08/99

Concentrated Extract Volume: 2000(uL) Date Analyzed: 11/28/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
91-20-3	Naphthalene	750		G
91-57-6	2-Methylnaphthalene	240		
208-96-8	Acenaphthylene	330		
83-32-9	Acenaphthene	270		
86-73-7	Fluorene	330		
85-01-8	Phenanthrene	1100		
120-12-7	Anthracene	750		
206-44-0	Fluoranthene	2000		
129-00-0	Pyrene	1800	D3	
56-55-3	Benzo(a)anthracene	680	JD3	
218-01-9	Chrysene	720	JD3	
205-99-2	Benzo(b)fluoranthene	970		
207-08-9	Benzo(k)fluoranthene	760		
50-32-8	Benzo(a)pyrene	850		
193-39-5	Indeno(1,2,3-cd)pyrene	150	U	E
53-70-3	Dibenzo(a,h)anthracene	150	U	E
191-24-2	Benzo(g,h,i)perylene	150	U	E

D3 - Result reported from a 5 fold dilution (P1720.D)

TD/QBD
1/10/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 12

MWCS151R4

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 910059

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910059-3

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J6247

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 20 decanted: (Y/N) Y Date Extracted: 11/03/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/22/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
108-95-2	Phenol	24		E
100-51-6	Benzyl alcohol	33	UX	R
95-48-7	2-Methylphenol	17	U	E
106-44-5	4-Methylphenol	17	UX	R
105-67-9	2,4-Dimethylphenol	8.4	U	E
65-85-0	Benzoic acid	200	U	
87-86-5	Pentachlorophenol	17	U	

X = Value reported from reanalysis
X Data file = >J6278

ed/QBO
1/13/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS116R3

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 910059

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910059-4

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J6248

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 28 decanted: (Y/N) Y Date Extracted: 11/03/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/22/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
108-95-2	Phenol	96		E
100-51-6	Benzyl alcohol	37	UX	R
95-48-7	2-Methylphenol	18	U	E
106-44-5	4-Methylphenol	79	X	R
105-67-9	2,4-Dimethylphenol	310		E
65-85-0	Benzoic acid	220	U	
87-86-5	Pentachlorophenol	43		

X = Value reported from reanalysis
X Data file = >J6279

RL/QBD
1/13/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS116R4

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 910059

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910059-8

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J6249

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 20 decanted: (Y/N) Y Date Extracted: 11/03/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/22/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
108-95-2	Phenol	26		E
100-51-6	Benzyl alcohol	33	UX	R
95-48-7	2-Methylphenol	17	U	E
106-44-5	4-Methylphenol	17	UX	R
105-67-9	2,4-Dimethylphenol	91		E
65-85-0	Benzoic acid	200	U	
87-86-5	Pentachlorophenol	17	U	

X = Value reported from reanalysis
X Data file = >J6280

RR/QBD
1/13/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS116R4 -RE

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 910059

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910059-8

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J6280

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 20 decanted: (Y/N) Y Date Extracted: 11/03/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/23/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
100-51-6	Benzyl alcohol	33	U	E
106-44-5	4-Methylphenol	17	U	

RL/QBD
1/13/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS151R4-RE

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 910059

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910059-3

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J6278

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 20 decanted: (Y/N) Y Date Extracted: 11/03/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/23/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
100-51-6	Benzyl alcohol	33	U	E
106-44-5	4-Methylphenol	17	U	

LL/QBD
1/13/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS116R3 -RE

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 910059

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910059-4

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J6279

Level: (low/med) LOW Date Collected: 09/30/99

% Moisture: 28 decanted: (Y/N) Y Date Extracted:11/03/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/23/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
100-51-6	Benzyl alcohol	37	U	
106-44-5	4-Methylphenol	79		RE

RLS/QBD
1/13/00

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INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS113R3B

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910059

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910071-1

% Solids: 51.0

Date Received: 10/27/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	28.5		*	P	G
7440-38-2	Arsenic	155			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	2.5			P	E
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	891			P	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	7.1			CV	
7440-02-0	Nickel	17.4			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	2.9			P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	954		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

12/20/99

00002

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS116R3

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910059

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910059-4

% Solids: 72.2

Date Received: 10/27/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	27.8		*	P	G
7440-38-2	Arsenic	110			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.82			P	E
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	841			P	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	5.2			CV	
7440-02-0	Nickel	14.9			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.75	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	580		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

Rd/QBD
12/20/99

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS116R4

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910059

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910059-8

% Solids: 79.8

Date Received: 10/27/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	3.2	U	*	P	4
7440-38-2	Arsenic	1.9		S	F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.32	U		P	E
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	14.6			P	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.12	U		CV	
7440-02-0	Nickel	6.6			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.63	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	21.1		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

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RL/QBD
12/20/99

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS126R3

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910059

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910059-9

% Solids: 71.4

Date Received: 10/27/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	4.6		*	P	G
7440-38-2	Arsenic	8.7			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.41			P	E
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	113			P	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	2.0			CV	
7440-02-0	Nickel	9.5			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.76	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	102		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

RA/QBD
12/20/99

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS126R4

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910059

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910059-10

% Solids: 74.7

Date Received: 10/27/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	3.5	U	*	P	G
7440-38-2	Arsenic	3.4			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.35	U		P	E
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	21.2			P	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.13	U		CV	
7440-02-0	Nickel	7.5			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.71	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	28.4		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

12/20/99

INORGANICS SW-846

00005

1

CLIENT ID

INORGANIC ANALYSIS DATA SHEET

MWCS127R3

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910059

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910059-6

% Solids: 57.2

Date Received: 10/27/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	5.3		*	P	G
7440-38-2	Arsenic	39.3			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.95			P	E
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	571			P	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	10.6			CV	
7440-02-0	Nickel	12.9			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.92	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	198		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

12/20/99

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS127R4

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910059

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910059-5

% Solids: 74.7

Date Received: 10/27/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	3.6	U	*	P	G
7440-38-2	Arsenic	7.3			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.36	U		P	E
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	62.9			P	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.65			CV	
7440-02-0	Nickel	8.8			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.73	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	40.6		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

CL/QBD
12/20/99

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS137R3

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910059

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910059-1

% Solids: 67.2

Date Received: 10/27/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	11.6		*	P	G
7440-38-2	Arsenic	44.3			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	1.1			P	E
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	762			P	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	21.0			CV	
7440-02-0	Nickel	13.6			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.79	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	311		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

QA/QBD
12/20/99

INORGANICS SW-846

00008

1

CLIENT ID

INORGANIC ANALYSIS DATA SHEET

MWCS137R4

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910059

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910059-2

% Solids: 75.5

Date Received: 10/27/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	12.8		*	P	G
7440-38-2	Arsenic	33.2			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.44			P	E
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	677			P	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	4.0			CV	
7440-02-0	Nickel	11.3			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.71	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	135		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

ea/QBD
12/20/99

Quality By Design

Laboratory Quality Assurance Consulting

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EPA Level 2
DATA VALIDATION REPORT

Project Name: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 29, 1999
SDG: 910058

Prepared for

Foster Wheeler Environmental
10900 NE 8th St.
Bellevue, WA 98004

Purchase Order No. 022828
QBD Job No. 270O

Reviewed and approved,

Lorraine Davis 1/19/00

Lorraine L. Davis, Owner Date

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A. Introduction

Laboratory Sciences, Inc., d.b.a. *Quality by Design* (QBD), has completed an EPA Level 2 Data Validation on the submitted data packages in accordance with P.O. Number 022828.

The reporting format and criteria for recommending data qualifying flags for this data set are described in the EPA *"Functional Guidelines for Evaluating Organics Analyses"* and *"Functional Guidelines for Evaluating Inorganics Analyses,"* as revised, 1994; and *"Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound"* ("PSEP Protocols"), May 1997; or using criteria listed in the method referenced. Data may be qualified for any of the following reasons:

1. By the laboratory prior to receipt by the reviewer
2. Because of laboratory deviation from the designated method
3. Because the data may not meet the criteria listed in the reference above
4. By the professional judgment of the reviewer.

The data set consists of one data package from Multichem Analytical Services in Renton, Washington, and contains data for the samples shown in Table 1. The data reviewer and senior reviewers are shown in Table 2.

Each data set includes an analytical data package for each sample, copies of the completed chain-of-custody (COC) forms, and a quality control (QC) data package. The analytical data package includes analytical results, blank sample results, both laboratory and client sample identifications, appropriate dates but not times, method reporting limits, method references, surrogate recoveries as appropriate, the laboratory's name and address, and the initials of the person releasing the data. The custody forms include the receipt of the sample but not the laboratory's internal tracking. The QC data package includes a tabular list of the laboratory's sample identification, spiking concentrations, recoveries, percentage calculations, and acceptance windows.

Raw data were provided which includes chromatograms, instrument print outs, injection logs, digestion/preparation logs.

This data validation report consists of several sections, each of which are formatted to follow Functional Guidelines, but which also include subsections discussing QBD contacts with the laboratory, other comments, and a summary table of data qualifiers.

Table 1. Sample Identification and Analysis

Sample Identification	Laboratory Identification	Methods 8081/8082	Method 8270	Method 6010/7000	Method 9060	Grain Size	Conventionals
MWCS111R4	910058-1		X				
MWCS111R3	910058-2		X				
MWCS156R3A	910058-3		X				
MWCS105R3	910058-4			X			
MWCS105R4	910058-5			X			
MWCS105R5	910058-6			X			
MWCS106R3	910058-7			X			
MWCS106R4	910058-8			X			
MWCS107R3	910058-9			X			
MWCS107R4	910058-10			X			
MWCS107R5	910058-11			X			

Key:
Method 8270 = Semivolatile organic compounds by gas chromatography/mass spectroscopy
Method 8081/8082 = Pesticides and polychlorinated biphenyls (PCB) by gas chromatography
Method 6010 & 7000 = Metals by inductively coupled plasma (ICP) and cold vapor atomic absorption (CVAA)
Method 9060 = Total organic carbon (TOC)
Conventionals = Sulfide, ammonia, and percent moisture

Table 2. Data Package, Reviewer, and Senior Reviewer

Analysis	Number of Pages	Reviewer	Senior Reviewer
SVOC	124	Debbie Copsey	Thomas S. Davis
Metals	142	Lorraine L. Davis	Thomas S. Davis

B. Chain-of-Custody

The analytical data package was reviewed and compared against the chain-of-custody (COC) forms. No data are missing from the COC forms and no transcription errors in accuracy were found. All tests requested on the COC were performed.

Discussion: These samples were collected and archived on September 29, 1999 as SDG 909071. A change order was made on October 26, 1999 authorizing the analyses. The samples were then re-accessioned as SDG 910058.

C. Review of GC/MS Semivolatiles Analyses

EPA Method 8270

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: Some of the analyses were added to the work order after the samples had been logged into the laboratory system, and the extraction for this analyses occurred after the 14-day holding time. As stated in the case narrative, the samples were frozen upon receipt and then thawed and extracted. PSDDA recognizes a holding time of one year for sediments which have been frozen. When the samples are thawed, Method 8270 recognizes a 14-day holding time to extraction. Since the request for analysis occurred during the analytical process for the SDG and since the samples were frozen until extraction, no data qualifier flags are recommended.

2. GC/MS Tuning

All decafluorotriphenylphosphine (DFTPP) tune criteria were met for the initial and continuing calibration for all dates of sample analysis.

3. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No target compound list (TCL) analytes had percent relative standard deviations (%RSD) greater than allowed by the method for the initial calibration or percent difference for the continuing calibration checks. All system performance check compound (SPCC) and calibration check compound (CCC) criteria were met, except as noted below.

Table 3. SVOC Data Qualifiers Due to Calibration Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS111R4	Fluoranthene	Continuing Calibration %D >20	35 G
MWCS111R4	Pyrene	Continuing Calibration %D >20	130 UG

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS111R4	Benzo(b)fluoranthene	Continuing Calibration %D >20	130 UG
MWCS111R4	Benzo(k)fluoranthene	Continuing Calibration %D >20	130 UG
MWCS111R4	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	130 UE
MWCS111R4	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	130 UE
MWCS111R4	Benzo(g,h,i)perylene	Continuing Calibration %D >20	130 UE
MWCS111R3	Fluoranthene	Continuing Calibration %D >20	250 G
MWCS111R3	Pyrene	Continuing Calibration %D >20	140 UG
MWCS111R3	Benzo(b)fluoranthene	Continuing Calibration %D >20	140 UG
MWCS111R3	Benzo(k)fluoranthene	Continuing Calibration %D >20	140 UG
MWCS111R3	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	140 UE
MWCS111R3	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	140 UE
MWCS111R3	Benzo(g,h,i)perylene	Continuing Calibration %D >20	140 UE
MWCT156R3A	Fluoranthene	Continuing Calibration %D >20	1600 G
MWCT156R3A	Pyrene	Continuing Calibration %D >20	2000 G
MWCT156R3A	Benzo(b)fluoranthene	Continuing Calibration %D >20	620 G
MWCT156R3A	Benzo(k)fluoranthene	Continuing Calibration %D >20	520 G
MWCT156R3A	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	140 UE
MWCT156R3A	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	140 UE
MWCT156R3A	Benzo(g,h,i)perylene	Continuing Calibration %D >20	140 UE

Discussion: The continuing calibration for several target compounds had percent differences which were out of the criteria of <20 percent. The associated results in Samples MWCS111R4, MWCS111R3, and MWCT156R3A have been flagged appropriately. If the results indicated a high bias, the results were flagged with "L" or "UL" to indicate that the value is less than the maximum shown and if the results indicated a low bias, the results were flagged with "G" and "UG" to

indicate the reporting limit is greater than the minimum shown. When other QC checks indicated both a high and low bias, the results were flagged with "E" to indicate an estimated value or "UE" to indicate an estimated reporting limit.

4. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

5. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria.

6. Laboratory Control Standards

The laboratory analyzed a second source sample with the analytical batch. The laboratory referred to this sample as a blank spike/blank spike duplicate (BS/BSD) rather than a laboratory control standard (LCS). Any anomalies or comments regarding the second source results are addressed in the next section.

7. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

Matrix spike (MS) and matrix spike duplicates (MSD) were analyzed as required by the referenced method and all percent recoveries and relative percent differences (RPD) were within QAPP criteria, except as noted below.

Table 4. SVOC Data Qualifiers Due to MS/MSD Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS111R4	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	130 UE
MWCS111R4	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	130 UE
MWCS111R4	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	130 UE
MWCS111R3	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	140 UE
MWCS111R3	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	140 UE
MWCS111R3	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	140 UE
MWCT156R3A	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	140 UE
MWCT156R3A	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	140 UE
MWCT156R3A	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	140 UE

Discussion: Indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene were out of QAPP criteria for accuracy in both the MS/MSD and BS/BSD pairs. The

associated results for all samples have been flagged have been flagged appropriately. If the results indicated a high bias, the results were flagged with "L" or "UL" to indicate that the value is less than the maximum shown and if the results indicated a low bias, the results were flagged with "G" and "UG" to indicate the reporting limit is greater than the minimum shown. When other QC checks indicated both a high and low bias, the results were flagged with "E" to indicate an estimated value or "UE" to indicate an estimated reporting limit.

8. Internal Standards Performance for Samples

All internal standard areas were within the required control limits.

9. Field Duplicates

No field duplicates were identified with this group of samples.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

Discussion: The laboratory noted a series of operational errors in the clean-up of samples by gel permeation chromatography that resulted in the raising of the reporting limits. The reviewer concurs that the reporting limits were raised appropriately, and does not recommend additional data qualifier flags because the increased limits are about one-third less than the "Low Soil/Solid" EQLs listed in Table 2 of the QAPP.

11. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

12. TCL Compound Identification

All target compound identifications met the criteria for retention times and peak identification of the referenced method.

13. Tentatively Identified Compounds

No TICs were reported with this data set.

14. Laboratory Contact

There was no verbal or written communication with the laboratory.

15. Other Comments

None.

16. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

D. Review of Metals Analyses

EPA Method 6010/7000

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: Some of the analyses were added to the work order after the samples had been logged into the laboratory system, and the analysis for mercury occurred after the 28-day holding time. As stated in the case narrative, the samples were frozen upon receipt and then thawed and extracted. PSDDA recognizes a holding time of one year for sediments which have been frozen. When the samples are thawed, Method 7471 recognizes a 28-day holding time to analyses. Since the request for analysis occurred during the analytical process for the SDG and since the samples were frozen until analyses, no data qualifier flags are recommended.

2. Initial and Continuing Calibration

All initial and continuing calibration Quality Control criteria were met. No TCL analytes had correlation coefficients greater than allowed by the method, and all percent differences for the continuing calibration verifications were acceptable.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. ICP Interference Check Standard

An interference check sample (ICS) was analyzed at a frequency required by the referenced method and was within established criteria.

5. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within QAPP criteria, except as noted below.

Discussion: Copper was out of the method criteria of 90 to 110 percent for the LCS. However, PSDDA allows 80 to 120 percent recovery of a second source sample. Since the analyte was within PSDDA acceptance criteria, no data qualifier flags are recommended.

6. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MSs were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria, except as noted below.

Table 5. Metal Data Qualifiers Due to MS/MSD Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS105R3	Mercury	MS	2.7 E

Discussion: MS recovery for mercury was out of criteria at 132 percent. Since the LCS was in criteria, only the results for this compound in the sample spiked has been flagged with "E" to indicate an estimated value.

7. Field Duplicates

No field duplicates were identified with this group of samples.

8. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPD were within QAPP criteria.

9. ICP Serial Dilution

Samples that were a factor of 50 above the instrument detection limit (IDL) for the analyte were diluted five-fold and were within criteria required by the referenced method.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

11. Graphite Furnace Atomic Absorption Analysis

Not applicable to this SDG.

12. Laboratory Contact

There was no verbal or written communication with the laboratory.

13. Other Comments

None.

14. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

Attachment 1 Puget Sound Estuary Program Data Qualifier Definitions

Used for both organics and inorganic analyses

B = Analyte detected in samples and in method blank

C = Combined with unresolved substances

E = Estimated

G = Value greater than minimum shown

K = Detected at less than the maximum shown

L = Value less than the maximum shown

M = Value is a mean

Q = Questionable value

R = Rejected or unusable value

T = Detected below the quantification limit shown

U = Undetected at the detection limit shown

Z = Blank corrected

Attachment 2 Summary Table of Data Qualifier Flags

Foster Wheeler Environmental
Project: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: September 29, 1999

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCS111R4	Fluoranthene	Continuing Calibration %D >20	35 G
MWCS111R4	Pyrene	Continuing Calibration %D >20	130 UG
MWCS111R4	Benzo(b)fluoranthene	Continuing Calibration %D >20	130 UG
MWCS111R4	Benzo(k)fluoranthene	Continuing Calibration %D >20	130 UG
MWCS111R4	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	130 UE
MWCS111R4	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	130 UE
MWCS111R4	Benzo(g,h,i)perylene	Continuing Calibration %D >20	130 UE
MWCS111R3	Fluoranthene	Continuing Calibration %D >20	250 G
MWCS111R3	Pyrene	Continuing Calibration %D >20	140 UG
MWCS111R3	Benzo(b)fluoranthene	Continuing Calibration %D >20	140 UG
MWCS111R3	Benzo(k)fluoranthene	Continuing Calibration %D >20	140 UG
MWCS111R3	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	140 UE
MWCS111R3	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	140 UE
MWCS111R3	Benzo(g,h,i)perylene	Continuing Calibration %D >20	140 UE
MWCT156R3A	Fluoranthene	Continuing Calibration %D >20	1600 G
MWCT156R3A	Pyrene	Continuing Calibration %D >20	2000 G
MWCT156R3A	Benzo(b)fluoranthene	Continuing Calibration %D >20	620 G
MWCT156R3A	Benzo(k)fluoranthene	Continuing Calibration %D >20	520 G
MWCT156R3A	Indeno(1,2,3-cd)pyrene	Continuing Calibration %D >20	140 UE
MWCT156R3A	Dibenzo(a,h)anthracene	Continuing Calibration %D >20	140 UE
MWCT156R3A	Benzo(g,h,i)perylene	Continuing Calibration %D >20	140 UE
MWCS111R4	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	130 UE
MWCS111R4	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	130 UE
MWCS111R4	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	130 UE
MWCS111R3	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	140 UE
MWCS111R3	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	140 UE
MWCS111R3	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	140 UE
MWCT156R3A	Indeno(1,2,3-cd)pyrene	MS/MSD, BS/BSD	140 UE
MWCT156R3A	Dibenzo(a,h)anthracene	MS/MSD, BS/BSD	140 UE

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCT156R3A	Benzo(g,h,i)perylene	MS/MSD, BS/BSD	140 UE
MWCS105R3	Mercury	MS	2.7 E

Attachment 3 Revised Laboratory Forms

00014

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS111R4

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910058

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910058-1

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1691

Level: (low/med) LOW Date Collected: 09/29/99

% Moisture: 20 decanted: (Y/N) Y Date Extracted: 11/08/99

Concentrated Extract Volume: 2000(uL) Date Analyzed: 11/26/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
91-20-3	Naphthalene	130	U	
91-57-6	2-Methylnaphthalene	130	U	
208-96-8	Acenaphthylene	130	U	
83-32-9	Acenaphthene	130	U	
86-73-7	Fluorene	130	U	
85-01-8	Phenanthrene	130	U	
120-12-7	Anthracene	130	U	
206-44-0	Fluoranthene	35	J	
129-00-0	Pyrene	130	U	G
56-55-3	Benzo(a)anthracene	130	U	G
218-01-9	Chrysene	130	U	
205-99-2	Benzo(b)fluoranthene	130	U	G
207-08-9	Benzo(k)fluoranthene	130	U	G
50-32-8	Benzo(a)pyrene	130	U	
193-39-5	Indeno(1,2,3-cd)pyrene	130	U	E
53-70-3	Dibenzo(a,h)anthracene	130	U	E
191-24-2	Benzo(g,h,i)perylene	130	U	E

TD/QBD 1/8/00

12/15/99

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS111R3

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910058

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910058-2

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1692

Level: (low/med) LOW Date Collected: 09/29/99

% Moisture: 25 decanted: (Y/N) Y Date Extracted: 11/08/99

Concentrated Extract Volume: 2000(uL) Date Analyzed: 11/26/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
91-20-3	Naphthalene	140	U	
91-57-6	2-Methylnaphthalene	140	U	
208-96-8	Acenaphthylene	140	U	
83-32-9	Acenaphthene	140	U	
86-73-7	Fluorene	140	U	
85-01-8	Phenanthrene	240		
120-12-7	Anthracene	140	U	
206-44-0	Fluoranthene	250		G
129-00-0	Pyrene	140	U	G
56-55-3	Benzo(a)anthracene	140	U	
218-01-9	Chrysene	140	U	
205-99-2	Benzo(b)fluoranthene	140	U	G
207-08-9	Benzo(k)fluoranthene	140	U	G
50-32-8	Benzo(a)pyrene	140	U	
193-39-5	Indeno(1,2,3-cd)pyrene	140	U	E
53-70-3	Dibenzo(a,h)anthracene	140	U	E
191-24-2	Benzo(g,h,i)perylene	140	U	E

TO/QBD
1/8/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCT156R3A

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910058

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910058-3

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1696

Level: (low/med) LOW Date Collected: 09/29/99

% Moisture: 25 decanted: (Y/N) Y Date Extracted: 11/08/99

Concentrated Extract Volume: 2000(uL) Date Analyzed: 11/26/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
91-20-3	Naphthalene	390		
91-57-6	2-Methylnaphthalene	140	U	
208-96-8	Acenaphthylene	320		
83-32-9	Acenaphthene	210		
86-73-7	Fluorene	360		
85-01-8	Phenanthrene	800		
120-12-7	Anthracene	660		
206-44-0	Fluoranthene	1600		G
129-00-0	Pyrene	2000		G
56-55-3	Benzo(a)anthracene	450		
218-01-9	Chrysene	570		
205-99-2	Benzo(b)fluoranthene	620		G
207-08-9	Benzo(k)fluoranthene	520		G
50-32-8	Benzo(a)pyrene	460		
193-39-5	Indeno(1,2,3-cd)pyrene	140	U	E
53-70-3	Dibenzo(a,h)anthracene	140	U	E
191-24-2	Benzo(g,h,i)perylene	140	U	E

TD/QBD 1/8/00
1/4/99

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS105R3A

12/13/99

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910058

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910058-4

% Solids: 57.3

Date Received: 10/27/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper	713			P
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	2.7			CV E
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

LL/QBD
12/21/99

Quality By Design

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EPA Level 2
DATA VALIDATION REPORT

Project Name: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: October 2, 1999
SDG: 910071

Prepared for

Foster Wheeler Environmental
10900 NE 8th St.
Bellevue, WA 98004

Purchase Order No. 022828
QBD Job No. 270N

Reviewed and approved,

Lorraine Davis 1/19/00

Lorraine L. Davis, Owner Date

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Attachments

Attachment 1 Data Flag Definitions
Attachment 2 Summary Table of Data Qualifier Flags
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A. Introduction

Laboratory Sciences, Inc., d.b.a. *Quality by Design* (QBD), has completed an EPA Level 2 Data Validation on the submitted data packages in accordance with P.O. Number 022828.

The reporting format and criteria for recommending data qualifying flags for this data set are described in the EPA *"Functional Guidelines for Evaluating Organics Analyses"* and *"Functional Guidelines for Evaluating Inorganics Analyses,"* as revised, 1994; and *"Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound"* ("PSEP Protocols"), May, 1997, or using criteria listed in the method referenced. Data may be qualified for any of the following reasons:

1. By the laboratory prior to receipt by the reviewer
2. Because of laboratory deviation from the designated method
3. Because the data may not meet the criteria listed in the reference above
4. By the professional judgment of the reviewer.

The data set consists of several data packages from Multichem Analytical Services in Renton, Washington, and contains data for the samples shown in Table 1. The data reviewers and senior reviewers are shown in Table 2.

Each data set includes an analytical data package for each sample, copies of the completed chain-of-custody (COC) forms, and a quality control (QC) data package. The analytical data package includes analytical results, blank sample results, both laboratory and client sample identifications, appropriate dates but not times, method reporting limits, method references, surrogate recoveries as appropriate, the laboratory's name and address, and the initials of the person releasing the data. The custody forms include the receipt of the sample but not the laboratory's internal tracking. The QC data package includes a tabular list of the laboratory's sample identification, spiking concentrations, recoveries, percentage calculations, and acceptance windows.

Raw data were provided which includes chromatograms, instrument print outs, injection logs, digestion/preparation logs.

This data validation report consists of several sections, each of which are formatted to follow Functional Guidelines, but which also include subsections discussing QBD contacts with the laboratory, other comments, and a summary table of data qualifiers.

Table 1. Sample Identification and Analysis

Sample Identification	Laboratory Identification	Methods 8081/8082	Method 8270	Method 6010/7000	Method 9060	Grain Size	Conventionals
MWCS113R3B	910071-1		X	X			X
MWCS113R5B	910071-2		X	X			X
MWCS112R5	910071-3	X	X	X			X
MWCS112R4	910071-4	X	X	X			X
MWCS112R3	910071-5	X	X	X			X
MWCS157R1	910071-6	X	X	X			X
MWCS114R4	910071-7		X	X			X
MWCS114R3	910071-8		X	X			X

Key:
Method 8270 = Semivolatile organic compounds by gas chromatography/mass spectroscopy
Method 8081/8082 = Pesticides and polychlorinated biphenyls (PCB) by gas chromatography
Method 6010 & 7000 = Metals by inductively coupled plasma (ICP) and cold vapor atomic absorption (CVAA)
Method 9060 = Total organic carbon (TOC)
Conventionals = Sulfide, ammonia, and percent moisture

Table 2. Data Package, Reviewer, and Senior Reviewer

Analysis	Number of Pages	Reviewer	Senior Reviewer
Pest/PCB	161	Melinda Jacobson	Thomas S. Davis
SVOC	566	Melinda Jacobson	Thomas S. Davis
Metals	183	Lorraine L. Davis	Thomas S. Davis
Conventionals	81	Lorraine L. Davis	Thomas S. Davis

B. Chain-of-Custody

The analytical data package was reviewed and compared against the chain-of-custody (COC) form. No data are missing from the COC forms and no transcription errors in accuracy were found. All tests requested on the COC were performed.

Discussion: These samples were collected and archived on October 2, 1999 as SDG 910006. A change order was made on October 26, 1999 authorizing the analyses. The samples were then re-accessioned as SDG 910071.

C. Review of GC/MS Semivolatiles Analyses

EPA Method 8270

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The analyses were added to the work order after the samples had been logged into the laboratory system, and the extraction for this analyses occurred after the 14-day holding time. As stated in the case narrative, the samples were frozen upon receipt, then thawed, and extracted. PSDDA recognizes a holding time of one year for sediments which have been frozen. When the samples are thawed, Method 8270 recognizes a 14-day holding time to extraction. Since the request for analysis occurred during the analytical process for the SDG and since the samples were frozen until extraction, no data qualifier flags are recommended.

2. GC/MS Tuning

All decafluorotriphenylphosphine (DFTPP) tune criteria were met for the initial and continuing calibration for all dates of sample analysis.

3. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No target compound list (TCL) analytes had percent relative standard deviations (%RSD) greater than allowed by the method for the initial calibration or percent difference for the continuing calibration checks. All system performance check compound (SPCC) and calibration check compound (CCC) criteria were met, except as noted below.

Table 3. SVOC Data Qualifiers Due to Calibration Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS113R3B	Fluoranthene	Continuing Calibration % D >20	9200 L
MWCS113R3B	Pyrene	Continuing Calibration % D >20	5500 E

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS113R3B	Benzo(b)fluoranthene	Continuing Calibration % D >20	3500 L
MWCS113R3B	Benzo(k)fluoranthene	Continuing Calibration % D >20	3500 L
MWCS113R3B	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	840 E
MWCS113R3B	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	250 E
MWCS113R3B	Benzo(g,h,i)perylene	Continuing Calibration % D >20	830 E
MWCS113R5B	Fluoranthene	Continuing Calibration % D >20	11000 L
MWCS113R5B	Pyrene	Continuing Calibration % D >20	4300 G
MWCS113R5B	Benzo(b)fluoranthene	Continuing Calibration % D >20	4100 L
MWCS113R5B	Benzo(k)fluoranthene	Continuing Calibration % D >20	3300 L
MWCS113R5B	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	690 G
MWCS113R5B	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	260 G
MWCS113R5B	Benzo(g,h,i)perylene	Continuing Calibration % D >20	650 G
MWCS112R5	Pyrene	Continuing Calibration % D >20	72 UG
MWCS112R5	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	72 UG
MWCS112R5	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	72 UG
MWCS112R5	Benzo(g,h,i)perylene	Continuing Calibration % D >20	72 UG
MWCS112R4	Pyrene	Continuing Calibration % D >20	72 UG
MWCS112R4	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	72 UG
MWCS112R4	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	72 UG
MWCS112R4	Benzo(g,h,i)perylene	Continuing Calibration % D >20	72 UG
MWCS112R3	Fluoranthene	Continuing Calibration % D >20	11000 L
MWCS112R3	Pyrene	Continuing Calibration % D >20	5300 E
MWCS112R3	Benzo(b)fluoranthene	Continuing Calibration % D >20	3900 L

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS112R3	Benzo(k)fluoranthene	Continuing Calibration % D >20	3200 L
MWCS112R3	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	680 G
MWCS112R3	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	230 G
MWCS112R3	Benzo(g,h,i)perylene	Continuing Calibration % D >20	630 G
MWCS157R3	Fluoranthene	Continuing Calibration % D >20	6500 L
MWCS157R3	Pyrene	Continuing Calibration % D >20	4100 G
MWCS157R3	Benzo(b)fluoranthene	Continuing Calibration % D >20	1800 L
MWCS157R3	Benzo(k)fluoranthene	Continuing Calibration % D >20	1700 L
MWCS157R3	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	320 G
MWCS157R3	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	96 G
MWCS157R3	Benzo(g,h,i)perylene	Continuing Calibration % D >20	370 G
MWCS114R4	Fluoranthene	Continuing Calibration % D >20	630 L
MWCS114R4	Pyrene	Continuing Calibration % D >20	440 G
MWCS114R4	Benzo(b)fluoranthene	Continuing Calibration % D >20	170 L
MWCS114R4	Benzo(k)fluoranthene	Continuing Calibration % D >20	210 L
MWCS114R4	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	68 UG
MWCS114R4	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	68 UG
MWCS114R4	Benzo(g,h,i)perylene	Continuing Calibration % D >20	68 UG
MWCS114R3	Fluoranthene	Continuing Calibration % D >20	3300 E
MWCS114R3	Pyrene	Continuing Calibration % D >20	1800G
MWCS114R3	Benzo(b)fluoranthene	Continuing Calibration % D >20	840 L
MWCS114R3	Benzo(k)fluoranthene	Continuing Calibration % D >20	780 L
MWCS114R3	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	76 UG

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS114R3	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	76 UG
MWCS114R3	Benzo(g,h,i)perylene	Continuing Calibration % D >20	190 G

Discussion: The continuing calibration for several of the target compounds had percent differences which were out of the criteria of <20 percent. The associated results in Samples MWCS113R3B, MWCS113R5B, MWCS112R5, MWCS112R4, MWCS112R3, M2CS157R3, MWCS113R4, and MWCS114R3 have been flagged appropriately. If the results indicated a high bias, the results were flagged with "L" or "UL" to indicate that the value is less than the maximum shown and if the results indicated a low bias, the results were flagged with "G" and "UG" to indicate the reporting limit is greater than the minimum shown. When other QC checks indicated both a high and low bias, the results were flagged with "E" to indicate an estimated value or "UE" to indicate an estimated reporting limit.

4. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

5. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria, except as noted below.

Table 4. SVOC Data Qualifiers Due to Surrogate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS114R3	Naphthalene	Surrogate	1100 G
MWCS114R3	2-Methylnaphthalene	Surrogate	300 G
MWCS114R3	Acenaphthylene	Surrogate	640 G
MWCS114R3	Acenaphthene	Surrogate	290 G
MWCS114R3	Fluorene	Surrogate	430 G
MWCS114R3	Phenanthrene	Surrogate	1400 G
MWCS114R3	Anthracene	Surrogate	680 G
MWCS114R3	Fluoranthene	Surrogate	3300 E
MWCS114R3	Pyrene	Surrogate	1800 G
MWCS114R3	Benzo(a)anthracene	Surrogate	600 G
MWCS114R3	Chrysene	Surrogate	700 G
MWCS114R3	Benzo(b)fluoranthene	Surrogate	840 E
MWCS114R3	Benzo(k)fluoranthene	Surrogate	780 E

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS114R3	Benzo(a)pyrene	Surrogate	800 G
MWCS114R3	Indeno(1,2,3-cd)pyrene	Surrogate	76 UG
MWCS114R3	Dibenz(a,h)anthracene	Surrogate	76 UG
MWCS114R3	Benzo(g,h,i)perylene	Surrogate	190 G
MWCS113R3B	Naphthalene	Surrogate	1500 L
MWCS113R3B	2-Methylnaphthalene	Surrogate	510 L
MWCS113R3B	Acenaphthylene	Surrogate	2000 L
MWCS113R3B	Acenaphthene	Surrogate	530 L
MWCS113R3B	Fluorene	Surrogate	650 L
MWCS113R3B	Phenanthrene	Surrogate	3200 L
MWCS113R3B	Anthracene	Surrogate	1600 L
MWCS113R3B	Fluoranthene	Surrogate	9200 L
MWCS113R3B	Pyrene	Surrogate	5500 E
MWCS113R3B	Benzo(a)anthracene	Surrogate	2900 L
MWCS113R3B	Chrysene	Surrogate	3200 L
MWCS113R3B	Benzo(b)fluoranthene	Surrogate	3500 L
MWCS113R3B	Benzo(k)fluoranthene	Surrogate	3500 L
MWCS113R3B	Benzo(a)pyrene	Surrogate	3600 L
MWCS113R3B	Indeno(1,2,3-cd)pyrene	Surrogate	840 E
MWCS113R3B	Dibenz(a,h)anthracene	Surrogate	250 E
MWCS113R3B	Benzo(g,h,i)perylene	Surrogate	830 E
MWCS112R3	Naphthalene	Surrogate	1600L
MWCS112R3	2-Methylnaphthalene	Surrogate	600 L
MWCS112R3	Acenaphthylene	Surrogate	1400 L
MWCS112R3	Acenaphthene	Surrogate	840 L
MWCS112R3	Fluorene	Surrogate	1200 L
MWCS112R3	Phenanthrene	Surrogate	5000 L
MWCS112R3	Anthracene	Surrogate	2400 L
MWCS112R3	Fluoranthene	Surrogate	11000 L
MWCS112R3	Pyrene	Surrogate	5300 E
MWCS112R3	Benzo(a)anthracene	Surrogate	3000 L
MWCS112R3	Chrysene	Surrogate	3600 L
MWCS112R3	Benzo(b)fluoranthene	Surrogate	3900 L
MWCS112R3	Benzo(k)fluoranthene	Surrogate	3200 L
MWCS112R3	Benzo(a)pyrene	Surrogate	3500 L
MWCS112R3	Indeno(1,2,3-cd)pyrene	Surrogate	680 E
MWCS112R3	Dibenz(a,h)anthracene	Surrogate	230 E
MWCS112R3	Benzo(g,h,i)perylene	Surrogate	630 E

Discussion: In Samples MWCS112R5, MWCS113R5B, MWCS112R3DL, and MWCS113R3BDL a single surrogate was out of criteria. No data qualifier flags are recommended because all other surrogates were in criteria.

The surrogate percent recoveries for nitrobenzene-d_5, 2-fluorobiphenyl, and terphenyl-d_{14} were out of the QAPP acceptance criteria for Samples MWCS112R3DL and MWCS113R5BDL due to large dilutions. Since all other QC checks were in criteria, no data qualifier flags are recommended.

In Sample MWCS114R3, the surrogates nitrobenzene-d_5 and terphenyl-d_{14} were out of QAPP criteria with low recoveries at 38 and 23 percent. The associated results have been flagged with "G" and "UG" to indicate the value is greater than the maximum shown.

In Samples MWCS114R3B and MWCS112R3, the surrogates nitrobenzene-d_5 and terphenyl-d_{14} were out of QAPP criteria with high recoveries of 127 and 138 percent for nitrobenzene-d_5 and 138 and 236 for terphenyl-d_{14}. The associated results have been flagged with "L" or "UL" to indicate the value is less than the maximum shown.

The surrogate percent recovery for phenol-d_6 was out of acceptance criteria for the blank associated with the data. No data qualifier flags are recommended because the surrogates were acceptable in the samples.

The surrogate percent recoveries for phenol-d_6 and 2-fluorophenol were out of acceptance criteria in the MS/MSD and BS/BSD. No data qualifier flags are recommended because the surrogates were acceptable in the samples.

6. Laboratory Control Standards

The laboratory analyzed a second source sample with the analytical batch. The laboratory referred to this sample as a blank spike/blank spike duplicate (BS/BSD) rather than a laboratory control standard (LCS). Any anomalies or comments regarding the second source results are addressed in the next section.

7. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

Matrix spike (MS) and matrix spike duplicates (MSD) were analyzed as required by the referenced method and all percent recoveries and relative percent differences (RPD) were within QAPP criteria, except as noted below.

Table 5. SVOC Data Qualifiers Due to MS/MSD Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS112R5	Indeno(1,2,3-cd)pyrene	MS/MSD	72 UG
MWCS112R5	Dibenzo(a,h,)anthracene	MS/MSD	72 UG

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS112R5	Benzo(g,h,i)perylene	MS/MSD	72 UG
MWCS157R3	Phenol	BS/BSD, MS/MSD	130 L
MWCS157R3	2-Methylphenol	BS/BSD, MS/MSD	22 UG
MWCS157R3	4-Methylphenol	BS/BSD, MS/MSD	92 G
MWCS157R3	2,4-Dimethylphenol	BS/BSD, MS/MSD	41 G

Discussion: The RPD for several of the target compounds in the BS/BSD pair were out of criteria. Since the RPD for the MS/MSD pair were acceptable, no data qualifier flags are recommended.

Indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene were out of criteria for accuracy (percent recovery) for the MS/MSD pair. Since the BS/BSD results were acceptable, only the results for these compounds in the sample spiked has been flagged with a "G" or "UG" to indicate to indicate the value is greater than minimum shown.

Benzo(b)fluoranthene and fluoranthene were out of acceptance criteria for the MS/MSD pair. Since the percent recovery exceed criteria, and since the sample results were non-detect, no data qualifier flags are recommended.

The percent recovery for phenol, 2-methylphenol, 4-methylphenol and 2,4-dimethylphenol were out of criteria in the BS/BSD pair. Since the same analytes were out of criteria in the MS/MSD, the associated results in Sample MWCS157R3 have been flagged appropriately. If the results indicated a high bias, the results were flagged with "L" or "UL" to indicate that the value is less than the maximum shown and if the results indicated a low bias, the results were flagged with "G" and "UG" to indicate the reporting limit is greater than the minimum shown.

Benzoic acid was out of criteria in the BS/BSD pair. Since the results for the MS/MSD were in criteria, no data qualifier flags are recommended.

The percent recovery for 2,4-dimethylphenol was out of criteria at zero percent in the BS/BSD. The laboratory had previously noted this problem and found the root cause to be the medium used for the blank spike (Ottawa sand). Given that this as been identified as a historical issue, the reviewer concurs with the laboratory's action to use the MS/MSD results as their QC check for precision and accuracy. Since the MS/MSD results were in criteria, no data qualifier flags are recommended.

8. Internal Standards Performance for Samples

All internal standard areas were within the required control limits.

9. Field Duplicates

No field duplicates were identified with this group of samples.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards or external standardization.

11. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

12. TCL Compound Identification

All target compound identifications met the criteria for retention times and peak identification of the referenced method.

13. Tentatively Identified Compounds

No TICs were reported with this data set.

14. Laboratory Contact

There was no verbal or written communication with the laboratory.

15. Other Comments

None.

16. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

D. Review of Pesticides/PCBs Analyses

EPA Method 8081/8082

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The analyses were added to the work order after the samples had been logged into the laboratory system, and the extraction for this analyses occurred after the 14-day holding time. As stated in the case narrative, the samples were frozen upon receipt and then thawed and extracted. PSDDA recognizes a holding time of one year for sediments which have been frozen. When the samples are thawed, Method 8082 recognizes a 14-day holding time to extraction. Since the request for analysis occurred during the analytical process for the SDG and since the samples were frozen until extraction, no data qualifier flags are recommended.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No TCL analytes had %RSD greater than that allowed for the initial calibration or percent difference for the continuing calibration checks.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MS and MSD were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria.

6. Field Duplicates

No field duplicates were identified with this group of samples.

7. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

8. TCL Compound Identification

No target compounds were detected.

9. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards or external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

10. Laboratory Contact

There was no verbal or written communication with the laboratory.

11. Other Comments

None.

12. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

E. Review of Metals Analyses

EPA Method 6010/7000

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: The analysis of mercury was performed 65 days after the samples were collected. However, the samples were archived frozen, for which PSEP guidelines allow one year of storage. The samples were then thawed, and analyzed within the 28-day holding time after thawing. Therefore, no data qualifier flags are recommended.

2. Initial and Continuing Calibration

All initial and continuing calibration Quality Control criteria were met. No TCL analytes had correlation coefficients greater than allowed by the method, and all percent differences for the continuing calibration verifications were acceptable.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit, except as noted below.

Table 6. Metal Data Qualifiers Due to Blank Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS114R3	Mercury	Sample value within 5 times of blank contamination	0.42 B

Discussion: Mercury was detected in the method blank at 0.3 mg/kg. This blank was associated with all samples in the SDG. PSEP guidelines differ from Functional Guidelines, in that the samples that are within five times of the highest blank are not revised to be non-detect at a higher detection limit. Instead, sample results that are within five times of the highest blank are flagged "B" to indicate blank contamination. Only Sample MWCS114R3 was within five times the blank contamination and has been flagged "B". All other samples were either non-detect or the result was greater than five times the blank contamination.

4. ICP Interference Check Standard

An interference check sample (ICS) was analyzed at a frequency required by the referenced method and was within established criteria.

5. Laboratory Control Standards

A second source LCS was analyzed at a frequency required by the referenced method and all percent recoveries were within QAPP criteria.

Discussion: All metals except silver, arsenic, and mercury were out of the method criteria of 90 to 110 percent recovery for the LCS. However, PSDDA allows 80 to 120 percent recovery of a second source check sample. All analytes except antimony, at 77.5 percent, were within PSDDA acceptance criteria. Therefore, no data qualifier flags are recommended. Antimony has been flagged for MS/BS deficiencies elsewhere in this report.

6. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

MSs were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria, except as noted below.

Table 7. Metal Data Qualifiers Due to MS/MSD Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS112R3	Antimony	MS/BS	4.2 UG
MWCS112R4	Antimony	MS/BS	3.7 UG
MWCA112R5	Antimony	MS/BS	3.6 UG
MWCS113R3B	Antimony	MS/BS	28.5 G
MWCS113R5	Antimony	MS/BS	15.9 G
MWCS157R3	Antimony	MS/BS	4.5 UG

Discussion: Antimony was out of the acceptance criteria of 75 to 125 percent at 52 percent in the MS. Since the BS recovery was also low, the associated results for Samples MWCS112R3, MWCS112R4, MWCS112R5, MWCS113R3B, MWCS113R5, and MWCS157R3 have been flagged with a "G" or "UG" to indicate that the reporting limit is greater than the minimum shown.

The post digestion spike for nickel was out of criteria, but since the MS was acceptable, no data qualifier flags are recommended.

The MS recovery for arsenic and mercury were out of criteria due to high concentrations of analytes in the original sample. Since all other QC checks were in criteria, no data qualifier flags are recommended.

7. Field Duplicates

No field duplicates were identified with this group of samples.

8. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPD were within QAPP criteria, except as noted below.

Table 8. Metal Data Qualifiers Due to Duplicate Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS113R3B	Antimony	Precision	28.5 E
MWCS113R5	Antimony	Precision	15.9 E

Discussion: Antimony was out of the criteria of less than 20 percent at 36.6 percent in the sample duplicate set. The associated positive results for Samples MWCS113R3B and MWCS113R5 have been flagged "E" to indicate an estimated value.

9. ICP Serial Dilution

Samples that were a factor of 50 above the instrument detection limit (IDL) for the analyte were diluted five-fold and were within criteria required by the referenced method, except as noted below.

Table 9. Metal Data Qualifiers Due to ICP Serial Dilution Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS112R3	Cadmium	Serial Dilution	0.90 E
MWCS112R3	Nickel	Serial Dilution	12.7 E
MWCS112R3	Zinc	Serial Dilution	160 E
MWCS112R4	Nickel	Serial Dilution	8.7 E
MWCS112R4	Zinc	Serial Dilution	22.7 E
MWCS112R5	Nickel	Serial Dilution	7.2 E
MWCS112R5	Zinc	Serial Dilution	17.4 E
MWCS113R3B	Cadmium	Serial Dilution	2.5 E
MWCS113R3B	Nickel	Serial Dilution	17.4 E
MWCS113R3B	Zinc	Serial Dilution	954 E
MWCS113R5	Cadmium	Serial Dilution	7.0 E
MWCS113R5	Nickel	Serial Dilution	15.8 E
MWCS113R5	Zinc	Serial Dilution	1710 E
MWCS157R3	Cadmium	Serial Dilution	1.2 E

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS157R3	Nickel	Serial Dilution	12.3 E
MWCS157R3	Zinc	Serial Dilution	123 E

Discussion: A serial dilution of cadmium, nickel, and zinc had percent differences greater than the acceptance criteria of ±10 percent. The associated results for Samples MWCS112R3, MWCS112R4, MWCS1125, MWCS113R3B, MWCS113R5, and MWCS157R3 have been flagged "E" to indicate an estimated value.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using external standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract, except as noted below.

Discussion: The reporting limit for lead failed to meet the requirement of 0.5 mg/kg that was listed in the QAPP. However, most field samples had positive results. For samples that were non-detect, the laboratory's reporting limit of 1.5 mg/kg was less than the Sediment Quality Standard Criteria of 450 mg/kg and the Sediment Impact Zone and Clean-up Criteria of 530 mg/kg, and no data qualifier flags are recommended.

11. Graphite Furnace Atomic Absorption Analysis

All special criteria for graphite furnace atomic absorption (GFAA) analysis were performed at a frequency required by the referenced method and was within established criteria.

12. Laboratory Contact

There was no verbal or written communication with the laboratory.

13. Other Comments

None.

14. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

F. Review of Conventional Analyses

Percent Moisture

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer.

2. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met, including the number of standards used and the correlation coefficients. All continuing calibration criteria, including frequency of analysis and percent recovery were met.

3. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no analytes were detected or levels were below the reporting limit.

4. Laboratory Control Standards

Not applicable for this analysis.

5. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

Not applicable for this analysis.

6. Sample Duplicates

Sample duplicates were analyzed as required by the referenced method and all RPD were within laboratory or method criteria.

7. Field Duplicates

No field duplicates were identified with this group of samples.

8. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate standardization. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

9. Laboratory Contact

There was no verbal or written communication with the laboratory.

10. Other Comments

None.

11. Data Use and Overall Assessment

The data are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

Attachment 1 Puget Sound Estuary Program Data Qualifier Definitions

Used for both organics and inorganic analyses

B = Analyte detected in samples and in method blank

C = Combined with unresolved substances

E = Estimated

G = Value greater than minimum shown

K = Detected at less than the maximum shown

L = Value less than the maximum shown

M = Value is a mean

Q = Questionable value

R = Rejected or unusable value

T = Detected below the quantification limit shown

U = Undetected at the detection limit shown

Z = Blank corrected

Attachment 2 Summary Table of Data Qualifier Flags

Foster Wheeler Environmental
Project: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: October 2, 1999

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCS113R3B	Fluoranthene	Continuing Calibration % D >20	9200 L
MWCS113R3B	Pyrene	Continuing Calibration % D >20	5500 E
MWCS113R3B	Benzo(b)fluoranthene	Continuing Calibration % D >20	3500 L
MWCS113R3B	Benzo(k)fluoranthene	Continuing Calibration % D >20	3500 L
MWCS113R3B	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	840 E
MWCS113R3B	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	250 E
MWCS113R3B	Benzo(g,h,i)perylene	Continuing Calibration % D >20	830 E
MWCS113R5B	Fluoranthene	Continuing Calibration % D >20	11000 L
MWCS113R5B	Pyrene	Continuing Calibration % D >20	4300 G
MWCS113R5B	Benzo(b)fluoranthene	Continuing Calibration % D >20	4100 L
MWCS113R5B	Benzo(k)fluoranthene	Continuing Calibration % D >20	3300 L
MWCS113R5B	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	690 G
MWCS113R5B	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	260 G
MWCS113R5B	Benzo(g,h,i)perylene	Continuing Calibration % D >20	650 G
MWCS112R5	Pyrene	Continuing Calibration % D >20	72 UG
MWCS112R5	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	72 UG
MWCS112R5	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	72 UG
MWCS112R5	Benzo(g,h,i)perylene	Continuing Calibration % D >20	72 UG
MWCS112R4	Pyrene	Continuing Calibration % D >20	72 UG
MWCS112R4	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	72 UG
MWCS112R4	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	72 UG
MWCS112R4	Benzo(g,h,i)perylene	Continuing Calibration % D >20	72 UG
MWCS112R3	Fluoranthene	Continuing Calibration % D >20	11000 L
MWCS112R3	Pyrene	Continuing Calibration % D >20	5300 E
MWCS112R3	Benzo(b)fluoranthene	Continuing Calibration % D >20	3900 L
MWCS112R3	Benzo(k)fluoranthene	Continuing Calibration % D >20	3200 L
MWCS112R3	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	680 G
MWCS112R3	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	230 G
MWCS112R3	Benzo(g,h,i)perylene	Continuing Calibration % D >20	630 G

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCS157R3	Fluoranthene	Continuing Calibration % D >20	6500 L
MWCS157R3	Pyrene	Continuing Calibration % D >20	4100 G
MWCS157R3	Benzo(b)fluoranthene	Continuing Calibration % D >20	1800 L
MWCS157R3	Benzo(k)fluoranthene	Continuing Calibration % D >20	1700 L
MWCS157R3	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	320 G
MWCS157R3	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	96 G
MWCS157R3	Benzo(g,h,i)perylene	Continuing Calibration % D >20	370 G
MWCS114R4	Fluoranthene	Continuing Calibration % D >20	630 L
MWCS114R4	Pyrene	Continuing Calibration % D >20	440 G
MWCS114R4	Benzo(b)fluoranthene	Continuing Calibration % D >20	170 L
MWCS114R4	Benzo(k)fluoranthene	Continuing Calibration % D >20	210 L
MWCS114R4	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	68 UG
MWCS114R4	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	68 UG
MWCS114R4	Benzo(g,h,i)perylene	Continuing Calibration % D >20	68 UG
MWCS114R3	Fluoranthene	Continuing Calibration % D >20	3300 E
MWCS114R3	Pyrene	Continuing Calibration % D >20	1800G
MWCS114R3	Benzo(b)fluoranthene	Continuing Calibration % D >20	840 L
MWCS114R3	Benzo(k)fluoranthene	Continuing Calibration % D >20	780 L
MWCS114R3	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >20	76 UG
MWCS114R3	Dibenzo(a,h)anthracene	Continuing Calibration % D >20	76 UG
MWCS114R3	Benzo(g,h,i)perylene	Continuing Calibration % D >20	190 G
MWCS114R3	Naphthalene	Surrogate	1100 G
MWCS114R3	2-Methylnaphthalene	Surrogate	300 G
MWCS114R3	Acenaphthylene	Surrogate	640 G
MWCS114R3	Acenaphthene	Surrogate	290 G
MWCS114R3	Fluorene	Surrogate	430 G
MWCS114R3	Phenanthrene	Surrogate	1400 G
MWCS114R3	Anthracene	Surrogate	680 G
MWCS114R3	Fluoranthene	Surrogate	3300 E
MWCS114R3	Pyrene	Surrogate	1800 G
MWCS114R3	Benzo(a)anthracene	Surrogate	600 G
MWCS114R3	Chrysene	Surrogate	700 G
MWCS114R3	Benzo(b)fluoranthene	Surrogate	840 E
MWCS114R3	Benzo(k)fluoranthene	Surrogate	780 E
MWCS114R3	Benzo(a)pyrene	Surrogate	800 G
MWCS114R3	Indeno(1,2,3-cd)pyrene	Surrogate	76 UG
MWCS114R3	Dibenz(a,h)anthracene	Surrogate	76 UG
MWCS114R3	Benzo(g,h,i)perylene	Surrogate	190 G
MWCS113R3B	Naphthalene	Surrogate	1500 L

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCS113R3B	2-Methylnaphthalene	Surrogate	510 L
MWCS113R3B	Acenaphthylene	Surrogate	2000 L
MWCS113R3B	Acenaphthene	Surrogate	530 L
MWCS113R3B	Fluorene	Surrogate	650 L
MWCS113R3B	Phenanthrene	Surrogate	3200 L
MWCS113R3B	Anthracene	Surrogate	1600 L
MWCS113R3B	Fluoranthene	Surrogate	9200 L
MWCS113R3B	Pyrene	Surrogate	5500 E
MWCS113R3B	Benzo(a)anthracene	Surrogate	2900 L
MWCS113R3B	Chrysene	Surrogate	3200 L
MWCS113R3B	Benzo(b)fluoranthene	Surrogate	3500 L
MWCS113R3B	Benzo(k)fluoranthene	Surrogate	3500 L
MWCS113R3B	Benzo(a)pyrene	Surrogate	3600 L
MWCS113R3B	Indeno(1,2,3-cd)pyrene	Surrogate	840 E
MWCS113R3B	Dibenz(a,h)anthracene	Surrogate	250 E
MWCS113R3B	Benzo(g,h,i)perylene	Surrogate	830 E
MWCS112R3	Naphthalene	Surrogate	1600L
MWCS112R3	2-Methylnaphthalene	Surrogate	600 L
MWCS112R3	Acenaphthylene	Surrogate	1400 L
MWCS112R3	Acenaphthene	Surrogate	840 L
MWCS112R3	Fluorene	Surrogate	1200 L
MWCS112R3	Phenanthrene	Surrogate	5000 L
MWCS112R3	Anthracene	Surrogate	2400 L
MWCS112R3	Fluoranthene	Surrogate	11000 L
MWCS112R3	Pyrene	Surrogate	5300 E
MWCS112R3	Benzo(a)anthracene	Surrogate	3000 L
MWCS112R3	Chrysene	Surrogate	3600 L
MWCS112R3	Benzo(b)fluoranthene	Surrogate	3900 L
MWCS112R3	Benzo(k)fluoranthene	Surrogate	3200 L
MWCS112R3	Benzo(a)pyrene	Surrogate	3500 L
MWCS112R3	Indeno(1,2,3-cd)pyrene	Surrogate	680 E
MWCS112R3	Dibenz(a,h)anthracene	Surrogate	230 E
MWCS112R3	Benzo(g,h,i)perylene	Surrogate	630 E
MWCS112R5	Indeno(1,2,3-cd)pyrene	MS/MSD	72 UG
MWCS112R5	Dibenzo(a,h,)anthracene	MS/MSD	72 UG
MWCS112R5	Benzo(g,h,i)perylene	MS/MSD	72 UG
MWCS157R3	Phenol	BS/BSD, MS/MSD	130 L
MWCS157R3	2-Methylphenol	BS/BSD, MS/MSD	22 UG
MWCS157R3	4-Methylphenol	BS/BSD, MS/MSD	92 G

Sample ID	Target Compound Affected	Type of Deviation	Qualifier
MWCS157R3	2,4-Dimethylphenol	BS/BSD, MS/MSD	41 G
MWCS114R3	Mercury	Sample value within 5 times of blank contamination	0.42 B
MWCS112R3	Antimony	MS/BS	4.2 UG
MWCS112R4	Antimony	MS/BS	3.7 UG
MWCA112R5	Antimony	MS/BS	3.6 UG
MWCS113R3B	Antimony	MS/BS	28.5 G
MWCS113R5	Antimony	MS/BS	15.9 G
MWCS157R3	Antimony	MS/BS	4.5 UG
MWCS113R3B	Antimony	Precision	28.5 E
MWCS113R5	Antimony	Precision	15.9 E
MWCS112R3	Cadmium	Serial Dilution	0.90 E
MWCS112R3	Nickel	Serial Dilution	12.7 E
MWCS112R3	Zinc	Serial Dilution	160 E
MWCS112R4	Nickel	Serial Dilution	8.7 E
MWCS112R4	Zinc	Serial Dilution	22.7 E
MWCS112R5	Nickel	Serial Dilution	7.2 E
MWCS112R5	Zinc	Serial Dilution	17.4 E
MWCS113R3B	Cadmium	Serial Dilution	2.5 E
MWCS113R3B	Nickel	Serial Dilution	17.4 E
MWCS113R3B	Zinc	Serial Dilution	954 E
MWCS113R5	Cadmium	Serial Dilution	7.0 E
MWCS113R5	Nickel	Serial Dilution	15.8 E
MWCS113R5	Zinc	Serial Dilution	1710 E
MWCS157R3	Cadmium	Serial Dilution	1.2 E
MWCS157R3	Nickel	Serial Dilution	12.3 E
MWCS157R3	Zinc	Serial Dilution	123 E

Attachment 3 Revised Laboratory Forms

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS113R3B

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910071

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910071-1

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1704

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 49 decanted: (Y/N) Y Date Extracted: 11/03/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/27/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
91-20-3	Naphthalene	1500		L
91-57-6	2-Methylnaphthalene	510		
208-96-8	Acenaphthylene	2000		
83-32-9	Acenaphthene	530		
86-73-7	Fluorene	650		
85-01-8	Phenanthrene	3200	D0	
120-12-7	Anthracene	1600		
206-44-0	Fluoranthene	9200	D0	L
129-00-0	Pyrene	5500	D0	E
56-55-3	Benzo(a)anthracene	2900	D0	L
218-01-9	Chrysene	3200	D0	
205-99-2	Benzo(b)fluoranthene	3500	D0	
207-08-9	Benzo(k)fluoranthene	3500	D0	
50-32-8	Benzo(a)pyrene	3600	D0	
193-39-5	Indeno(1,2,3-cd)pyrene	840		E
53-70-3	Dibenzo(a,h)anthracene	250		
191-24-2	Benzo(g,h,i)perylene	830		

D0 - Result reported from an 8 fold dilution (P1681.D)

lc/QBD
1/17/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS113R5B

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910071

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910071-2

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1703

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 51 decanted: (Y/N) Y Date Extracted: 11/03/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/27/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
91-20-3	Naphthalene	860		
91-57-6	2-Methylnaphthalene	340		
208-96-8	Acenaphthylene	1000		
83-32-9	Acenaphthene	590		
86-73-7	Fluorene	740		
85-01-8	Phenanthrene	3100	D3	
120-12-7	Anthracene	1400		
206-44-0	Fluoranthene	11000	D4	L
129-00-0	Pyrene	4300	D3	G
56-55-3	Benzo(a)anthracene	2700	D3	
218-01-9	Chrysene	3200	D3	
205-99-2	Benzo(b)fluoranthene	4100	D3	L
207-08-9	Benzo(k)fluoranthene	3300	D3	L
50-32-8	Benzo(a)pyrene	3000	D3	
193-39-5	Indeno(1,2,3-cd)pyrene	690		G
53-70-3	Dibenzo(a,h)anthracene	260		G
191-24-2	Benzo(g,h,i)perylene	650		G

D3 - Result reported from a 5 fold dilution (P1678.D)

D4 - Result reported from a 10 fold dilution (P1701.D)

12/5/99
1/13/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWCS112R5

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910071

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910071-3

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1672

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 26 decanted: (Y/N) Y Date Extracted: 11/03/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/24/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
91-20-3	Naphthalene	72	U	
91-57-6	2-Methylnaphthalene	72	U	
208-96-8	Acenaphthylene	72	U	
83-32-9	Acenaphthene	72	U	
86-73-7	Fluorene	72	U	
85-01-8	Phenanthrene	72	U	
120-12-7	Anthracene	72	U	
206-44-0	Fluoranthene	72	U	
129-00-0	Pyrene	72	U	G
56-55-3	Benzo(a)anthracene	72	U	
218-01-9	Chrysene	72	U	
205-99-2	Benzo(b)fluoranthene	72	U	
207-08-9	Benzo(k)fluoranthene	72	U	
50-32-8	Benzo(a)pyrene	72	U	
193-39-5	Indeno(1,2,3-cd)pyrene	72	U	G
53-70-3	Dibenzo(a,h)anthracene	72	U	G
191-24-2	Benzo(g,h,i)perylene	72	U	G

12/6/00-
11/15/00
12/5/99

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS112R4

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910071

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910071-4

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1675

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 26 decanted: (Y/N) Y Date Extracted: 11/03/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/24/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
91-20-3	Naphthalene	72	U	
91-57-6	2-Methylnaphthalene	72	U	
208-96-8	Acenaphthylene	72	U	
83-32-9	Acenaphthene	72	U	
86-73-7	Fluorene	72	U	
85-01-8	Phenanthrene	72	U	
120-12-7	Anthracene	72	U	
206-44-0	Fluoranthene	72	U	
129-00-0	Pyrene	72	U	G
56-55-3	Benzo(a)anthracene	72	U	
218-01-9	Chrysene	72	U	
205-99-2	Benzo(b)fluoranthene	72	U	
207-08-9	Benzo(k)fluoranthene	72	U	
50-32-8	Benzo(a)pyrene	72	U	
193-39-5	Indeno(1,2,3-cd)pyrene	72	U	G
53-70-3	Dibenzo(a,h)anthracene	72	U	G
191-24-2	Benzo(g,h,i)perylene	72	U	G

CR/QBD
1/13/00
12/5/95

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO. 108

MWCS112R3 ✓

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910071

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910071-5 ✓

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1705 ✓

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 36 ✓ decanted: (Y/N) Y Date Extracted: 11/03/99 ✓

Concentrated Extract Volume: 1000(uL) ✓ Date Analyzed: 11/27/99 ✓

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y ✓ pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG ✓	Q	
91-20-3	Naphthalene	1600		L
91-57-6	2-Methylnaphthalene	600		
208-96-8	Acenaphthylene	1400		
83-32-9	Acenaphthene	840		
86-73-7	Fluorene	1200		
85-01-8	Phenanthrene	5000	D3	
120-12-7	Anthracene	2400	D3	
206-44-0	Fluoranthene	11000	D5	
129-00-0	Pyrene	5300	D3 ✓	E
56-55-3	Benzo(a)anthracene	3000	D3	L
218-01-9	Chrysene	3600	D3 ✓	
205-99-2	Benzo(b)fluoranthene	3900	D3	
207-08-9	Benzo(k)fluoranthene	3200	D3	
50-32-8	Benzo(a)pyrene	3500	D3	
193-39-5	Indeno(1,2,3-cd)pyrene	680		E
53-70-3	Dibenzo(a,h)anthracene	230		
191-24-2	Benzo(g,h,i)perylene	630		

D3 - Result reported from a 5 fold dilution (P1680.D) ✓

D5 - Result reported from a 20 fold dilution (P1700.D) ✓

RL/QBD
1/17/00

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS157R3

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910071

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910071-6

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1702

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 40 decanted: (Y/N) Y Date Extracted: 11/03/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/27/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
91-20-3	Naphthalene	2000	D3	
91-57-6	2-Methylnaphthalene	540		
208-96-8	Acenaphthylene	1300		
83-32-9	Acenaphthene	580		
86-73-7	Fluorene	810		
85-01-8	Phenanthrene	3200	D3	
120-12-7	Anthracene	1400		
206-44-0	Fluoranthene	6500	D3	L
129-00-0	Pyrene	4100	D3	G
56-55-3	Benzo(a)anthracene	1300		
218-01-9	Chrysene	1400		
205-99-2	Benzo(b)fluoranthene	1800	D3	L
207-08-9	Benzo(k)fluoranthene	1700	D3	L
50-32-8	Benzo(a)pyrene	1700		
193-39-5	Indeno(1,2,3-cd)pyrene	320		G
53-70-3	Dibenzo(a,h)anthracene	96		G
191-24-2	Benzo(g,h,i)perylene	370		G

D3 - Result reported from a 5 fold dilution (P1679.D)

ld/QBD 1/13/99 1/6/99

00183

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS114R4 ✓

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910071

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910071-7 ✓

Sample wt/vol: 75.0 ✓ (g/mL) G Lab File ID: P1676 ✓

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 22 ✓ decanted: (Y/N) Y Date Extracted: 11/03/99 ✓

Concentrated Extract Volume: 1000(uL) ✓ Date Analyzed: 11/24/99 ✓

Injection Volume: 2.0(uL) Dilution Factor: 1.0 ✓

GPC Cleanup: (Y/N) Y ✓ pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG ✓	Q	
91-20-3	Naphthalene	720		
91-57-6	2-Methylnaphthalene	210		
208-96-8	Acenaphthylene	280		
83-32-9	Acenaphthene	130		
86-73-7	Fluorene	160		✓
85-01-8	Phenanthrene	570		
120-12-7	Anthracene	240		
206-44-0	Fluoranthene	630		L
129-00-0	Pyrene	440		Q
56-55-3	Benzo(a)anthracene	270		
218-01-9	Chrysene	250		
205-99-2	Benzo(b)fluoranthene	170		L
207-08-9	Benzo(k)fluoranthene	210		✓
50-32-8	Benzo(a)pyrene	250		
193-39-5	Indeno(1,2,3-cd)pyrene	68	U	Q
53-70-3	Dibenzo(a,h)anthracene	68	U	Q
191-24-2	Benzo(g,h,i)perylene	68	U	Q

CL/QBD
1/13/00
12/5/99

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
MWCS114R3

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 910071

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910071-8

Sample wt/vol: 75.0 (g/mL) G Lab File ID: P1677

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 30 decanted: (Y/N) Y Date Extracted: 11/03/99

Concentrated Extract Volume: 2000(uL) Date Analyzed: 11/25/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG		Q
91-20-3	Naphthalene	1100		G
91-57-6	2-Methylnaphthalene	300		
208-96-8	Acenaphthylene	640		
83-32-9	Acenaphthene	290		
86-73-7	Fluorene	430		
85-01-8	Phenanthrene	1400		
120-12-7	Anthracene	680		
206-44-0	Fluoranthene	3300		E
129-00-0	Pyrene	1800		G
56-55-3	Benzo(a)anthracene	600		G
218-01-9	Chrysene	700		G
205-99-2	Benzo(b)fluoranthene	840		E
207-08-9	Benzo(k)fluoranthene	780		E
50-32-8	Benzo(a)pyrene	800		G
193-39-5	Indeno(1,2,3-cd)pyrene	76	U	G
53-70-3	Dibenzo(a,h)anthracene	76	U	G
191-24-2	Benzo(g,h,i)perylene	190		G

CL/QBD 1/13/00

12/5/99

FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MWCS157R3

Lab Name: MULTICHEM ANALYTICAL SERV Contract:

Lab Code: MAS Case No.: SAS No.: SDG No.: 910071

Matrix: (soil/water) SEDIMENT Lab Sample ID: 910071-6

Sample wt/vol: 75.0 (g/mL) G Lab File ID: J6252

Level: (low/med) LOW Date Collected: 10/02/99

% Moisture: 41 decanted: (Y/N) Y Date Extracted: 11/03/99

Concentrated Extract Volume: 1000(uL) Date Analyzed: 11/23/99

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
108-95-2	Phenol	130		L
100-51-6	Benzyl alcohol	45	UX	
95-48-7	2-Methylphenol	22	U	G
106-44-5	4-Methylphenol	92	X	G
105-67-9	2,4-Dimethylphenol	41		G
65-85-0	Benzoic acid	270	U	
87-86-5	Pentachlorophenol	22	U	

X = Value reported from reanalysis
X Data file = >J6283

11/11/00

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS112R3

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910071

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910071-5

% Solids: 64.4

Date Received: 10/26/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	4.2	U	*	P	G
7440-38-2	Arsenic	21.7			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.90			P	E
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	297			P	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	5.7			CV	
7440-02-0	Nickel	12.7			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.84	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	160		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: BROWN Texture: MEDIUM

Color After: BROWN Clarity After: BROWN Artifacts: _____

Comments:

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1/17/00

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS112R4

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910071

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910071-4

% Solids: 73.9

Date Received: 10/26/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	3.7	U	*	P	G
7440-38-2	Arsenic	1.7		S	F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.37	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	18.4			P	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.14	U		CV	
7440-02-0	Nickel	8.7			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.74	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	22.7		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: BROWN Texture: MEDIUM

Color After: BROWN Clarity After: BROWN Artifacts: _____

Comments:

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS112R5

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910071

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910071-3

% Solids: 73.8

Date Received: 10/26/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	3.6	U	*	P	G
7440-38-2	Arsenic	1.4			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	0.36	U		P	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	13.7			P	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.13	U		CV	
7440-02-0	Nickel	7.2			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.71	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	17.4		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: BROWN Texture: MEDIUM

Color After: BROWN Clarity After: BROWN Artifacts: _____

Comments:

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1/17/00

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS113R3B

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910071

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910071-1

% Solids: 51.0

Date Received: 10/26/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	28.5		*	P	G
7440-38-2	Arsenic	155			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	2.5			P	E
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	891			P	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	7.1			CV	
7440-02-0	Nickel	17.4			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	2.9			P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	954		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: BROWN Texture: MEDIUM

Color After: BROWN Clarity After: BROWN Artifacts: _____

Comments:

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1/17/00

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS113R5

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910071

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910071-2

% Solids: 49.3

Date Received: 10/26/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	15.9		*	P	G
7440-38-2	Arsenic	80.6			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	7.0			P	E
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	1340			P	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	16.7			CV	
7440-02-0	Nickel	15.8			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	13.6			P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	1710		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: BROWN Texture: MEDIUM

Color After: BROWN Clarity After: BROWN Artifacts: _____

Comments:

FORM I - IN

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1/11/00

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS114R3

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910071

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910071-8

% Solids: 70.0

Date Received: 10/26/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic				NR	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.42			CV	B
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
	Cyanide				NR	

Color Before: BROWN Clarity Before: BROWN Texture: MEDIUM

Color After: BROWN Clarity After: BROWN Artifacts: _____

Comments:

FORM I - IN

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1/17/00

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS113R3B

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910059

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910071-1

% Solids: 51.0

Date Received: 10/27/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	28.5		*	P	E
7440-38-2	Arsenic	155			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	2.5			P	E
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	891			P	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	7.1			CV	
7440-02-0	Nickel	17.4			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	2.9			P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	954		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

LL/QBD
1/17/00

INORGANICS SW-846

1

INORGANIC ANALYSIS DATA SHEET

CLIENT ID

MWCS157R3

Lab Name: MULTICHEM ANALYTICAL SERVICES

SDG No.: 910071

Matrix (soil/water): SEDIMENT

Lab Sample ID: 910071-6

% Solids: 59.9

Date Received: 10/26/99

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony	4.5	U	*	P	G
7440-38-2	Arsenic	13.5			F	
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium	1.2			P	E
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper	216			P	
7439-89-6	Iron				NR	
7439-92-1	Lead				NR	
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	2.2			CV	
7440-02-0	Nickel	12.3			P	E
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver	0.90	U		P	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc	123		E	P	E
	Cyanide				NR	

Color Before: BROWN Clarity Before: BROWN Texture: MEDIUM

Color After: BROWN Clarity After: BROWN Artifacts:

Comments:

FORM I - IN

CO/QBD
1/11/00

EPA Level 2
DATA VALIDATION REPORT

Project Name: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: October 2, 1999
SDG: 912040

Prepared by

Foster Wheeler Environmental
10900 NE 8th St.
Bellevue, WA 98004

Reviewed and approved,

Sherri L Woodrich 2/7/00
Date

Contents

A. Introduction 1
B. Chain-of-Custody 5
C. Review of GC/MS Semivolatiles Analyses 6

Tables

Table 1. Sample Identification and Analysis 4
Table 2. SVOC Data Qualifiers Due to Calibration Deviations 7

Attachments

Attachment 1 Data Flag Definitions
Attachment 2 Summary Table of Data Qualifier Flags
Attachment 3 Communications with the Laboratory
Attachment 4 Revised Laboratory Forms

A. Introduction

Foster Wheeler Environmental has completed an EPA Level 2 Data Validation on the submitted data package.

The reporting format and criteria for recommending data qualifying flags for this data set are described in the EPA *"Functional Guidelines for Evaluating Organics Analyses"* as revised, October 1999; and "*Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound"* ("PSEP Protocols"), May, 1997; or using criteria listed in the method referenced. Data may be qualified for any of the following reasons:

1. By the laboratory prior to receipt by the reviewer
2. Because of laboratory deviation from the designated method
3. Because the data may not meet the criteria listed in the reference above
4. By the professional judgment of the reviewer.

The data set consists of one data package from Multichem Analytical Services in Renton, Washington, and contains data for the samples shown in Table 1. Mark Herrenkohl of Foster Wheeler was the data reviewer for this data package.

The data set includes an analytical data package for each sample, copies of the completed chain-of-custody (COC) forms, and a quality control (QC) data package. The analytical data package includes analytical results, blank sample results, both laboratory and client sample identifications, appropriate dates but not times, method reporting limits, method references, surrogate recoveries as appropriate, the laboratory's name and address, and the initials of the person releasing the data. The custody forms include the receipt of the sample but not the laboratory's internal tracking. The QC data package includes a tabular list of the laboratory's sample identification, spiking concentrations, recoveries, percentage calculations, and acceptance windows.

Raw data were provided which includes chromatograms, instrument print outs, injection logs, digestion/preparation logs.

This data validation report consists of several sections, each of which are formatted to follow Functional Guidelines, but which also include subsections discussing Foster Wheeler contacts with the laboratory, other comments, and a summary table of data qualifiers.

Table 1. Sample Identification and Analysis

Sample Identification	Laboratory Identification	Method 8270
MWCS113R6B	912040-1	X
MWCS157R4	912040-2	X
MWCS157R6	912040-3	X
MWCS157R5	912040-4	X

Key: Method 8270 = Semivolatile organic compounds by gas chromatography/mass spectroscopy (8270-SIM for Acid Fraction and 8270 for Base/Neutral Fraction)

B. Chain-of-Custody

The analytical data package was reviewed and compared against the chain-of-custody (COC) form. Samples were collected on October 2, 1999 by Foster Wheeler and archived frozen at MultiChem. Gary Braun of Foster Wheeler, telephoned MultiChem on December 22, 1999 and requested that these four samples be pulled from archive and analyzed for target compounds using SW8270. The laboratory removed the frozen samples from their freezer on December 29, 1999. All tests requested verbally were performed by the laboratory.

C. Review of GC/MS Semivolatiles Analyses

EPA Method 8270

1. Timeliness and a Check for Errors

The analytical plan and the data packages were reviewed and compared against the COC and other data. All samples were properly preserved and analyzed within the technical holding times. There are no contractual deviations that have been brought to the attention of the reviewer, except as noted below.

Discussion: Holding times were met for all samples. The Dredged Material Management Program (DMMP) recognizes a holding time of one year for frozen samples. Once unfrozen, samples are to be extracted within 14 days and analyzed within 40 days. Samples were extracted on December 29, 1999; within 14 days of being taken out of archive (frozen). Analysis took place on January 19, 2000 for the acid fraction and January 13, 2000 for the base/neutral fraction; both within 40 days of archival.

2. GC/MS Tuning (Instrument Performance Check)

All decafluorotriphenylphosphine (DFTPP) tune criteria were met for the initial and continuing calibration for all dates of sample analysis.

3. Initial and Continuing Calibration

All initial and continuing calibration quality control criteria were met. No target compound list (TCL) analytes had percent relative standard deviations (%RSD) greater than allowed by the method for the initial calibration (<30%) or percent difference for the continuing calibration checks (±20%). All system performance check compound (SPCC) and calibration check compound (CCC) criteria were met, except as noted below.

Table 3. SVOC Data Qualifiers Due to Calibration Deviations

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS113R6B	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >±20	1300 G
MWCS113R6B	Benzo(g,h,i)perylene	Continuing Calibration % D >±20	1400 G
MWCS157R4	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >±20	230 G
MWCS157R4	Benzo(g,h,i)perylene	Continuing Calibration % D >±20	280 G
MWCS157R6	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >±20	120 G
MWCS157R6	Benzo(g,h,i)perylene	Continuing Calibration % D >±20	110 G
MWCS157R5	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >±20	240 G
MWCS157R5	Benzo(g,h,i)perylene	Continuing Calibration % D >±20	240 G

Discussion: The continuing calibration for several target compounds had percent differences out of the criteria of ±20 percent. The associated positive results in all samples have been flagged appropriately. If the results indicated a decrease in sensitivity, the results were flagged with "L" and if the results indicated an increase in sensitivity, the results were flagged with "G".

4. Blanks and Checks for Contamination

Instrument and method blank analyses were performed at the required frequencies and either no target analytes were detected or levels were below the reporting limit.

5. Surrogate Recovery

Surrogate analytes were added to all samples and blanks as required by the referenced method and all recoveries were within QAPP criteria.

Discussion: In Samples MWCS157R4, MWCS157R5, and the extraction blank, a single surrogate (acid fraction) was out of criteria. No data qualifier flags are recommended because all other surrogates were in criteria.

6. Laboratory Control Standards

The laboratory analyzed a second source sample with the analytical batch. The laboratory referred to this sample as a blank spike/blank spike duplicate (BS/BSD) rather than a laboratory control standard (LCS). Any anomalies or comments regarding the second source results are addressed in the next section.

7. Matrix Spike/Matrix Spike Duplicates and Blank Spike/Blank Spike Duplicates

Matrix spike (MS) and matrix spike duplicates (MSD) were analyzed as required by the referenced method and all percent recoveries and RPD were within QAPP criteria.

Discussion: The BS and BSD recoveries for 2,4-dimethylphenol and BSD recovery for 2-methylphenol and 4-methylphenol were out of criteria. The RPD's for phenol, 2-methylphenol, and 4-methylphenol were out of criteria. Since the recoveries and RPD's of these analytes were acceptable in the MS/MSD, no data qualifier flags are recommended.

The RPD for pentachlorophenol was out of criteria for the MS/MSD pair. Since the corresponding BS/BSD had acceptable RPD, no data qualifiers are recommended.

The MS recovery for fluorene, phenanthrene, benzo(b)fluoranthene, benzo(a)pyrene and benzo(g,h,i)perylene were out of criteria in the MS/MSD pair. The MSD recovery fluorene, phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, and benzo(a)pyrene were out of criteria in the MS/MSD pair. Since the corresponding BS/BSD had acceptable recovery for these analytes, no data qualifier flags are recommended for both accuracy (percent recovery) and precision (%RPD).

8. Internal Standards Performance for Samples

All internal standard areas were within the required control limits, except as noted below.

Discussion: As noted by the laboratory, internal standards were out of acceptance criteria for some of the samples. The samples were reanalyzed and the compounds associated with the internal standards were reported from the reanalysis where the internal standard was within acceptance criteria. The reviewer concurs that reporting the diluted values was appropriate and no data qualifier flags are recommended. The laboratory should be commended for tracking this problem and taking corrective action.

9. Field Duplicates

No field duplicates were identified with this group of samples.

10. Compound Quantitation and Reported Detection Limits

Quantitation was performed in accordance with the referenced method, including the correct calculations using appropriate internal standards. Quantitation was reviewed against contract requirements to determine that results were reported on a dry-weight basis, that no results exceeded the highest calibration standard, and that dilutions were performed and calculated appropriately. Reporting limits have been correctly adjusted for dilutions and extraction amounts. No errors in accuracy or methodology were found. The reporting limits meet the requirements of the contract.

11. System Performance

The analytical system performance was acceptable and had no significant problems such as baseline shifts, loss of resolution, or peak tailing.

12. TCL Compound Identification

All target compound identifications met the criteria for retention times and peak identification of the referenced method.

13. Tentatively Identified Compounds

No TICs were reported with this data set.

14. Laboratory Contact

There was no verbal or written communication with the laboratory.

15. Other Comments

None.

16. Data Use and Overall Assessment

The data, as qualified, are acceptable for use. The analyses were generally within the requirements of the referenced method and no discrepancies were observed between raw data and reported data results. All data flags are summarized at the end of this report.

Attachment 1 Puget Sound Estuary Program Data Qualifier Definitions

Used for both organics and inorganic analyses

B = Analyte detected in samples and in method blank

C = Combined with unresolved substances

E = Estimated

G = Value greater than minimum shown

K = Detected at less than the maximum shown

L = Value less than the maximum shown

M = Value is a mean

Q = Questionable value

R = Rejected or unusable value

T = Detected below the quantification limit shown

U = Undetected at the detection limit shown

Z = Blank corrected

Attachment 2 Summary Table of Data Qualifier Flags

Foster Wheeler Environmental

Project: Middle Waterway
Type of Samples: Sediments
Dates of Sampling: October 2, 1999

Sample ID	Target Compound Affected	Type of Deviation	Flag
MWCS113R6B	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >±20	1300 G
MWCS113R6B	Benzo(g,h,i)perylene	Continuing Calibration % D >±20	1400 G
MWCS157R4	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >±20	230 G
MWCS157R4	Benzo(g,h,i)perylene	Continuing Calibration % D >±20	280 G
MWCS157R6	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >±20	120 G
MWCS157R6	Benzo(g,h,i)perylene	Continuing Calibration % D >±20	110 G
MWCS157R5	Indeno(1,2,3-cd)pyrene	Continuing Calibration % D >±20	240 G
MWCS157R5	Benzo(g,h,i)perylene	Continuing Calibration % D >±20	240 G

Supplemental Communications

Records for Round 1B

Middle Waterway

Quality by Design
29 Shipman Street, Suite 101
Hilo, Hawaii 96720
Phone: 808/969-9424 Fax: 808/969-9094
e-mail: qbdhilo@gte.net

Date: January 3, 2000 Fax #: 425/228-8336

To: MultiChem Analytical Services
Attn: Dave Wunderlich

From: Thomas Davis
Total pages, including this one: 12

Here are the chromatograms that we discussed on phone today. All of these are continuing calibration checks for SDG 909056, but have also been used for other SDGs in the same project. The project is Foster Wheeler's Middle Waterway and the tests are EPA 8270. Some of the discrepancies that we noticed are:

Item	Page	Date/Time Acquired	Date/Time Integrated	Date/Time Last Update
Chromatogram, e-file 1237	536	10/7 @ 16:33	10/7 @ 16:02	11/5 @ 15:51
Quant Report, e-file 1237	537	10/7 @ 16:33	10/7 @ 17:02	10/7 @ 17:00
Chromatogram, e-file 1263	540	10/8 @ 16:56	10/8 @ 16:25	11/4 @ 14:53
Quant Report, e-file 1263	541	10/8 @ 16:56	10/8 @ 16:25	10/8 @ 17:23
Chromatogram, e-file 1289	544	10/9 @ 16:16	10/9 @ 16:41	10/8 @ 17:32
Quant Report, e-file 1289	545	10/9 @ 16:16	10/9 @ 16:41	10/8 @ 17:32

Something that I didn't mention on the phone is that the Form 7 for the 10/9 calibration check (Page 543) is a duplicate of the Form 7 for 10/8 (Page 539) but with a different date. The RRFs and %D do not match the raw data for 10/9. When this all resolved, could we have a revised Form 7 issued to replace Page 543?

Foster Wheeler is in a time crunch and is panting for our report, so please call to discuss this as soon as you can. Thanks for your help.

cc: Melinda Jacobson, QBD (cover only)

Send Hard Copy? ___ Yes XX No

Quantitation Report

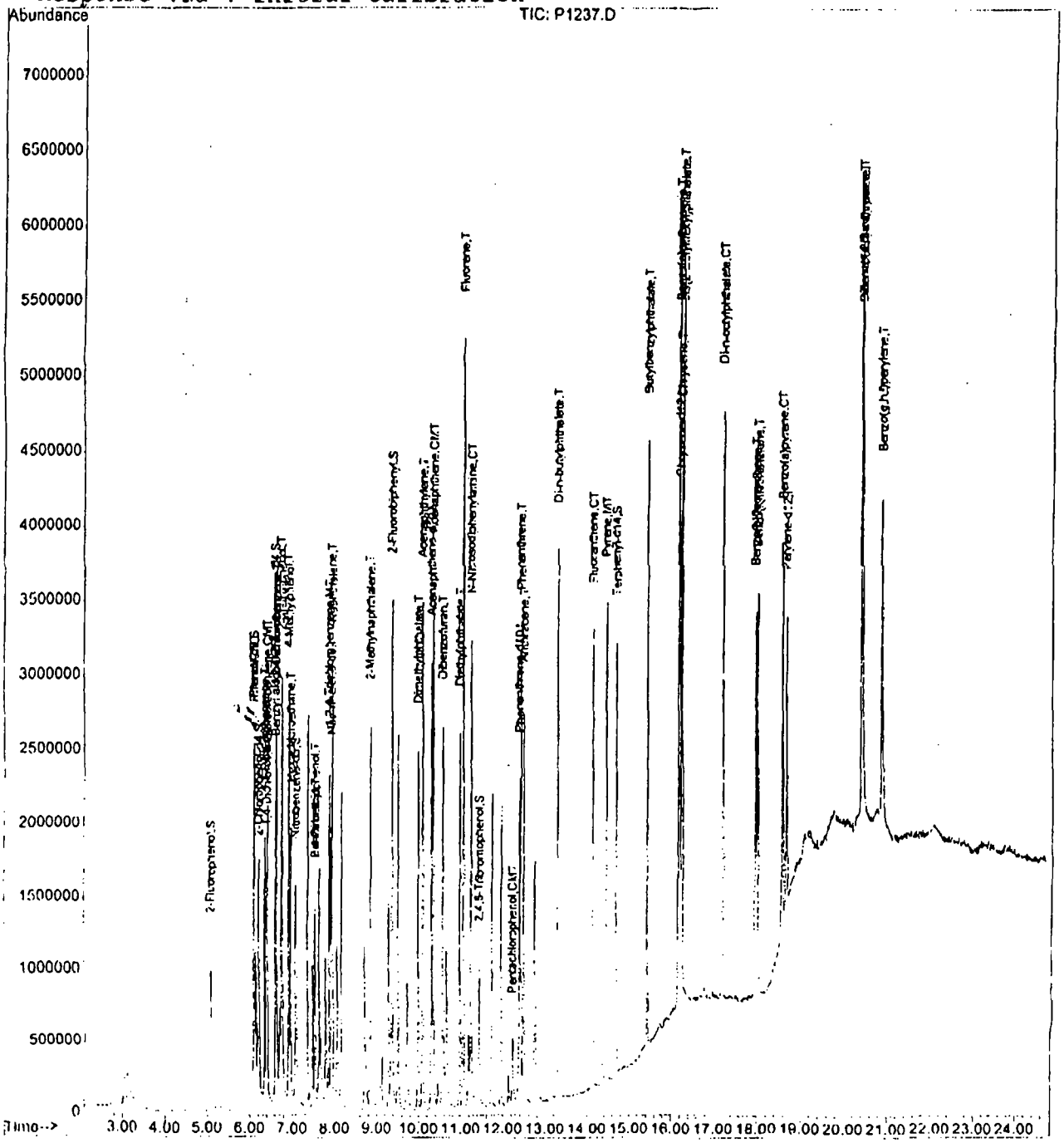
536

Data File : D:\DATAHP5\1007A\P1237.D
Acq On : 7 Oct 1999 16:33
Sample : SSTD050 426-88-1
Misc : ABN STD 25NG/UL
MS Integration Params: RTEINT.P
Quant Time: Oct 7 16:02 1999

Vial: 3
Operator: PL
Inst : HP#5
Multiplr: 1.00

Quant Results File: PSEDBN.RES

Method : C:\HPCHEM\1\METHODS\PSEDBN.M (RTE Integrator)
Title : SEMIVOLATILES BY SW-8270
Last Update : Fri Nov 05 15:51:09 1999
Response via : Initial Calibration



Quantitation Report (Not Reviewed)

Data File : C:\HPCHEM\1\DATA\1007A\P1237.D
Acq On : 7 Oct 1999 16:33
Sample : SSTD050 426-88-1
Misc : ABN STD 25NG/UL
MS Integration Params: RTEINT.P
Quant Time: Oct 7 17:02 1999

Vial: 3
Operator: PL
Inst : HP#5
Multiplr: 1.00

537

Quant Results File: PSEDBN.RES

Quant Method : C:\HPCHEM\1\METHODS\PSEDBN.M (RTE Integrator)
Title : SEMIVOLATILES BY SW-8270
Last Update : Thu Oct 07 17:00:54 1999
Response via : Initial Calibration
DataAcq Meth : PSEDBN

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Dichlorobenzene-d4	6.38	152	266352	20.00	ng/uL	-0.06
14) Naphthalene-d8	7.90	136	1215079	20.00	ng/uL	-0.06
21) Acenaphthene-d10	10.28	164	672406	20.00	ng/uL	-0.06
29) Phenanthrene-d10	12.36	188	1176375	20.00	ng/uL	-0.05
37) Chrysene-d12	16.18	240	1203927m	20.00	ng/uL	0.00
44) Perylene-d12	18.65	264	1178821	20.00	ng/uL	-0.03
System Monitoring Compounds						
2) 2-Fluorophenol	5.08	112	498313	31.44	ng/uL	-0.04
Spiked Amount 75.000	Range 46 - 118		Recovery = 41.92%#			
4) Phenol-d6	6.08	99	674738	32.50	ng/uL	-0.04
Spiked Amount 75.000	Range 44 - 119		Recovery = 43.33%#			
5) 2-Chlorophenol-d4	6.18	132	463202	28.88	ng/uL	-0.06
Spiked Amount 75.000	Range 40 - 160		Recovery = 38.51%#			
9) 1,2-Dichlorobenzene-d4	6.60	152	373872	29.82	ng/uL	-0.06
Spiked Amount 50.000	Range 40 - 160		Recovery = 59.64%			
15) Nitrobenzene-d5	7.06	82	706971	36.29	ng/uL	-0.06
Spiked Amount 50.000	Range 46 - 137		Recovery = 72.58%			
22) 2-Fluorobiphenyl	9.35	172	1216247	29.63	ng/uL	-0.06
Spiked Amount 50.000	Range 46 - 119		Recovery = 59.26%			
31) 2,4,6-Tribromophenol	11.41	330	150481	24.96	ng/uL	-0.05
Spiked Amount 75.000	Range 45 - 143		Recovery = 33.28%#			
39) Terphenyl-d14	14.66	244	1484076	30.34	ng/uL	-0.05
Spiked Amount 50.000	Range 32 - 132		Recovery = 60.68%			
Target Compounds						Qvalue
3) Phenol	6.09	94	759748	30.67	ng/uL	90
6) 1,3-Dichlorobenzene	6.34	146	541500	27.05	ng/uL	99
7) 1,4-Dichlorobenzene	6.40	146	574216	27.53	ng/uL	98
8) 1,2-Dichlorobenzene	6.61	146	547309	28.84	ng/uL	98
10) Benzyl alcohol	6.59	108	273153	23.04	ng/uL	88
11) 2-Methylphenol	6.74	108	507459	29.97	ng/uL	85
12) Hexachloroethane	6.95	117	236723	31.32	ng/uL	94
13) 4-Methylphenol	6.91	108	526062	29.22	ng/uL	95
16) 2,4-Dimethylphenol	7.52	107	462371	25.59	ng/uL	93
17) 1,2,4-Trichlorobenzene	7.85	180	499601	27.46	ng/uL	99
18) Naphthalene	7.93	128	1657424	26.23	ng/uL	99
19) Benzoic acid	7.52	122	371791	40.01	ng/uL	88
20) 2-Methylnaphthalene	8.83	142	1094990	27.59	ng/uL	98
23) Dimethylphthalate	9.97	163	1221507	28.60	ng/uL	94
24) Acenaphthylene	10.07	152	1668054	30.83	ng/uL	99
25) Acenaphthene	10.32	153	1037188	29.42	ng/uL	98

(#) = qualifier out of range (m) = manual integration

Quantitation Report (Not Reviewed)

538

Data File : C:\HPCHEM\1\DATA\1007A\P1237.D Vial: 3
Acq On : 7 Oct 1999 16:33 Operator: PL
Sample : SSTD050 426-88-1 Inst : HP#5
Misc : ABN STD 25NG/UL Multiplr: 1.00
MS Integration Params: RTEINT.P
Quant Time: Oct 7 17:02 1999 Quant Results File: PSEDBN.RES

Quant Method : C:\HPCHEM\1\METHODS\PSEDBN.M (RTE Integrator)
Title : SEMIVOLATILES BY SW-8270
Last Update : Thu Oct 07 17:00:54 1999
Response via : Initial Calibration
DataAcq Meth : PSEDBN

Compound	R.T.	Qlon	Response	Conc	Unit	Qvalue
26) Dibenzofuran	10.55	168	1438070	26.33	ng/uL	98
27) Diethylphthalate	10.95	149	1128223	30.44	ng/uL	98
28) Fluorene	11.04	166	1126553	27.58	ng/uL	100
30) N-Nitrosodiphenylamine	11.22	169	855142	24.44	ng/uL	98
32) Pentachlorophenol	12.21	266	105233	16.59	ng/uL	85
33) Phenanthrene	12.39	178	1652249	24.23	ng/uL	100
34) Anthracene	12.46	178	1770544	28.13	ng/uL	100
35) Di-n-butylphthalate	13.26	149	2267989	36.10	ng/uL	99
36) Fluoranthene	14.11	202	1932479	28.52	ng/uL	100
38) Pyrene	14.43	202	2020869	27.50	ng/uL	99
40) Butylbenzylphthalate	15.41	149	1075339	38.51	ng/uL	94
41) Benzo(a)anthracene	16.15	228	1869932m	29.29	ng/uL	
42) Chrysene	16.21	228	1769408	25.70	ng/uL	99
43) bis(2-Ethylhexyl)phthalate	16.24	149	1543894m	41.13	ng/uL	
45) Di-n-octylphthalate	17.19	149	2601912	45.38	ng/uL	98
46) Benzo(b)fluoranthene	17.94	252	1883408	28.61	ng/uL	98
47) Benzo(k)fluoranthene	17.99	252	2013864	28.23	ng/uL	98
48) Benzo(a)pyrene	18.55	252	1801482	28.35	ng/uL	98
49) Indeno(1,2,3-cd)pyrene	20.37	276	2361037	28.44	ng/uL	99
50) Dibenzo(a,h)anthracene	20.38	278	2050347	27.89	ng/uL	96
51) Benzo(g,h,i)perylene	20.84	276	2059493	27.47	ng/uL	98

(#) = qualifier out of range (m) = manual integration

FORM 7
SEMIVOLATILE CONTINUING CALIBRATION CHECK

539

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909056

Instrument ID: HP5 Calibration Date: 10/08/99 Time: 1656

Lab File ID: P1263 Init. Calib. Date(s): 06/17/99 06/17/99

Init. Calib. Times: 1707 2105

GC Column: RTX-5 ID: 0.25 (mm)

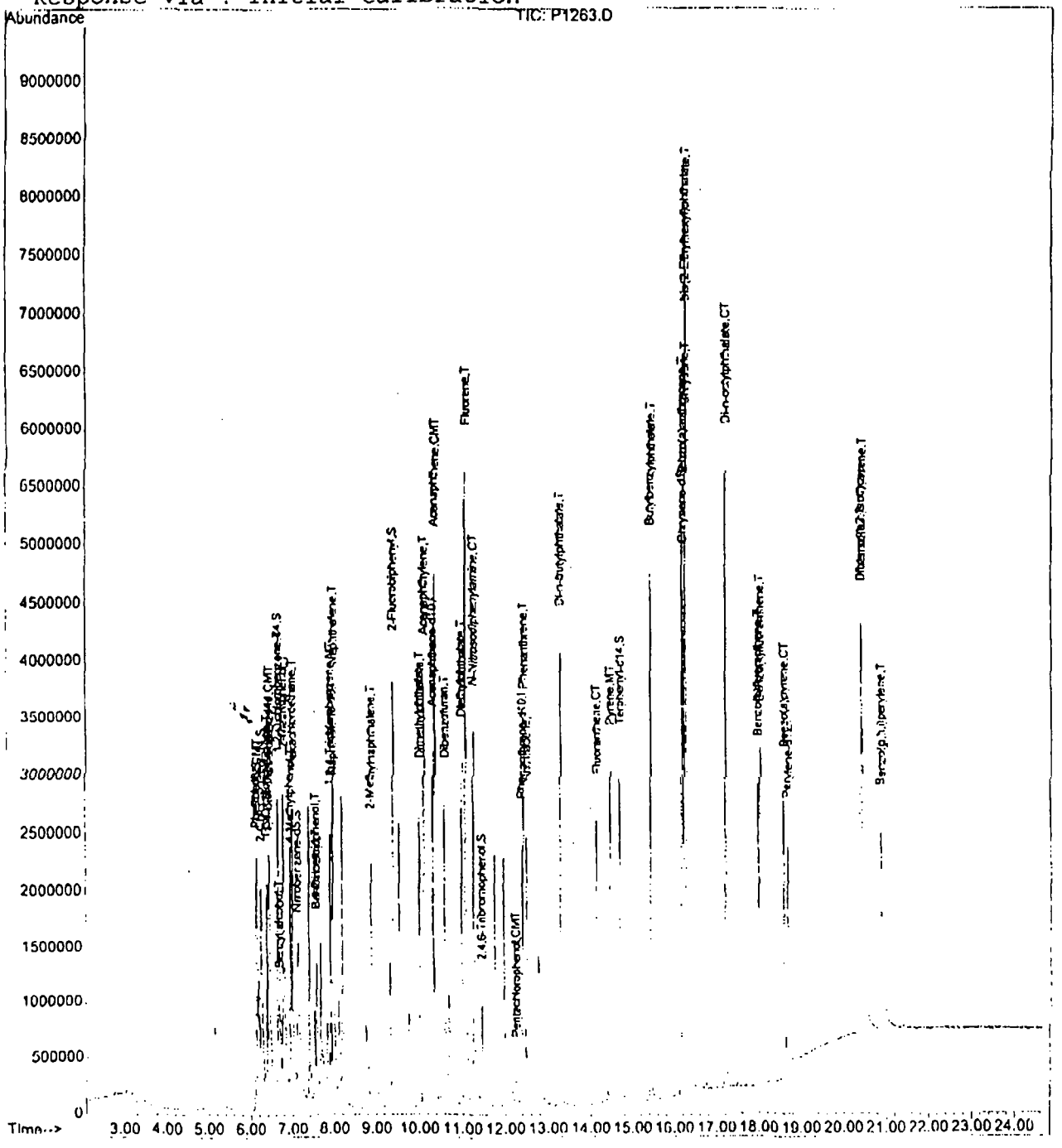
COMPOUND	RRF	RRF25	MIN RRF	%D	MAX %D	
1,3-Dichlorobenzene	1.503	1.566	0.01	4.2	100	
1,4-Dichlorobenzene	1.566	1.762	0.01	12.5	20.5	
1,2-Dichlorobenzene	1.425	1.512	0.01	6.1	100	
1,2,4-Trichlorobenzene	0.300	0.334	0.01	11.3	100	
Naphthalene	1.040	1.089	0.01	4.7	100	
2-Methylnaphthalene	0.653	0.692	0.01	6.0	100	
Dimethylphthalate	1.270	1.390	0.01	9.4	100	
Acenaphthylene	1.609	2.008	0.01	24.8	100	
Acenaphthene	1.048	1.210	0.01	15.4	20.5	
Dibenzofuran	1.625	1.728	0.01	6.3	100	
Diethylphthalate	1.102	1.257	0.01	14.1	100	
Fluorene	1.215	1.331	0.01	9.5	100	
N-Nitrosodiphenylamine	0.595	0.593	0.01	0.3	20.5	
Phenanthrene	1.160	1.045	0.01	9.9	100	
Anthracene	1.070	1.278	0.01	19.4	100	
Di-n-butylphthalate	1.068	1.592	0.01	49.1	100	
Fluoranthene	1.152	1.317	0.01	14.3	20.5	
Pyrene	1.221	1.321	0.01	8.2	100	
Butylbenzylphthalate	0.464	0.704	0.01	51.7	100	
Benzo(a)anthracene	1.060	1.169	0.01	10.3	100	
Chrysene	1.144	1.231	0.01	7.6	100	
bis(2-Ethylhexyl)phthalate	0.624	0.998	0.01	59.9	100	
Di-n-octylphthalate	0.973	1.885	0.01	93.7	20.5	<-
Benzo(b)fluoranthene	1.117	1.070	0.01	4.2	100	
Benzo(k)fluoranthene	1.210	1.535	0.01	26.8	100	
Benzo(a)pyrene	1.078	1.232	0.01	14.3	20.5	
Indeno(1,2,3-cd)pyrene	1.408	1.643	0.01	16.7	100	
Dibenzo(a,h)anthracene	1.247	1.382	0.01	10.8	100	
Benzo(g,h,i)perylene	1.272	1.315	0.01	3.4	100	
Nitrobenzene-d5	0.320	0.419	0.01	30.9	100	
2-Fluorobiphenyl	1.221	1.432	0.01	17.3	100	
Terphenyl-d14	0.813	0.945	0.01	16.2	100	
1,2-Dichlorobenzene-d4	0.941	1.049	0.01	11.5	100	

Quantitation Report

Data File : K:\1008A\P1263.D
Acq On : 8 Oct 1999 16:56
Sample : SSTD050 426-88-1
Misc : ABN STD 25NG/UL
MS Integration Params: RTEINT.P
Quant Time: Oct 8 16:25 1999

Vial: 3 540
Operator: PL
Inst : HP#5
Multiplr: 1.00
Quant Results File: PSEDBN.RES

Method : C:\HPCHEM\1\METHODS\PSEDBN.M (RTE Integrator)
Title : SEMIVOLATILES BY SW-8270
Last Update : Thu Nov 04 14:53:13 1999
Response via : Initial Calibration



Quantitation Report (Not Reviewed)

541

Data File : K:\1008A\P1263.D
Acq On : 8 Oct 1999 16:56
Sample : SSTD050 426-88-1
Misc : ABN STD 25NG/UL
MS Integration Params: RTEINT.P
Quant Time: Oct 8 16:25 1999

Vial: 3
Operator: PL
Inst : HP#5
Multiplr: 1.00

Quant Results File: PSEDBN.RES

Quant Method : C:\HPCHEM\1\METHODS\PSEDBN.M (RTE Integrator)
Title : SEMIVOLATILES BY SW-8270
Last Update : Fri Oct 08 17:23:56 1999
Response via : Initial Calibration
DataAcq Meth : PSEDBN

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Dichlorobenzene-d4	6.41	152	340784	20.00	ng/uL	-0.03
14) Naphthalene-d8	7.93	136	1556126	20.00	ng/uL	-0.04
21) Acenaphthene-d10	10.30	164	906717	20.00	ng/uL	-0.04
29) Phenanthrene-d10	12.38	188	1534237	20.00	ng/uL	-0.03
37) Chrysene-d12	16.19	240	1635755m	20.00	ng/uL	0.00
44) Perylene-d12	18.66	264	1544727	20.00	ng/uL	0.00
System Monitoring Compounds						
2) 2-Fluorophenol	5.07	112	127	0.01	ng/uL	-0.05
Spiked Amount 75.000	Range 46 - 118		Recovery = 0.01%#			
4) Phenol-d6	6.12	99	754529	28.40	ng/uL	0.00
Spiked Amount 75.000	Range 44 - 119		Recovery = 37.87%#			
5) 2-Chlorophenol-d4	6.23	132	561862	27.38	ng/uL	-0.02
Spiked Amount 75.000	Range 40 - 160		Recovery = 36.51%#			
9) 1,2-Dichlorobenzene-d4	6.63	152	447005	27.86	ng/uL	-0.03
Spiked Amount 50.000	Range 40 - 160		Recovery = 55.72%			
15) Nitrobenzene-d5	7.09	82	815261	32.68	ng/uL	-0.03
Spiked Amount 50.000	Range 46 - 137		Recovery = 65.36%			
22) 2-Fluorobiphenyl	9.37	172	1623552	29.33	ng/uL	-0.04
Spiked Amount 50.000	Range 46 - 119		Recovery = 58.66%			
31) 2,4,6-Tribromophenol	11.44	330	166821	21.21	ng/uL	-0.03
Spiked Amount 75.000	Range 45 - 143		Recovery = 28.28%#			
39) Terphenyl-d14	14.68	244	1931591	29.06	ng/uL	-0.04
Spiked Amount 50.000	Range 32 - 132		Recovery = 58.12%			
Target Compounds						Qvalue
3) Phenol	6.13	94	878328	27.71	ng/uL	73
6) 1,3-Dichlorobenzene	6.37	146	667010	26.05	ng/uL	96
7) 1,4-Dichlorobenzene	6.43	146	750418	28.12	ng/uL	98
8) 1,2-Dichlorobenzene	6.64	146	644292	26.53	ng/uL	97
10) Benzyl alcohol	6.67	108	244199	16.10	ng/uL	92
11) 2-Methylphenol	6.77	108	539105	24.88	ng/uL	79
12) Hexachloroethane	6.98	117	302900	31.32	ng/uL	97
13) 4-Methylphenol	6.94	108	539874	23.44	ng/uL	93
16) 2,4-Dimethylphenol	7.55	107	586700	25.35	ng/uL	89
17) 1,2,4-Trichlorobenzene	7.88	180	650015	27.90	ng/uL	99
18) Naphthalene	7.95	128	2118960	26.18	ng/uL	99
19) Benzoic acid	7.55	122	433161	37.15	ng/uL	82
20) 2-Methylnaphthalene	8.85	142	1347107	26.50	ng/uL	97
23) Dimethylphthalate	9.99	163	1575452	27.35	ng/uL	95
24) Acenaphthylene	10.09	152	2276272	31.20	ng/uL	99
25) Acenaphthene	10.34	153	1371335	28.85	ng/uL	99

(#) = qualifier out of range (m) = manual integration

Quantitation Report (Not Reviewed)

542

Data File : K:\1008A\P1263.D
Acq On : 8 Oct 1999 16:56
Sample : SSTD050 426-88-1
Misc : ABN STD 25NG/UL
MS Integration Params: RTEINT.P
Quant Time: Oct 8 16:25 1999

Vial: 3
Operator: PL
Inst : HP#5
Multiplr: 1.00
Quant Results File: PSEDBN.RES

Quant Method : C:\HPCHEM\1\METHODS\PSEDBN.M (RTE Integrator)
Title : SEMIVOLATILES BY SW-8270
Last Update : Fri Oct 08 17:23:56 1999
Response via : Initial Calibration
DataAcq Meth : PSEDBN

Compound	R.T.	QIon	Response	Conc	Unit	Qvalue
26) Dibenzofuran	10.57	168	1958876	26.59	ng/uL	99
27) Diethylphthalate	10.97	149	1424763	28.50	ng/uL	98
28) Fluorene	11.05	166	1508101	27.38	ng/uL	97
30) N-Nitrosodiphenylamine	11.24	169	1137756	24.94	ng/uL	99
32) Pentachlorophenol	12.23	266	58232	9.71	ng/uL	85
33) Phenanthrene	12.41	178	2003512	22.52	ng/uL	98
34) Anthracene	12.48	178	2451098	29.85	ng/uL	100
35) Di-n-butylphthalate	13.27	149	3052782	37.26	ng/uL	99
36) Fluoranthene	14.12	202	2526625	28.59	ng/uL	99
38) Pyrene	14.45	202	2700679	27.04	ng/uL	100
40) Butylbenzylphthalate	15.42	149	1439318	37.93	ng/uL	95
41) Benzo(a)anthracene	16.16	228	2390427	27.56	ng/uL	100
42) Chrysene	16.23	228	2517800	26.91	ng/uL	100
43) bis(2-Ethylhexyl)phthalate	16.24	149	2040582	40.01	ng/uL	100
45) Di-n-octylphthalate	17.19	149	3639626	48.44	ng/uL	99
46) Benzo(b)fluoranthene	17.96	252	2065639	23.94	ng/uL	97
47) Benzo(k)fluoranthene	18.00	252	2963988	31.71	ng/uL	98
48) Benzo(a)pyrene	18.57	252	2378702	28.56	ng/uL	98
49) Indeno(1,2,3-cd)pyrene	20.37	276	3172042	29.16	ng/uL	99
50) Dibenzo(a,h)anthracene	20.39	278	2667663	27.69	ng/uL	95
51) Benzo(g,h,i)perylene	20.85	276	2538384	25.84	ng/uL	100

(#) = qualifier out of range (m) = manual integration

FORM 7
SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909056

Instrument ID: HP5 Calibration Date: 10/09/99 Time: 1616

Lab File ID: P1289 Init. Calib. Date(s): 06/17/99 06/17/99

Init. Calib. Times: 1707 2105

GC Column: RTX-5 ID: 0.25 (mm)

COMPOUND	RRF	RRF25	MIN RRF	%D	MAX %D	
1,3-Dichlorobenzene	1.503	1.566	0.01	4.2	100	
1,4-Dichlorobenzene	1.566	1.762	0.01	12.5	20.5	
1,2-Dichlorobenzene	1.425	1.512	0.01	6.1	100	
1,2,4-Trichlorobenzene	0.300	0.334	0.01	11.3	100	
Naphthalene	1.040	1.089	0.01	4.7	100	
2-Methylnaphthalene	0.653	0.692	0.01	6.0	100	
Dimethylphthalate	1.270	1.390	0.01	9.4	100	
Acenaphthylene	1.609	2.008	0.01	24.8	100	
Acenaphthene	1.048	1.210	0.01	15.4	20.5	
Dibenzofuran	1.625	1.728	0.01	6.3	100	
Diethylphthalate	1.102	1.257	0.01	14.1	100	
Fluorene	1.215	1.331	0.01	9.5	100	
N-Nitrosodiphenylamine	0.595	0.593	0.01	0.3	20.5	
Phenanthrene	1.160	1.045	0.01	9.9	100	
Anthracene	1.070	1.278	0.01	19.4	100	
Di-n-butylphthalate	1.068	1.592	0.01	49.1	100	
Fluoranthene	1.152	1.317	0.01	14.3	20.5	
Pyrene	1.221	1.321	0.01	8.2	100	
Butylbenzylphthalate	0.464	0.704	0.01	51.7	100	
Benzo(a)anthracene	1.060	1.169	0.01	10.3	100	
Chrysene	1.144	1.231	0.01	7.6	100	
bis(2-Ethylhexyl)phthalate	0.624	0.998	0.01	59.9	100	
Di-n-octylphthalate	0.973	1.885	0.01	93.7	20.5	<-
Benzo(b)fluoranthene	1.117	1.070	0.01	4.2	100	
Benzo(k)fluoranthene	1.210	1.535	0.01	26.8	100	
Benzo(a)pyrene	1.078	1.232	0.01	14.3	20.5	
Indeno(1,2,3-cd)pyrene	1.408	1.643	0.01	16.7	100	
Dibenzo(a,h)anthracene	1.247	1.382	0.01	10.8	100	
Benzo(g,h,i)perylene	1.272	1.315	0.01	3.4	100	
Nitrobenzene-d5	0.320	0.419	0.01	30.9	100	
2-Fluorobiphenyl	1.221	1.432	0.01	17.3	100	
Terphenyl-d14	0.813	0.945	0.01	16.2	100	
1,2-Dichlorobenzene-d4	0.941	1.049	0.01	11.5	100	

Results here are exactly the same as 10/09 16:16 - 10/08 16:46

Quantitation Report

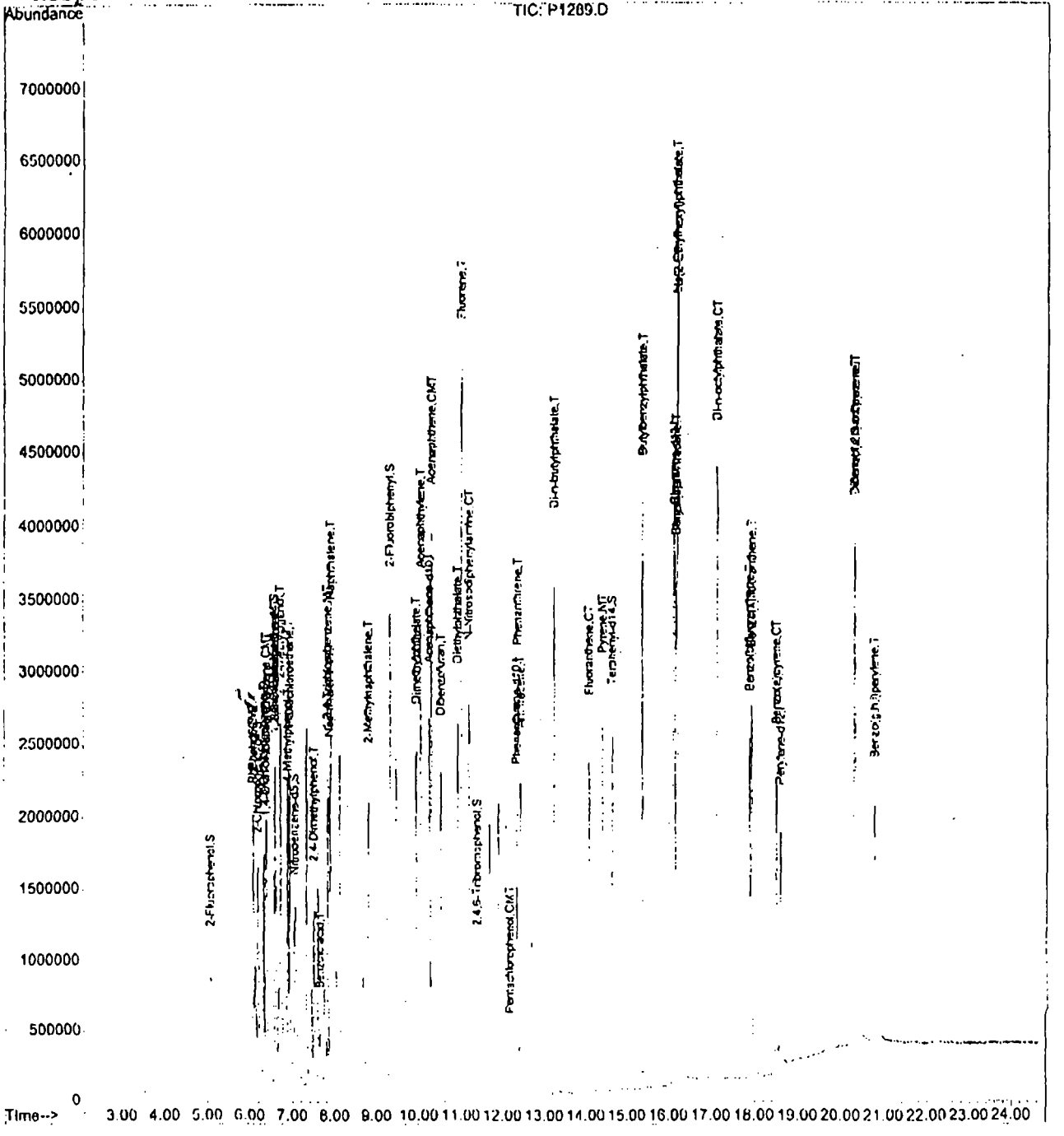
Data File : C:\HPCHEM\1\DATA\1009A\P1289.D
Acq On : 9 Oct 1999 16:16
Sample : SSTD050 426-88-1
Misc : ABN STD 25NG/UL
MS Integration Params: RTEINT.P
Quant Time: Oct 9 16:41 1999

Vial: 3
Operator: PL
Inst : HP#5
Multiplr: 1.00

544

Quant Results File: PSEDBN.RES

Method : C:\HPCHEM\1\METHODS\PSEDBN.M (RTE Integrator)
Title : SEMIVOLATILES BY SW-8270
Last Update : Fri Oct 08 17:32:14 1999
Response via : Initial Calibration



Quantitation Report (Not Reviewed)

Data File : C:\HPCHEM\1\DATA\1009A\P1289.D Vial: 3 545
Acq On : 9 Oct 1999 16:16 Operator: PL
Sample : SSTD050 426-88-1 Inst : HP#5
Misc : ABN STD 25NG/UL Multiplr: 1.00
MS Integration Params: RTEINT.P
Quant Time: Oct 9 16:41 1999 Quant Results File: PSEDBN.RES

Quant Method : C:\HPCHEM\1\METHODS\PSEDBN.M (RTE Integrator)
Title : SEMIVOLATILES BY SW-8270
Last Update : Fri Oct 08 17:32:14 1999
Response via : Initial Calibration
DataAcq Meth : PSEDBN

Internal Standards	R.T.	Qlon	Response	Conc	Units	Dev(Min)
1) 1,4-Dichlorobenzene-d4	6.37	152	269514	20.00	ng/uL	-0.04
14) Naphthalene-d8	7.88	136	1239361	20.00	ng/uL	-0.04
21) Acenaphthene-d10	10.26	164	713097	20.00	ng/uL	-0.04
29) Phenanthrene-d10	12.33	188	1210699	20.00	ng/uL	-0.05
37) Chrysene-d12	16.14	240	1284817	20.00	ng/uL	-0.05
44) Perylene-d12	18.60	264	1199553	20.00	ng/uL	-0.06
System Monitoring Compounds						
2) 2-Fluorophenol	5.08	112	513777	32.04	ng/uL	-0.05
Spiked Amount 75.000	Range 46 - 118		Recovery = 42.72%#			
4) Phenol-d6	6.07	99	598220	28.47	ng/uL	-0.04
Spiked Amount 75.000	Range 44 - 119		Recovery = 37.96%#			
5) 2-Chlorophenol-d4	6.18	132	449401	27.69	ng/uL	-0.05
Spiked Amount 75.000	Range 40 - 160		Recovery = 36.92%#			
9) 1,2-Dichlorobenzene-d4	6.58	152	353028	27.82	ng/uL	-0.05
Spiked Amount 50.000	Range 40 - 160		Recovery = 55.64%			
15) Nitrobenzene-d5	7.05	82	664962	33.47	ng/uL	-0.04
Spiked Amount 50.000	Range 46 - 137		Recovery = 66.94%			
22) 2-Fluorobiphenyl	9.33	172	1275561	29.30	ng/uL	-0.04
Spiked Amount 50.000	Range 46 - 119		Recovery = 58.60%			
31) 2,4,6-Tribromophenol	11.39	330	137593	22.17	ng/uL	-0.05
Spiked Amount 75.000	Range 45 - 143		Recovery = 29.56%#			
39) Terphenyl-d14	14.63	244	1466496	28.09	ng/uL	-0.05
Spiked Amount 50.000	Range 32 - 132		Recovery = 56.18%			
Target Compounds						Qvalue
3) Phenol	6.08	94	688319	27.46	ng/uL	97
6) 1,3-Dichlorobenzene	6.33	146	532153	26.27	ng/uL	99
7) 1,4-Dichlorobenzene	6.39	146	538412	25.51	ng/uL	96
8) 1,2-Dichlorobenzene	6.60	146	516059	26.87	ng/uL	98
10) Benzyl alcohol	6.60	108	195247	16.28	ng/uL	99
11) 2-Methylphenol	6.72	108	467138	27.26	ng/uL	99
12) Hexachloroethane	6.94	117	240814	31.49	ng/uL	96
13) 4-Methylphenol	6.90	108	469261	25.76	ng/uL	96
16) 2,4-Dimethylphenol	7.50	107	466062	25.29	ng/uL	99
17) 1,2,4-Trichlorobenzene	7.84	180	511601	27.57	ng/uL	98
18) Naphthalene	7.91	128	1735270	26.92	ng/uL	99
19) Benzoic acid	7.65	122	140479	17.88	ng/uL	95
20) 2-Methylnaphthalene	8.81	142	1070402	26.44	ng/uL	97
23) Dimethylphthalate	9.95	163	1290962	28.50	ng/uL	99
24) Acenaphthylene	10.05	152	1805591	31.47	ng/uL	99
25) Acenaphthene	10.30	153	1104417	29.54	ng/uL	99

(#) = qualifier out of range (m) = manual integration

Quantitation Report (Not Reviewed)

Data File : C:\HPCHEM\1\DATA\1009A\P1289.D Vial: 3
Acq On : 9 Oct 1999 16:16 Operator: PL
Sample : SSTD050 426-88-1 Inst : HP#5
Misc : ABN STD 25NG/UL Multiplr: 1.00
MS Integration Params: RTEINT.P
Quant Time: Oct 9 16:41 1999 Quant Results File: PSEDBN.RES

546

Quant Method : C:\HPCHEM\1\METHODS\PSEDBN.M (RTE Integrator)
Title : SEMIVOLATILES BY SW-8270
Last Update : Fri Oct 08 17:32:14 1999
Response via : Initial Calibration
DataAcq Meth : PSEDBN

Compound	R.T.	QIon	Response	Conc Unit	Qvalue
26) Dibenzofuran	10.52	168	1529934	26.41 ng/uL	98
27) Diethylphthalate	10.92	149	1160400	29.52 ng/uL	99
28) Fluorene	11.01	166	1203224	27.78 ng/uL	99
30) N-Nitrosodiphenylamine	11.19	169	892903	24.80 ng/uL	99
32) Pentachlorophenol	12.18	266	56370	10.86 ng/uL	93
33) Phenanthrene	12.37	178	1599083	22.78 ng/uL	99
34) Anthracene	12.43	178	1896817	29.28 ng/uL	100
35) Di-n-butylphthalate	13.23	149	2411290	37.29 ng/uL	99
36) Fluoranthene	14.08	202	1970484	28.26 ng/uL	99
38) Pyrene	14.40	202	2105626	26.84 ng/uL	99
40) Butylbenzylphthalate	15.37	149	1128090	37.85 ng/uL	96
41) Benzo(a)anthracene	16.17	228	1937125	28.44 ng/uL	96
42) Chrysene	16.17	228	1937125	26.36 ng/uL	99
43) bis(2-Ethylhexyl)phthalate	16.20	149	1646250	41.10 ng/uL	99
45) Di-n-octylphthalate	17.14	149	2835307	48.59 ng/uL	99
46) Benzo(b)fluoranthene	17.88	252	1777026	26.52 ng/uL	99
47) Benzo(k)fluoranthene	17.93	252	2174175	29.95 ng/uL	99
48) Benzo(a)pyrene	18.50	252	1846267	28.55 ng/uL	99
49) Indeno(1,2,3-cd)pyrene	20.30	276	2560899	30.32 ng/uL	99
50) Dibenzo(a,h)anthracene	20.31	278	2198188	29.38 ng/uL	98
51) Benzo(g,h,i)perylene	20.77	276	2107562	27.63 ng/uL	98

(#) = qualifier out of range (m) = manual integration

HP LaserJet 3100
Printer/Fax/Copier/Scanner

SEND CONFIRMATION REPORT for
Quality by Design
808 969 9094
Jan-3-00 10:07AM

Job	Start Time	Usage	Phone Number or ID	Type	Pages	Mode	Status
648	1/ 3 10:01AM	6'29"	425 228 8336	Send	12/12	EC 96	Completed

Total 6'29" Pages Sent: 12 Pages Printed: 0

Quality by Design
29 Shipman Street, Suite 101
Hilo, Hawaii 96720
Phone: 808/969-9424 Fax: 808/969-9094
e-mail: qbdhilo@gte.net

Date: January 3, 2000 Fax #: 425/228-8336

To: MultiChem Analytical Services
Attn: Dave Wunderlich

From: Thomas Davis
Total pages, including this one: 12

Here are the chromatograms that we discussed on phone today. All of these are continuing calibration checks for SDG 909056, but have also been used for other SDGs in the same project. The project is Foster Wheeler's Middle Waterway and the tests are EPA 8270. Some of the discrepancies that we noticed are:

Item	Page	Date/Time Acquired	Date/Time Integrated	Date/Time Last Update
Chromatogram, e-file 1237	536	10/7 @ 16:33	10/7 @ 16:02	11/5 @ 15:51
Quant Report, e-file 1237	537	10/7 @ 16:33	10/7 @ 17:02	10/7 @ 17:00
Chromatogram, e-file 1263	540	10/8 @ 16:56	10/8 @ 16:25	11/4 @ 14:53
Quant Report, e-file 1263	541	10/8 @ 16:56	10/8 @ 16:25	10/8 @ 17:23
Chromatogram, e-file 1289	544	10/9 @ 16:16	10/9 @ 16:41	10/8 @ 17:32
Quant Report, e-file 1289	545	10/9 @ 16:16	10/9 @ 16:41	10/8 @ 17:32

Something that I didn't mention on the phone is that the Form 7 for the 10/9 calibration check (Page 543) is a duplicate of the Form 7 for 10/8 (Page 539) but with a different date. The RRFs and %D do not match the raw data for 10/9. When this all resolved, could we have a revised Form 7 issued to replace Page 543?

Foster Wheeler is in a time crunch and is panting for our report, so please call to discuss this as soon as you can. Thanks for your help.

cc: Melinda Jacobson, QBD (cover only)

Send Hard Copy? ___ Yes _XX_ No

HP LaserJet 3100
Printer/Fax/Copier/Scanner

SEND CONFIRMATION REPORT for
Quality by Design
808 969 9094
Jan-3-00 9:40AM

Job	Start Time	Usage	Phone Number or ID	Type	Pages	Mode	Status
644	1/ 3 9:40AM	0'36"	1 480 473 3006	Send.....	1/ 1	EC144	Completed.....

Total 0'36" Pages Sent: 1 Pages Printed: 0

Quality by Design
29 Shipman Street, Suite 101
Hilo, Hawaii 96720
Phone: 808/969-9424 Fax: 808/969-9094
e-mail: qbdhilo@gte.net

Date: January 3, 2000 Fax #: 425/228-8336

To: MultiChem Analytical Services From: Thomas Davis
Attn: Dave Wunderlich Total pages, including this one: 12

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Item	Page	Date/Time Acquired	Date/Time Integrated	Date/Time Last Update
Chromatogram, e-file 1237	536	10/7 @ 16:33	10/7 @ 16:02	11/5 @ 15:51
Quant Report, e-file 1237	537	10/7 @ 16:33	10/7 @ 17:02	10/7 @ 17:00
Chromatogram, e-file 1263	540	10/8 @ 16:56	10/8 @ 16:25	11/4 @ 14:53
Quant Report, e-file 1263	541	10/8 @ 16:56	10/8 @ 16:25	10/8 @ 17:23
Chromatogram, e-file 1289	544	10/9 @ 16:16	10/9 @ 16:41	10/8 @ 17:32
Quant Report, e-file 1289	545	10/9 @ 16:16	10/9 @ 16:41	10/8 @ 17:32

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Foster Wheeler is in a time crunch and is panting for our report, so please call to discuss this as soon as you can. Thanks for your help.

cc: Melinda Jacobson, QBD (cover only)

Send Hard Copy? ___ Yes _XX_ No

MultiChem
ANALYTICAL SERVICES

Fax Cover Sheet

DATE: 1/5/00 **TIME:** 11:02 AM

TO: Tom Davis **PHONE:**
QBD **FAX:** 808-969-9094

FROM: David Wunderlich **PHONE:** 425/228-8335
CQAM-MultiChem **FAX:** 425/228-8336

RE: Amended Form 7

Number of pages including cover sheet: 2

FORM 7
SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: MULTICHEM Contract:

Lab Code: MAS-RENTON Case No.: SAS No.: SDG No.: 909056

Instrument ID: HP5 Calibration Date: 10/09/99 Time: 1616

Lab File ID: P1289 Init. Calib. Date(s): 06/17/99 06/17/99

Init. Calib. Times: 1707 2105

GC Column: RTX-5 ID: 0.25 (mm)

COMPOUND	$\overline{RRF}$	RRF25	MIN RRF	%D	MAX %D	
1,3-Dichlorobenzene	1.503	1.580	0.01	5.1	100	
1,4-Dichlorobenzene	1.566	1.598	0.01	2.0	20.5	
1,2-Dichlorobenzene	1.425	1.532	0.01	7.5	100	
1,2,4-Trichlorobenzene	0.300	0.330	0.01	10.0	100	
Naphthalene	1.040	1.120	0.01	7.7	100	
2-Methylnaphthalene	0.653	0.691	0.01	5.8	100	
Dimethylphthalate	1.270	1.448	0.01	14.0	100	
Acenaphthylene	1.609	2.026	0.01	25.9	100	
Acenaphthene	1.048	1.239	0.01	18.2	20.5	
Dibenzofuran	1.625	1.716	0.01	5.6	100	
Diethylphthalate	1.102	1.302	0.01	18.1	100	
Fluorene	1.215	1.350	0.01	11.1	100	
N-Nitrosodiphenylamine	0.595	0.590	0.01	0.8	20.5	
Phenanthrene	1.160	1.057	0.01	8.9	100	
Anthracene	1.070	1.253	0.01	17.1	100	
Di-n-butylphthalate	1.068	1.593	0.01	49.2	100	
Fluoranthene	1.152	1.302	0.01	13.0	20.5	
Pyrene	1.221	1.311	0.01	7.4	100	
Butylbenzylphthalate	0.464	0.702	0.01	51.3	100	
Benzo(a)anthracene	1.060	1.206	0.01	13.8	100	
Chrysene	1.144	1.206	0.01	5.4	100	
bis(2-Ethylhexyl)phthalate	0.624	1.025	0.01	64.3	100	
Di-n-octylphthalate	0.973	1.891	0.01	94.3	20.5	<-
Benzo(b)fluoranthene	1.117	1.185	0.01	6.1	100	
Benzo(k)fluoranthene	1.210	1.450	0.01	19.8	100	
Benzo(a)pyrene	1.078	1.231	0.01	14.2	20.5	
Indeno(1,2,3-cd)pyrene	1.408	1.708	0.01	21.3	100	
Dibenzo(a,h)anthracene	1.247	1.466	0.01	17.6	100	
Benzo(g,h,i)perylene	1.272	1.406	0.01	10.5	100	
Nitrobenzene-d5	0.320	0.429	0.01	34.1	100	
2-Fluorobiphenyl	1.221	1.431	0.01	17.2	100	
Terphenyl-d14	0.813	0.913	0.01	12.3	100	
1,2-Dichlorobenzene-d4	0.941	1.048	0.01	11.4	100	

MultiChem
ANALYTICAL SERVICES

Fax Cover Sheet

DATE: 1/6/00 **TIME:** 10:11 AM

TO: Tom Davis **PHONE:**
QBD **FAX:** 808/969-9094

FROM: David Wunderlich **PHONE:** 425/228-8335
CQAM-MultiChem **FAX:** 425/228-8336

RE: HP5 (Method 8270/BN) - Dates and Times - Middle Waterway

Number of pages including cover sheet: 24

MultiChem
ANALYTICAL SERVICES

01/06/00

Dear Mr. Davis:

Your hypothesis about the different drives and different clocks and their role in this anomaly seems to be correct. Our systems manager recalls that the "old server" was running 20 to 30 minutes fast. Its not possible to verify this now, since it was necessary to replace this server in preparation for year 2000. He also explained that NT machines, such as the one associated with HP5, aren't too consistent when it comes time to setting and maintaining their clocks in relation to other systems that are running in parallel. In fact, we recently discovered that the computer clock associated with HP5 will lag behind the server's clock if the analyst has not remembered to log onto the network.

As per your suggestion, we reprinted the chros and quant reports for files P1263 and P1237. The reprints showed the same anomalies as the original chros and quants. When the data was requanted on January 3, the acquisition times were as they should be - that is, earlier than the quant time.

We are forwarding the audit text for files P1263 and P1237. According to the audit text for file P1237, the earliest quantitation event occurred on Oct 7 at 16:58. The acquisition time given on the chro and quant for this file is 16:33. The audit text for file P1263 shows the earliest quantitation event occurred on Oct 8 at 17:21. The acquisition time given on the chro and quant for this file is 16:56.

An amended Form 7 for file P1289 was faxed to your office yesterday. If you have any questions or need additional information, please let me know.

-DW

560 Naches Avenue SW, Suite 101, Renton, Washington 98055-2200 • 425-228-8335 • FAX 425-228-8336 • 1-800-609-0580 • info@multichem.com

MultiChem
ANALYTICAL SERVICES

Fax Cover Sheet

DATE: 1/6/00 **TIME:** 10:11 AM

TO: Tom Davis **PHONE:**
QBD **FAX:** 808/969-9094

FROM: David Wunderlich **PHONE:** 425/228-8335
CQAM-MultiChem **FAX:** 425/228-8336

RE: HP5 (Method 8270/BN) - Dates and Times - Middle Waterway

Number of pages including cover sheet: 24

Created Thu Oct 07 16:58:42 1999

```
Modified : Thu Oct 07 16:58:42 1999
Event    : Quantitation
Message  : Calculation using initial calibration
QuantFile: PSEDBN.RES
User     : Sequence:
Why      : Sequence
Severity : 0

Modified : Thu Oct 07 16:58:48 1999
Event    : Report Generation
Message  : Generated Report using option: S
QuantFile: PSEDBN.RES
User     : Sequence:  Sequence:
Why      : Sequence
Severity : 0

Modified : Thu Oct 07 16:58:49 1999
Event    : ISTD Area
Message  : 266352 1,4-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
User     : Sequence:  Sequence:  Sequence:
Why      : Sequence
Severity : 1

Modified : Thu Oct 07 16:58:49 1999
Event    : ISTD Area
Message  : 1.21508e+006 Naphthalene-d8
QuantFile: PSEDBN.RES
User     : Sequence:  Sequence:  Sequence:  Sequence:
Why      : Sequence
Severity : 1

Modified : Thu Oct 07 16:58:49 1999
Event    : ISTD Area
Message  : 672406 Acenaphthene-d10
QuantFile: PSEDBN.RES
User     : Sequence:  Sequence:  Sequence:  Sequence:  Sequence:
Why      : Sequence
Severity : 1

Modified : Thu Oct 07 16:58:49 1999
Event    : ISTD Area
Message  : 1.17638e+006 Phenanthrene-d10
QuantFile: PSEDBN.RES
User     : Sequence:  Sequence:  Sequence:  Sequence:  Sequence:  Sequence:
Why      : Sequence
Severity : 1

Modified : Thu Oct 07 16:58:49 1999
Event    : ISTD Area
Message  : 5119 Chrysene-d12
QuantFile: PSEDBN.RES
User     : Sequence:  Sequence:  Sequence:  Sequence:  Sequence:  Sequence:  Se
```

Why : Sequence
Severity : 1

Modified : Thu Oct 07 16:58:49 1999
Event : ISTD Area
Message : 1.17882e+006 Perylene-d12
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence: Sequence: Sequence: Se
Why : Sequence
Severity : 1

Modified : Thu Oct 07 16:58:50 1999
Event : Surrogate Recovery
Message : -0.04 2-Fluorophenol
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence: Sequence: Sequence: Se
Why : Sequence
Severity : 1

Modified : Thu Oct 07 16:58:50 1999
Event : Surrogate Recovery
Message : -0.04 Phenol-d6
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence: Sequence: Sequence: Se
Why : Sequence
Severity : 1

Modified : Thu Oct 07 16:58:50 1999
Event : Surrogate Recovery
Message : -0.06 2-Chlorophenol-d4
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence: Sequence: Sequence: Se
Severity : 1

Modified : Thu Oct 07 16:58:50 1999
Event : Surrogate Recovery
Message : -0.06 1,2-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence: Sequence: Sequence: Se
Severity : 1

Modified : Thu Oct 07 16:58:50 1999
Event : Surrogate Recovery
Message : -0.06 Nitrobenzene-d5
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence: Sequence: Sequence: Se
Severity : 1

Modified : Thu Oct 07 16:58:50 1999
Event : Surrogate Recovery
Message : -0.06 2-Fluorobiphenyl
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence: Sequence: Sequence: Se
Severity : 1

Modified : Thu Oct 07 17:01:12 1999
Event : ISTD Area
Message : 1.17882e+006 Perylene-d12
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:01:12 1999
Event : Surrogate Recovery
Message : -0.04 2-Fluorophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:01:12 1999
Event : Surrogate Recovery
Message : -0.04 2-Fluorophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:01:12 1999
Event : Surrogate Recovery
Message : -0.04 Phenol-d6
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:01:12 1999
Event : Surrogate Recovery
Message : -0.04 Phenol-d6
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:01:12 1999
Event : Surrogate Recovery
Message : -0.06 2-Chlorophenol-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:01:12 1999
Event : Surrogate Recovery
Message : -0.06 2-Chlorophenol-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:01:12 1999
Event : Surrogate Recovery
Message : -0.06 1,2-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:01:12 1999
Event : Surrogate Recovery
Message : -0.06 1,2-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:01:12 1999
Event : Surrogate Recovery
Message : -0.06 Nitrobenzene-d5
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:01:12 1999
Event : Surrogate Recovery
Message : -0.06 Nitrobenzene-d5
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:01:13 1999
Event : Surrogate Recovery
Message : -0.06 2-Fluorobiphenyl
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:01:13 1999
Event : Surrogate Recovery
Message : -0.06 2-Fluorobiphenyl
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:01:13 1999
Event : Surrogate Recovery
Message : -0.05 2,4,6-Tribromophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:01:13 1999
Event : Surrogate Recovery
Message : -0.05 2,4,6-Tribromophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:01:13 1999
Event : Surrogate Recovery
Message : -0.05 Terphenyl-d14
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:01:13 1999
Event : Surrogate Recovery
Message : -0.05 Terphenyl-d14
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:02:33 1999
Event : Manual Integration
Message : Changed peak amount for Chrysene-d12 from 20ng/uL to 20ng/uL
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:02:49 1999
Event : Manual Integration
Message : Changed peak amount for Benzo(a)anthracene from 27.6983ng/uL to 29.
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:02:57 1999
Event : Manual Integration
Message : Changed peak amount for bis(2-Ethylhexyl)phthalate from 0.0578404ng/
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:34 1999
Event : Report Generation
Message : Generated Report using option:
QuantFile: PSEDBN.RES
Severity : 0

Modified : Thu Oct 07 17:03:34 1999
Event : ISTD Area
Message : 266352 1,4-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:34 1999
Event : ISTD Area
Message : 1.21508e+006 Naphthalene-d8
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:34 1999
Event : ISTD Area
Message : 672406 Acenaphthene-d10
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:35 1999
Event : ISTD Area
Message : 1.17638e+006 Phenanthrene-d10
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:35 1999
Event : ISTD Area
Message : 1.20393e+006 Chrysene-d12
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:35 1999
Event : ISTD Area
Message : 1.17882e+006 Perylene-d12
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:35 1999
Event : Surrogate Recovery
Message : -0.04 2-Fluorophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:35 1999
Event : Surrogate Recovery
Message : -0.04 2-Fluorophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:35 1999
Event : Surrogate Recovery
Message : -0.04 Phenol-d6
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:35 1999
Event : Surrogate Recovery
Message : -0.04 Phenol-d6
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:35 1999
Event : Surrogate Recovery
Message : -0.06 2-Chlorophenol-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:35 1999
Event : Surrogate Recovery
Message : -0.06 2-Chlorophenol-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:35 1999
Event : Surrogate Recovery
Message : -0.06 1,2-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:35 1999
Event : Surrogate Recovery
Message : -0.06 1,2-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:36 1999
Event : Surrogate Recovery
Message : -0.06 Nitrobenzene-d5
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:36 1999
Event : Surrogate Recovery
Message : -0.06 Nitrobenzene-d5
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:36 1999
Event : Surrogate Recovery
Message : -0.06 2-Fluorobiphenyl
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:36 1999
Event : Surrogate Recovery
Message : -0.06 2-Fluorobiphenyl
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:36 1999
Event : Surrogate Recovery
Message : -0.05 2,4,6-Tribromophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:36 1999
Event : Surrogate Recovery
Message : -0.05 2,4,6-Tribromophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:36 1999
Event : Surrogate Recovery
Message : -0.05 Terphenyl-d14
QuantFile: PSEDBN.RES
Severity : 1

Modified : Thu Oct 07 17:03:36 1999
Event : Surrogate Recovery
Message : -0.05 Terphenyl-d14
QuantFile: PSEDBN.RES
Severity : 1

Modified : Tue Nov 09 16:45:53 1999
Event : Report Generation
Message : Generated Report using option:
QuantFile: PSEDBN.RES
Severity : 0

Modified : Tue Nov 09 16:45:54 1999
Event : ISTD Area
Message : 266352 1,4-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Tue Nov 09 16:45:54 1999
Event : ISTD Area
Message : 1.21508e+006 Naphthalene-d8
QuantFile: PSEDBN.RES
Severity : 1

Modified : Tue Nov 09 16:45:54 1999
Event : ISTD Area
Message : 672406 Acenaphthene-d10
QuantFile: PSEDBN.RES
Severity : 1

Modified : Tue Nov 09 16:45:55 1999
Event : ISTD Area
Message : 1.17638e+006 Phenanthrene-d10
QuantFile: PSEDBN.RES
Severity : 1

Modified : Tue Nov 09 16:45:55 1999
Event : ISTD Area
Message : 1.20393e+006 Chrysene-d12
QuantFile: PSEDBN.RES
Severity : 1

Modified : Tue Nov 09 16:45:55 1999
Event : ISTD Area
Message : 1.17882e+006 Perylene-d12
QuantFile: PSEDBN.RES
Severity : 1

Modified : Tue Nov 09 16:45:55 1999
Event : Surrogate Recovery
Message : -0.04 2-Fluorophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Tue Nov 09 16:45:55 1999
Event : Surrogate Recovery
Message : -0.04 2-Fluorophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Tue Nov 09 16:45:55 1999
Event : Surrogate Recovery
Message : -0.04 Phenol-d6
QuantFile: PSEDBN.RES
Severity : 1

Modified : Tue Nov 09 16:45:55 1999
Event : Surrogate Recovery
Message : -0.04 Phenol-d6
QuantFile: PSEDBN.RES
Severity : 1

Modified : Tue Nov 09 16:45:55 1999
Event : Surrogate Recovery
Message : -0.06 2-Chlorophenol-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Tue Nov 09 16:45:55 1999
Event : Surrogate Recovery
Message : -0.06 2-Chlorophenol-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Tue Nov 09 16:45:55 1999
Event : Surrogate Recovery
Message : -0.06 1,2-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Tue Nov 09 16:45:55 1999
Event : Surrogate Recovery
Message : -0.06 1,2-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Tue Nov 09 16:45:56 1999
Event : Surrogate Recovery
Message : -0.06 Nitrobenzene-d5
QuantFile: PSEDBN.RES
Severity : 1

Modified : Tue Nov 09 16:45:56 1999
Event : Surrogate Recovery
Message : -0.06 Nitrobenzene-d5
QuantFile: PSEDBN.RES
Severity : 1

Modified : Tue Nov 09 16:45:56 1999
Event : Surrogate Recovery
Message : -0.06 2-Fluorobiphenyl
QuantFile: PSEDBN.RES
Severity : 1

Modified : Tue Nov 09 16:45:56 1999
Event : Surrogate Recovery
Message : -0.06 2-Fluorobiphenyl
QuantFile: PSEDBN.RES
Severity : 1

Modified : Tue Nov 09 16:45:56 1999
Event : Surrogate Recovery
Message : -0.05 2,4,6-Tribromophenol
QuantFile: PSEDBN.RES
Severity : 1

C:\HPCHEM\1\DATA\1006A\P1263.D\Audit.txt
Created Fri Oct 08 17:21:05 1999

Modified : Fri Oct 08 17:21:05 1999
Event : Quantitation
Message : Calculation using initial calibration
QuantFile: PSEDBN.RES
User : Sequence:
Why : Sequence
Severity : 0

Modified : Fri Oct 08 17:21:11 1999
Event : Report Generation
Message : Generated Report using option: S
QuantFile: PSEDBN.RES
User : Sequence: Sequence:
Why : Sequence
Severity : 0

Modified : Fri Oct 08 17:21:11 1999
Event : ISTD Area
Message : 340784 1,4-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence:
Why : Sequence
Severity : 1

Modified : Fri Oct 08 17:21:11 1999
Event : ISTD Area
Message : 1.55613e+006 Naphthalene-d8
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence:
Why : Sequence
Severity : 1

Modified : Fri Oct 08 17:21:11 1999
Event : ISTD Area
Message : 906717 Acenaphthene-d10
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence: Sequence:
Why : Sequence
Severity : 1

Modified : Fri Oct 08 17:21:12 1999
Event : ISTD Area
Message : 1.53424e+006 Phenanthrene-d10
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence: Sequence: Sequence:
Why : Sequence
Severity : 1

Modified : Fri Oct 08 17:21:12 1999
Event : ISTD Area
Message : 204 Chrysene-d12
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence: Sequence: Sequence: Se

Why : Sequence
Severity : 1

Modified : Fri Oct 08 17:21:12 1999
Event : ISTD Area
Message : 1.54473e+006 Perylene-d12
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence: Sequence: Sequence: Se
Why : Sequence
Severity : 1

Modified : Fri Oct 08 17:21:12 1999
Event : Surrogate Recovery
Message : -0.05 2-Fluorophenol
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence: Sequence: Sequence: Se
Why : Sequence
Severity : 1

Modified : Fri Oct 08 17:21:12 1999
Event : Surrogate Recovery
Message : 0.00 Phenol-d6
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence: Sequence: Sequence: Se
Why : Sequence
Severity : 1

Modified : Fri Oct 08 17:21:12 1999
Event : Surrogate Recovery
Message : -0.02 2-Chlorophenol-d4
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence: Sequence: Sequence: Se
Severity : 1

Modified : Fri Oct 08 17:21:13 1999
Event : Surrogate Recovery
Message : -0.03 1,2-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence: Sequence: Sequence: Se
Severity : 1

Modified : Fri Oct 08 17:21:13 1999
Event : Surrogate Recovery
Message : -0.03 Nitrobenzene-d5
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence: Sequence: Sequence: Se
Severity : 1

Modified : Fri Oct 08 17:21:13 1999
Event : Surrogate Recovery
Message : -0.04 2-Fluorobiphenyl
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence: Sequence: Sequence: Se
Severity : 1

Modified : Fri Oct 08 17:21:13 1999
Event : Surrogate Recovery
Message : -0.03 2,4,6-Tribromophenol
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence: Sequence: Sequence: Se
Severity : 1

Modified : Fri Oct 08 17:21:13 1999
Event : Surrogate Recovery
Message : -0.03 Terphenyl-d14
QuantFile: PSEDBN.RES
User : Sequence: Sequence: Sequence: Sequence: Sequence: Sequence: Se
Severity : 1

Modified : Fri Oct 08 17:24:08 1999
Event : Quantitation
Message : Calculation using initial calibration
QuantFile: PSEDBN.RES
Severity : 0

Modified : Fri Oct 08 17:24:14 1999
Event : Report Generation
Message : Generated Report using option:
QuantFile: PSEDBN.RES
Severity : 0

Modified : Fri Oct 08 17:24:15 1999
Event : ISTD Area
Message : 340784 1,4-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:15 1999
Event : ISTD Area
Message : 1.55613e+006 Naphthalene-d8
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:15 1999
Event : ISTD Area
Message : 906717 Acenaphthene-d10
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:16 1999
Event : ISTD Area
Message : 1.53424e+006 Phenanthrene-d10
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:16 1999
Event : ISTD Area
Message : 204 Chrysene-d12
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:16 1999
Event : ISTD Area
Message : 1.54473e+006 Perylene-d12
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:16 1999
Event : Surrogate Recovery
Message : -0.05 2-Fluorophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:16 1999
Event : Surrogate Recovery
Message : -0.05 2-Fluorophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:16 1999
Event : Surrogate Recovery
Message : 0.00 Phenol-d6
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:16 1999
Event : Surrogate Recovery
Message : 0.00 Phenol-d6
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:16 1999
Event : Surrogate Recovery
Message : -0.02 2-Chlorophenol-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:17 1999
Event : Surrogate Recovery
Message : -0.02 2-Chlorophenol-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:17 1999
Event : Surrogate Recovery
Message : -0.03 1,2-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:17 1999
Event : Surrogate Recovery
Message : -0.03 1,2-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:17 1999
Event : Surrogate Recovery
Message : -0.03 Nitrobenzene-d5
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:17 1999
Event : Surrogate Recovery
Message : -0.03 Nitrobenzene-d5
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:17 1999
Event : Surrogate Recovery
Message : -0.04 2-Fluorobiphenyl
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:17 1999
Event : Surrogate Recovery
Message : -0.04 2-Fluorobiphenyl
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:17 1999
Event : Surrogate Recovery
Message : -0.03 2,4,6-Tribromophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:18 1999
Event : Surrogate Recovery
Message : -0.03 2,4,6-Tribromophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:18 1999
Event : Surrogate Recovery
Message : -0.04 Terphenyl-d14
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:24:18 1999
Event : Surrogate Recovery
Message : -0.04 Terphenyl-d14
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:07 1999
Event : Manual Integration
Message : Changed peak amount for Chrysene-d12 from 20ng/uL to 20ng/uL
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:21 1999
Event : Report Generation
Message : Generated Report using option:
QuantFile: PSEDBN.RES
Severity : 0

Modified : Fri Oct 08 17:25:21 1999
Event : ISTD Area
Message : 340784 1,4-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:22 1999
Event : ISTD Area
Message : 1.55613e+006 Naphthalene-d8
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:22 1999
Event : ISTD Area
Message : 906717 Acenaphthene-d10
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:22 1999
Event : ISTD Area
Message : 1.53424e+006 Phenanthrene-d10
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:22 1999
Event : ISTD Area
Message : 1.63576e+006 Chrysene-d12
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:22 1999
Event : ISTD Area
Message : 1.54473e+006 Perylene-d12
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:23 1999
Event : Surrogate Recovery
Message : -0.05 2-Fluorophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:23 1999
Event : Surrogate Recovery
Message : -0.05 2-Fluorophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:23 1999
Event : Surrogate Recovery
Message : 0.00 Phenol-d6
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:23 1999
Event : Surrogate Recovery
Message : 0.00 Phenol-d6
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:23 1999
Event : Surrogate Recovery
Message : -0.02 2-Chlorophenol-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:23 1999
Event : Surrogate Recovery
Message : -0.02 2-Chlorophenol-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:23 1999
Event : Surrogate Recovery
Message : -0.03 1,2-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:23 1999
Event : Surrogate Recovery
Message : -0.03 1,2-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:24 1999
Event : Surrogate Recovery
Message : -0.03 Nitrobenzene-d5
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:24 1999
Event : Surrogate Recovery
Message : -0.03 Nitrobenzene-d5
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:24 1999
Event : Surrogate Recovery
Message : -0.04 2-Fluorobiphenyl
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:24 1999
Event : Surrogate Recovery
Message : -0.04 2-Fluorobiphenyl
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:24 1999
Event : Surrogate Recovery
Message : -0.03 2,4,6-Tribromophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:24 1999
Event : Surrogate Recovery
Message : -0.03 2,4,6-Tribromophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:24 1999
Event : Surrogate Recovery
Message : -0.04 Terphenyl-d14
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Oct 08 17:25:24 1999
Event : Surrogate Recovery
Message : -0.04 Terphenyl-d14
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:57:50 1999
Event : Report Generation
Message : Generated Report using option:
QuantFile: PSEDBN.RES
Severity : 0

Modified : Fri Nov 05 11:59:13 1999
Event : Report Generation
Message : Generated Report using option:
QuantFile: PSEDBN.RES
Severity : 0

Modified : Fri Nov 05 11:59:15 1999
Event : ISTD Area
Message : 340784 1,4-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:16 1999
Event : ISTD Area
Message : 1.55613e+006 Naphthalene-d8
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:17 1999
Event : ISTD Area
Message : 906717 Acenaphthene-d10
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:18 1999
Event : ISTD Area
Message : 1.53424e+006 Phenanthrene-d10
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:19 1999
Event : ISTD Area
Message : 1.63576e+006 Chrysene-d12
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:20 1999
Event : ISTD Area
Message : 1.54473e+006 Perylene-d12
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:21 1999
Event : Surrogate Recovery
Message : -0.05 2-Fluorophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:22 1999
Event : Surrogate Recovery
Message : -0.05 2-Fluorophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:22 1999
Event : Surrogate Recovery
Message : 0.00 Phenol-d6
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:23 1999
Event : Surrogate Recovery
Message : 0.00 Phenol-d6
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:23 1999
Event : Surrogate Recovery
Message : -0.02 2-Chlorophenol-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:24 1999
Event : Surrogate Recovery
Message : -0.02 2-Chlorophenol-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:24 1999
Event : Surrogate Recovery
Message : -0.03 1,2-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:25 1999
Event : Surrogate Recovery
Message : -0.03 1,2-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:26 1999
Event : Surrogate Recovery
Message : -0.03 Nitrobenzene-d5
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:26 1999
Event : Surrogate Recovery
Message : -0.03 Nitrobenzene-d5
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:27 1999
Event : Surrogate Recovery
Message : -0.04 2-Fluorobiphenyl
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:28 1999
Event : Surrogate Recovery
Message : -0.04 2-Fluorobiphenyl
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:29 1999
Event : Surrogate Recovery
Message : -0.03 2,4,6-Tribromophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:29 1999
Event : Surrogate Recovery
Message : -0.03 2,4,6-Tribromophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:30 1999
Event : Surrogate Recovery
Message : -0.04 Terphenyl-d14
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 11:59:31 1999
Event : Surrogate Recovery
Message : -0.04 Terphenyl-d14
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 12:00:02 1999
Event : Report Generation
Message : Generated Report using option:
QuantFile: PSEDBN.RES
Severity : 0

Modified : Fri Nov 05 12:00:08 1999
Event : Report Generation
Message : Generated Report using option:
QuantFile: PSEDBN.RES
Severity : 0

Modified : Fri Nov 05 12:00:09 1999
Event : ISTD Area
Message : 340784 1,4-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 12:00:11 1999
Event : ISTD Area
Message : 1.55613e+006 Naphthalene-d8
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 12:00:12 1999
Event : ISTD Area
Message : 906717 Acenaphthene-d10
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 12:00:13 1999
Event : ISTD Area
Message : 1.53424e+006 Phenanthrene-d10
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 12:00:14 1999
Event : ISTD Area
Message : 1.63576e+006 Chrysene-d12
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 12:00:15 1999
Event : ISTD Area
Message : 1.54473e+006 Perylene-d12
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 12:00:16 1999
Event : Surrogate Recovery
Message : -0.05 2-Fluorophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 12:00:16 1999
Event : Surrogate Recovery
Message : 0.00 Phenol-d6
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 12:00:17 1999
Event : Surrogate Recovery
Message : -0.02 2-Chlorophenol-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 12:00:17 1999
Event : Surrogate Recovery
Message : -0.03 1,2-Dichlorobenzene-d4
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 12:00:18 1999
Event : Surrogate Recovery
Message : -0.03 Nitrobenzene-d5
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 12:00:19 1999
Event : Surrogate Recovery
Message : -0.04 2-Fluorobiphenyl
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 12:00:20 1999
Event : Surrogate Recovery
Message : -0.03 2,4,6-Tribromophenol
QuantFile: PSEDBN.RES
Severity : 1

Modified : Fri Nov 05 12:00:21 1999
Event : Surrogate Recovery
Message : -0.04 Terphenyl-d14
QuantFile: PSEDBN.RES

BIOLOGICAL DATA VALIDATION

BIOASSAY QUALITY ASSURANCE SUMMARY AND DATA VALIDATION

MIDDLE WATERWAY PROBLEM AREA SAMPLING ROUND 1B

Prepared by

Foster Wheeler Environmental Corporation
10900 NE 8th Street
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December 22, 1999

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Table 1 Dates and Holding Times for Bioassays

1. INTRODUCTION

Sediment samples were collected at nine stations within the Middle Waterway Problem Area of the Commencement Bay/Nearshore Tideflats Superfund Site (Middle Waterway), at two reference stations located in Carr Inlet and at a control site on West Beach, Whidbey Island during September 1999 for the Round 1B Sampling and Analysis. These samples were submitted to Northwestern Aquatic Sciences (NAS) where three separate bioassays were performed to assess the potential toxicity to benthic organisms from sediments in Middle Waterway. This report contains a summary of the independent Quality Assurance (QA) review conducted by Foster Wheeler Environmental in December 1999 for the NAS data reports. Attached to this report are Bioassay Data Validation Checklists for each of the three bioassays.

1.1 QUALITY ASSURANCE REVIEW SCOPE AND TASKS

The purpose of this QA review was to examine all aspects of the laboratory data report provided by NAS in order to ensure that protocols were followed and that summary data were accurately calculated and reported. Specifically, within each of the three data reports, the following items were reviewed:

- Testing Protocol for Consistency with PSEP Guidelines and EPA-approved Sampling Analysis Plan (SAP) (Foster Wheeler Environmental 1998)
- Holding Conditions and Sample Tracking
- Bench Sheets and Daily Logs
- Water Quality Data
- Negative and Positive Control Performance
- Ammonia Data in Pore Water and Overlying Water
- Spreadsheet and Statistical Calculations Checked for Transcription Errors

2. QUALITY ASSURANCE SUMMARIES

2.1 QUALITY ASSURANCE OF TESTING PROTOCOLS

The testing protocols followed by NAS were found to be nearly identical to PSEP guidelines and EPA-approved SAP. These protocols included provisions for selection of organisms for use in bioassays, description of the test system and experimental design, water quality criteria and monitoring, QA samples (negative and positive controls), and data analysis.

2.2 SAMPLE COLLECTION, HOLDING CONDITIONS AND SAMPLE TRACKING

Each of the three NAS data reports contained complete information regarding the collection, transport and handling of sediment samples and test organisms. Copies of shipping labels and chain-of-custody paperwork were included in each of the data reports. There were no discrepancies noted between this paperwork and the reported receipt of samples. Complete documentation of holding conditions was provided. The holding conditions followed PSEP guidelines for all of the bioassays. No major discrepancies were found between the testing conditions and the protocol specifications. The only noted difference was the recommended sediment holding time of 14 days stated in the NAS protocol which was stricter than the PSEP requirement of 56 days. The maximum holding time for any given sediment sample was 15 days. Holding times are summarized in Table 1. Slight deviations from the testing protocol, which are specified below, were limited to water quality conditions (e.g., pH, temperature and salinity levels) and were noted by NAS in the data reports. These minor deviations are not believed to adversely affect the quality of the data.

Table 1. Dates and Holding Times for Bioassays

	Bioassay Sediment Samples			
	MWAT042R1 MWAT045R1	MWAT044R1 MWAT047R1 MWAT153R1	MWAT041R1 MWAT046R1	MWAS034R1 MWAS037R1 MWRC213R1 MWRC214R1
Sediment collected	9-21-99	9-22-99	9-23-99	9-27-99
Sediment received	9-23-99	9-23-99	9-25-99	9-29-99
Larval bioassay started	10-8-99	10-8-99	10-8-99	10-8-99
Larval bioassay ended	10-11-99	10-11-99	10-11-99	10-11-99
Amphipod bioassay started	10-5-99	10-5-99	10-5-99	10-5-99
Amphipod bioassay ended	10-15-99	10-15-99	10-15-99	10-15-99
Polychaete bioassay started	10-5-99	10-5-99	10-5-99	10-5-99
Polychaete bioassay ended	10-25-99	10-25-99	10-25-99	10-25-99

2.3 TRANSCRIPTION AND CALCULATION CHECKS

All of the data within each of the summary tables provided by NAS was checked against the data reported on the bench sheets. When spreadsheets were provided, output columns were checked against input parameters. Input data in statistical calculations was also checked against data reported in summary tables. No discrepancies were found between bench sheets and summary tables, and no transcription errors were found in the spreadsheets included in the three data reports.

2.4 BIOASSAY SPECIFIC QUALITY ASSURANCE SUMMARIES

2.4.1 Echinoderm Larval Sediment Toxicity Test

2.4.1.1 Summary of Data Quality

Overall, the echinoderm larval bioassays performed for the Round 1B Sampling and Analysis of Middle Waterway followed the recommended PSEP protocols, with modifications as specified by the Puget Sound Dredged Material Management Program (DMMP), and the EPA-approved SAP (Foster Wheeler Environmental 1998). The data are considered acceptable without qualification.

2.4.1.2 Collection, Transport and Holding Conditions

The echinoderm larval sediment toxicity test was conducted on sediment samples collected from nine stations within the Middle Waterway, two reference stations (Carr Inlet) and one control site (West Beach, Whidbey Island). Test and reference sediments were delivered to NAS via overnight mail. All samples were received at the laboratory either on September 23, 25, or 29, 1999. Samples were placed under nitrogen and stored at 4 °C in the dark in capped containers until used. The bioassay was initiated on 10-8-99. The maximum holding time prior to initiation of the bioassay was 15 days. *Dendraster excentricus* (sand dollar) was the organism selected for this bioassay because it naturally spawns from April to October. The test organisms used for this bioassay were received at NAS from Long Beach, California on October 7, 1999. The collection date for these organisms was not specified. There were no protocol deviations noted in this data report.

2.4.1.3 Test Procedures, Water Monitoring and QA Samples

Following the initiation of spawning, 10 ml subsamples of echinoderm larval stock solution were collected from the stock solution, analyzed for density of organisms and aliquoted into each of the sample containers. Five replicates were used per treatment with an additional replicate serving as a water quality control. The negative control had an acceptable survival

and the EC_{50} derived from the positive control was within the acceptable range for NAS. There were no noted protocol deviations.

2.4.2 10-Day Amphipod Sediment Toxicity Test

2.4.2.1 Summary of Data Quality

Overall, the amphipod bioassays performed for the Round 1B Sampling and Analysis of Middle Waterway followed the recommended PSEP protocols, with modifications as specified by DMMP, and the EPA-approved SAP (Foster Wheeler Environmental 1998). The data are considered acceptable without qualification.

2.4.2.2 Collection, Transport and Holding conditions

The 10-day Amphipod Sediment Toxicity Test was conducted on sediment samples collected from nine stations within the Middle Waterway, two reference stations (Carr Inlet) and one control site (West Beach, Whidbey Island). Test and reference sediments were delivered to NAS via overnight mail. All samples were received at the laboratory either on September 23, 25, or 29, 1999. Samples were placed under nitrogen and stored at 4 °C in the dark in capped containers until used. The bioassay was initiated on 10-5-99. The maximum holding time prior to initiation of the bioassay was 12 days. *Rhepoxynius abronius* was the organism chosen for this bioassay. The test organisms were collected from West Beach, Whidbey Island on 9-29-99 and received at NAS on 10-1-99.

2.4.2.3 Test Procedures, Water Monitoring and QA Samples

Five replicates were used per treatment. The negative control had an acceptable survival and the EC_{50} derived from the positive control was within the acceptable range for NAS. Minor protocol deviations were noted in the data report. The protocol deviations noted were corrected by the laboratory and were not found to adversely impact the quality of the data. Issues related to this test included:

- Interstitial salinity for three of the sediments were slightly below the recommended criteria of 25 ppt. These samples were MWAT042R1, MWAT045R1, and MWAT041R1. These samples were adjusted to meet the acceptable criteria prior to initiation of the bioassays.
- Overlying water salinity values were slightly elevated in several water quality beakers on day 3 and day 8.
- Temperature was in excess of the specified range of 15.0 ±1°C in several beakers on days 0 to 4 and day 8.

- The interstitial salinity was not recorded at the conclusion of the bioassay as specified in PSEP guidance documents.

2.4.3 20-Day Juvenile Polychaete Sediment Toxicity Test

2.4.3.1 Summary of Data Quality

Overall, the juvenile polychaete bioassays performed for the Round 1B Sampling and Analysis of Middle Waterway followed the recommended PSEP protocols, with modifications as specified by DMMP, and the EPA-approved SAP (Foster Wheeler Environmental 1998). The data are considered acceptable without qualification.

2.4.3.2 Collection, Transport and Holding conditions

The 20-day polychaete sediment toxicity test was conducted on sediment samples collected from six stations within the Middle Waterway, two reference stations (Carr Inlet) and one control site (West Beach, Whidbey Island). Test and reference sediments were delivered to NAS via overnight mail. All samples were received at the laboratory either on September 23, 25, or 29, 1999. Samples were placed under nitrogen and stored at 4 °C in the dark in capped containers until used. The bioassay was initiated on 10-5-99. The maximum holding time prior to initiation of the bioassay was 12 days. *Neanthes arenaceodentata* in its juvenile stage was the organism used for this bioassay. The test organisms were received from Long Beach, CA on 9-29-99 where they were laboratory reared.

2.4.3.3 Test Procedures, Water Monitoring and QA Samples

Five replicates were used per treatment. The negative control had an acceptable survival and the EC_{50} derived from the positive control was within the acceptable range for NAS. There were no noted protocol deviations.

3. QUALITY ASSURANCE CONCLUSIONS

The data reports provided by NAS were reviewed to ensure the integrity of the bioassay sediment toxicity data. These reports were found to be acceptable and the data are considered usable without qualification. All questions noted during this QA check of the NAS data reports were answered by laboratory personnel.

4. REFERENCES

Foster Wheeler Environmental Corporation. 1998. Sampling and Analysis Plan for the Middle Waterway Problem Area of the Commencement Bay Nearshore/Tideflats Superfund Site. Prepared for the Middle Waterway Action Committee. Foster Wheeler Environmental Corporation, Bellevue, WA.

Puget Sound Estuary Program. 1996. Recommended Protocols for Sampling and Analyzing Subtidal Benthic Macroinvertebrate Assemblages in Puget Sound. Prepared for U.S. Environmental Agency, Region 10, Office of Puget Sound, Seattle, WA. Prepared by Tetra Tech, Inc., Bellevue, WA. 30 pp.

ATTACHMENTS

BIOASSAY DATA VALIDATION CHECKLISTS

1. Echinoderm Larval Sediment Toxicity Test

Review Date 12-15-99

Test name and protocol: Echinoderm Embryo Sediment Toxicity Test, NAS-XXX-SP/DE4

Species: *Dendraster excentricus*

Testing Lab: Northwestern Aquatic Sciences, Newport, OR

Batch No. 1 of 1 No. of Samples 11 & Negative Control

Dates: Sampling 9-21-99, 9-22-99, 9-23-99, 9-27-99

Shipping 9-22-99, 9-24-99, 9-28-99

Receiving 9-23-99, 9-25-99, 9-29-99

Completeness and Holding Conditions

No. of Analyses (Test, Reference, & Control) 12 Ratio (no. analyzed/no. submitted) 11/11

Holding Samples within 2 - 6 ^{0}C Temperature Range (Y/N) Y

Interstitial Salinity ≥10 ppt (Y/N) Y If No, List Samples _____

Sediment Holding Time at Test Initiation t_0 = 10-8-99 10–15 days[a]

Seawater Source Yaquina Bay, OR Seawater holding ≤2 days (Y/N) Y

Source of Organisms Long Beach, CA

Holding Time for Organisms 1 day

Problems Noted in Shipping and Holding (Y/N) N

Lab Report Format

Standard Data Report Case narrative with tables, protocol, bench sheets, calculations

Individual and Replicate Mean and Stnd Dev., % Mortality and Abnormality at t_{final} (Y/N) Y

QA/QC Data (Y/N) Y Water Quality Data (Y/N) Y

Chain of Custody (Y/N) Y

QA/QC Samples

Positive Control (96 hr)

Reference Toxicant Cadmium chloride (mg/L) EC_{50} 10.2

EC_{50} Lab Reference Range 4.6–12.4

Exposure Concentrations/Organism Response (Conc. (mg $CdCl_2$/L):% Abnormal)

0:2% 1:1%, 2:2%, 4:3%, 8:16%, 15:99%, 30:100%

<30% Mortality in Seawater (Y/N) Y

Negative Control

Collection Site West Beach sediment

Frequency 1 per batch Total No. 1

<30% Mortality in Seawater (Y/N) Y

Reference Sediment

Collection Site Carr Inlet

Frequency 2 per batch Total No. 2

Analytical Replicates

Beakers Randomized (Y/N) Y	No. Organisms/rep at t_0 221
Subsample vol. 10 ml	
Amount of Sediment Used 18 g	Final Volume 900 ml

Water Quality Monitoring

Measured in all Reps at $T_{initial}$ (Y/N) N[b]	Measured in 1 Rep of each Dil. Daily (Y/N) Y
Measured in all Reps at T_{final} (Y/N) N[b]	
Temperature 14–16 ^{0}C (Y/N) Y	If No, List Samples
Salinity 27–29 ppt (Y/N) Y	If No, List Samples
DO ≥60% Sat. (≥ 4.9 ppt) (Y/N) Y	If No, List Samples
pH 7.3–8.3 (Y/N) Y	If No, List Samples

Continuos Light (Y/N) Y

Beakers Aerated if DO <60% (Y/N) NA

Ammonia and Sulfide

Ammonia Overlying Water Concentrations (mg/L)

$T_{initial}$ (range) <0.5–2.5 T_{final} (range) <0.5–0.5

Sulfide Overlying Water Concentrations (mg/L)

$T_{initial}$ (range) <0.02–<0.02 T_{final} (range) <0.02–<0.02

Calibrations Performed (Y/N) Y

Notes

[a] Meets PSEP criteria of 56 days, but not NAS criteria of 14 days

[b] Discussed with Michelle Redmond (12-17-99). NAS protocol only requires water quality monitoring in sacrificial beakers.

2. 10-Day Amphipod Toxicity Test

Review Date 12-15-99

Test name and protocol: Amphipod 10-Day Sediment Toxicity Test, NAS-XXX-RA4

Species: *Rhepoxynius abronius*

Testing Lab: Northwestern Aquatic Sciences, Newport, OR

Batch No. 1 of 1 No. of Test Samples 11 & Negative Control

Dates: Sampling 9-21-99, 9-22-99, 9-23-99, 9-27-99

Shipping 9-22-99, 9-24-99, 9-28-99

Receiving 9-23-99, 9-25-99, 9-29-99 (Control 10-1-99)

Completeness and Holding Conditions

No. of Analyses (Test, Reference, & Control) 12 Ratio (no. analyzed/no. submitted) 11/11

Holding Samples within 2–6 ^{0}C Temperature Range (Y/N) Y

Interstitial Salinity ≥25 ppt (Y/N) Y[a] If No, List Samples

Sediment Holding Time at Test Initiation t_0 = 10-5-99 6-12 days

Seawater Source Yaquina Bay, OR Seawater holding ≤2 days (Y/N) Y

Source of Organisms West Beach

Organism Holding/Acclimation 4 days

Problems Noted in Shipping and Holding (Y/N) N

Lab Report Format

Standard Data Report Case narrative with tables, protocol, bench sheets, calculations

No. of Survivors (Y/N) Y No. of Dead/Missing (Y/N) Y

Biological Observations (Y/N) Y No. Reburying (Y/N) Y

QA/QC Data (Y/N) Y Water Quality Data (Y/N) Y

Chain of Custody (Y/N) Y

QA/QC Samples

Positive Control

Reference Toxicant Cadmium chloride (mg/L) 96-hr LC_{50} 1.54

LC_{50} Lab Reference Range 0.00–2.81

Exposure Concentrations/Organism Response (Conc. (mg $CdCl_2$/L):% Mortality)

0.0/5%. 0.1/0%, 0.3/5%, 1.0/40%, 3.0/75%, 10/100%

2 Partial Responses (Y/N) Y >50% Mort. at High Conc. (Y/N) Y

Negative Control

Collection Site West Beach sediment

Frequency 1 per batch Total No. 1

<10% Mortality in Control (Y/N) Y

Reference Sediment

Collection Site Carr Inlet

Frequency 2 per batch Total No. 2

<20% Mortality in Reference over Negative Control (Y/N) Y

Analytical Replicates

5 Reps per Sample (Y/N) Y	1 Rep/Sample for Ammonia P/W (Y/N) Y
Beakers Randomized (Y/N) Y	No. Organisms/Rep 20
Amount of Sediment Used 175 ml	Final Volume 950 ml

Water Quality Monitoring

Measured in all Reps at $T_{initial}$ (Y/N) Y Measured in 1 Rep Daily (Y/N) Y

Measured in all Reps at T_{final} (Y/N) Y

Temperature 14–16 ^{0}C (Y/N) N[b] If No, List Samples Multiple Samples on Days 0-4 and Day 8, Overall Range 15.3–16.3 ^{0}C

Salinity 27–29 ppt (Y/N) N[b] If No, List Samples Multiple Samples on Day 3 and Day 8, Overall Range 27.5–32.0

DO ≥ 5mg/L (Y/N) Y If No, List Samples

pH 7.3–8.3 (Y/N) N[c] If No, List Samples 1 Sample on Day 6, Day 7, and Day 8, Overall Range 7.4–8.6

Continuous Light (Y/N) Y

All Beakers Aerated (Y/N) Y

Ammonia

Porewater Concentrations <15 mg/L (Y/N) Y If No, List Samples

$T_{initial}$ (range) <2.5–12.5 T_{final} (range) <2.5–12.5

Overlying Water Concentrations (mg/L)

$T_{initial}$ (range) <.05–2.0 T_{final} (range) <.05–3.5

Calibrations Performed (Y/N) Y

Notes

[a] Samples MWAT042R1,MWAT045R1, MWAT041R1 required adjustment at the lab to reach interstitial salinity >25 ppt

[b] Prompt corrective action taken to rectify deviation

[c] Deviations limited to reference samples and are not believed to adversely affect the quality of the data.

3. 20-Day Juvenile Polychaete Toxicity Test

Review Date 12-15-99

Test name and protocol: 20-Day Juvenile Polychaete Sediment Toxicity Test, NAS-XXX-NA4

Species: *Neanthes arenaceodentata*

Testing Lab: Northwestern Aquatic Sciences, Newport, OR

Batch No. 1 No. of Samples 8 & Negative Control

Dates: Sampling 9-21-99, 9-22-99, 9-23-99, 9-27-99

Shipping 9-22-99, 9-24-99, 9-28-99

Receiving 9-23-99, 9-25-99, 9-29-99 (Control 10-1-99)

Completeness and Holding Conditions

No. of Analyses 9 Ratio (no. analyzed/no. submitted) 8/8

Holding Samples within 2–6 ^{0}C Temperature Range (Y/N) Y

Interstitial Salinity ≥20 ppt (Y/N) Y If No, List Samples

Holding Time at Test Initiation t_0 = 10-5-99 6-12 days

Source of Organisms Long Beach, CA

Holding Time for Organisms 15 days

Worm weight (Avg.) 0.5–1.0 mg at t_0 (Y/N) Y Initial worm weight 0.76 mg

Problems Noted in Shipping and Holding (Y/N) N

Lab Report Format

Standard Data Report Case narrative with tables, protocol, bench sheets, calculations

No. of Survivors (Y/N) Y No. of Dead (Y/N) Y

Total Biomass for 3 groups of 5 worms (Y/N) Y Average Growth Rate (Y/N) Y

20 Day Total and Average Individual Biomass (Y/N) Y

QA/QC Data (Y/N) Y Water Quality Data (Y/N) Y

Chain of Custody (Y/N) Y

QA/QC Samples

Positive Control

Reference Toxicant Cadmium (mg/L) 96-hr LC_{50} 7.6

Lab Reference Range 3.96–11.1

Exposure Concentrations/Organism Response (Conc. (mg Cd/L)% Mortality)

0:0%, 1.56:0%, 3.13:0%, 6.25:40%, 12.5:90%, 25:95%

2 Partial responses (Y/N) Y >50% Mort. At High Conc. (Y/N) Y

Negative Control

Collection Site West Beach

Frequency 1/batch Total No. 1

<10% Mortality in Control (Y/N) Y ≥ 0.72 mg/kg growth Rate in Control (Y/N) Y

Reference Sediment

Collection Site Carr Inlet

Frequency 2 per/batch Total Number 2

Analytical Replicates

5 Reps per Sample (Y/N) Y	
Beakers Randomized (Y/N) Y	No. Organisms/Rep 5
Amount of Sediment Used 175 ml	Final Volume 950 ml

Water Quality Monitoring

Measured in all Reps at $T_{initial}$ (Y/N) Y	Measured in 1 Rep Daily (Y/N) Y
Measured in all Reps at T_{final} (Y/N) Y	
Temperature 19–21 ^{0}C (Y/N) Y	If No, List Samples
Salinity 26–30 ppt (Y/N) Y	If No, List Samples
DO ≥ 5mg/L (Y/N) Y	If No, List Samples
pH 7.3–8.3 (Y/N) N[b]	If No, List Samples Days 6, 18, 20
Range 7.4–8.5	

Continuous Light (Y/N) Y

All Beakers Aerated (Y/N) Y

Feeding every other day (Y/N) Y

Ammonia

Porewater Concentrations <15 mg/L (Y/N) Y	If No, List Samples
$T_{initial}$ (range) <2.5–12.5	T_{final} (range) <2.5–12.5
Overlying Water Concentrations (mg/L)	
$T_{initial}$ (range) <.05–2.0	T_{final} (range) <.05–3.5
Calibrations Performed (Y/N) Y	

Notes

[a] Discussed with Michelle Redmond (12-17-99). This minor deviation is not believed to adversely affect the quality of the data.

BENTHIC INFAUNA QA REVIEW

FOSTER WHEELER ENVIRONMENTAL CORPORATION

Memorandum

Date: January 17, 2000

To: Middle Waterway File (1699.0014.0000.00004)

From: G. Braun

RE: Middle Waterway Benthic Infauna – QA Review

SUMMARY OF DATA QUALITY

The sampling and analysis of benthic infauna assemblages for the Round 1B Sampling and Analysis of the Middle Waterway Problem Area of the Commencement Bay/Nearshore Tideflats Superfund Site followed the recommended Puget Sound Estuary Program (PSEP) protocols and the EPA-approved Sampling and Analysis Plan (Foster Wheeler Environmental 1998). The data are considered acceptable without qualification.

SAMPLE COLLECTION, TRANSPORT, AND CHAIN-OF-CUSTODY

Benthic macroinvertebrates were collected at three stations within Middle Waterway and at a reference station in the Hylebos Waterway (near Round 1A station MW206). The three Middle Waterway and one reference station were located within the intertidal area of each waterway and were analyzed for benthic infauna.

Seven replicate grab samples were collected at each station, for a total of 28 samples. All grab samples were collected using a 0.023-m^2 petite Ponar grab sampler. In the field, samples were washed on a sieve with 1.0-mm mesh openings and fixed with a 10 percent solution of buffered formalin. Sample tracking records followed each sample through all stages of sample collection and laboratory processing.

The field sampling methods used to collect benthic macroinvertebrate samples during the Round 1B survey were outlined in the SAP (Foster Wheeler Environmental 1998) and the PSEP protocols. The following discussion summarizes those procedures.

Benthic samples were initially collected from each intertidal station at low tide, sieved, and preserved. It was discovered that these initial samples had been sieved using freshwater, therefore, they were rejected. Samples were recollected on September 29, 1999. However, due to the tide conditions, all samples, including the reference station, were collected from a boat at high tide.

Following deployment and retrieval of the grab sampler, the sediment sample was inspected carefully to determine the acceptability of the sample. Samples were rejected if they did not meet the acceptance criteria.

When a sample was judged to be acceptable, the following qualitative sediment characteristics were recorded:

- Penetration depth
- Sediment texture
- Sediment color
- Presence and strength of odors
- Degree of leakage and/or surface disturbance
- Presence of debris or shell fragments.

Field log sheets for all stations are provided in Appendix A.

After these observations were recorded, the sampler was opened and the sediment was released into a clean bucket containing a label identifying the sample. The sampler was rinsed so that all sediment from the sampler was contained in the bucket. The sediment from each bucket was rinsed into a sieve box and the sample material was then completely washed until material no longer passed through the 1.0-mm mesh screen. That portion of the sample retained on the screen was then placed in a plastic sample bag having both internal and external labels. Samples were then fixed in the field with a 10 percent solution of buffered formalin.

LABORATORY ANALYSIS

In the laboratory, benthic invertebrate samples were washed on a 0.5-mm sieve and transferred to a 70 percent solution of alcohol. The rescreening process was performed by Marine Taxonomic Services, Ltd. (MTS).

Of the 28 samples (i.e., 4 stations) collected, 8 samples (i.e., replicates six and seven from each of the stations) were archived and have not been processed. The remaining 20 samples (i.e., replicates 1-5 from each station) were processed by MTS. Project personnel who sorted and identified the samples are identified in the material received from MTS dated December 8, 1999. Organisms were identified to the lowest practical taxonomic level. Planktonic organisms that occurred in the samples were not enumerated, but were given an abundance of "1" to note their presence in the sample. Specimens of each species (or lowest practical taxon) that occurred in the survey were placed in a reference collection prepared by the taxonomists.

QUALITY ASSURANCE/QUALITY CONTROL

Quality control (QC) checks of sample sorting were performed by resorting 20 percent of each sample. If the 20 percent resort indicated a calculated difference of 5.0 percent or greater in total sample abundance for all taxa combined, the entire sample was resorted. Quality control checks of taxonomic identifications were performed by having one expert taxonomist re-identify 5 percent of another taxonomist's samples. All specimens placed in the reference collection, were

also compared with specimens in the taxonomists voucher collection from organisms identified in Puget Sound.

Howard Jones, of MTS, entered the benthic infauna data from the taxonomist's original laboratory data sheets onto an electronic spreadsheet (e.g. Excel). NODC taxonomic codes were included for most taxa. All entries in the spreadsheet were verified against the original laboratory sheets after data entry. The hard copies of the data set were reviewed for errors. None were found.

QA/QC procedures resulted in an acceptable data set without qualification.

DATA DELIVERABLES

On December 13, 1999, Foster Wheeler received the following from MTS: diskettes containing the spreadsheets of data for the four stations, hard copy of the data for the same stations, an invertebrate species checklist, bulk QA report, voucher collection and QA report, benthic sorting QC report, and biomass report. The voucher collection samples were received on January 6, 2000.

A checklist of all taxa identified for the project was received, and the list was reviewed for accuracy. The QA results from various taxonomists were also provided, and it appeared that the QA information provided by MTS to Foster Wheeler was accurate.

REFERENCES

Foster Wheeler Environmental. 1998. Sampling and Analysis Plan for the Middle Waterway Problem Area of the Commencement Bay Nearshore/Tideflats Superfund Site. Prepared for the Middle Waterway Action Committee. Foster Wheeler Environmental Corporation, Bellevue, WA.

Puget Sound Estuary Program. 1996. Recommended protocols for sampling and analyzing subtidal benthic macroinvertebrate assemblages in Puget Sound. Prepared for U.S. Environmental Protection Agency, Region 10, Office of Puget Sound, Seattle, WA. Prepared by Tetra Tech, Inc., Bellevue, WA. 30 pp.

Appendix E

APPENDIX E

GEOTECHNICAL SAMPLE DATA

SOIL
TECHNOLOGY™
INNOVATIVE SOLUTIONS

LETTER OF TRANSMITTAL

TO : **Anchor Environmental**
1141 4th Avenue, Suite 1210
Seattle, WA 98101

Date: November 30, 1999
Job No.: J-1289

ATTENTION: John Verduin

REFERENCE: Middle Waterway

We are sending the following items:

Date	Description
11/30/99	Moisture Contents (Table 1) Pages 1 through 3
11/30/99	Percent Passing U.S. Sieve Number 200 (Table 2) Page 3
11/30/99	Specific Gravity (Table 3) Page 3
11/30/99	Consolidation Test Reports (Plots 1 through 10)
11/30/99	Triaxial Compression Unconsolidated Undrained (UU-1 through UU-4)
11/30/99	Particle Size Distribution Test Reports (Plates 1 and 2)
11/30/99	Plasticity Chart (Figures 1 and 2)
11/30/99	Credit Invoice No. 1894

These are transmitted for your use.

REMARKS: Testing was performed in general accordance with ASTM D-2216, D-1140, D-854, D-2435, D-2850, D-422 and D-4318. All samples are considered non-hazardous and will be discarded sixty (60) days from the date of this transmittal. It is understood and agreed that Soil technology, Inc. is not, and has no responsibility as a generator, treater, storer, or disposer of hazardous or toxic substances associated with this project and CLIENT agrees to assume responsibility for the foregoing. If you should have any questions about the data enclosed herein or if I can be of further assistance please do not hesitate to contact me. The attached credit invoice is for an overcharge of moisture contents. Thank you for using Soil Technology's laboratory services.

Best Regards,
SOIL TECHNOLOGY, INC.

Anthony C. Parkins,
Soils Laboratory Manager

7865 N. E. Day Road West • Bainbridge Island, WA 98110
(206)842-8977 • Fax 842-9014 • Toll Free 1-800-546-5022 • Web Site www.soils-sti.com

Anchor Environmental
Middle Waterway Geotech

Moisture Contents
Table 1

Exploration Number	Sample Number	Sample Depth (ft)	Moisture Content %
MW-161	R2	12.5-14.0	24
MW-161	R3	15.0-16.5	68
MW-161	R4	17.5-19	27
MW-161	R5	21-21.5	23
MW-161	R-6	22.5-24.0	35
MW-161	R7	27.5-29	22
MW-161	R8	32.5-34	29
MW-161	R10	39.5-41	30
MW-161	R11	42.5-44	30
MW-161	R12	47.5-49	28
MW-161	R13	52.5-54.0	21
MW-161	R14	57.5-59	26
MW-162	R2	2.5-4	11
MW-162	R3	5.0-6.5	26
MW-162	R4	7.5-8.5	34
MW-162	R5	8.5-9	41
MW-162	R6	10.0-11.5	35
MW-162	R7	12.5-14	32
MW-162	R8	17.5-19	37
MW-162	R9	22.5-24	28
MW-162	R10	27.5-28.7	91
MW-162	R11	28.7-29	35
MW-162	R12	32.5-33	28
MW-162	R13	33-33.5	35
MW-162	R14	33.5-34	22
MW-162	R15	37.5-38.5	26
MW-162	R16	38.5-39	37
MW-162	R17	42.5-43.5	29
MW-162	R18	43.5-44	35
MW-162	R19	47.5-49	31
MW-162	R20	52.5-54	26
MW-162	R21	57.5-58.5	25
MW-162	R22	58.5-58.9	20
MW-162	R23	58.9-59	30
MW-163	R2	2.5-4	7
MW-163	R3	5-6.25	50
MW-163	R4	6.25-6.5	29
MW-163	R5	7.5-9	28
MW-163	R6	10.0-11.5	35
MW-163	R7	12.5-14.0	33
MW-163	R8	17.5-19	25
MW-163	R10	24.5-26.0	27
MW-163	R11	27.5-29	24
MW-163	R12	32.5-34.0	13
MW-163	R13	37.5-39	34

Anchor Environmental
Middle Waterway Geotech

Moisture Contents
Table 1 (Continued)

Exploration Number	Sample Number	Sample Depth (ft)	Moisture Content %
MW-163	R14	42.5-44	27
MW-163	R15	47.5-49.0	28
MW-163	R16	52.5-53.5	28
MW-163	R17	53.5-54	30
MW-163	R18	57.5-59	24
MW-164	R2	12.5-14	20
MW-164	R3	15-16	22
MW-164	R4	16-17.5	36
MW-164	R5	17.5-17.75	46
MW-164	R6	17.75-18	23
MW-164	R7	18-19	26
MW-164	R8	20.0-21.5	5
MW-164	R9	22.5-23.75	23
MW-164	R10	23.75-24	35
MW-164	R11	27.5-28.5	26
MW-164	R12	28.5-28.8	40
MW-164	R13	32.5-33.5	25
MW-164	R14	33.5-34.0	35
MW-164	R15	37.75-39	38
MW-164	R18	47.5-49	42
MW-164	R19	52.5-54	35
MW-164	R20	57.5-	32
MW-164	R21	58-59	33
MW-165	R2	2.5-4	9
MW-165	R3	5-6.5	25
MW-165	R4	7.5-9	116
MW-165	R5	10-11.5	28
MW-165	R6	12.5-14	48
MW-165	R8	17.5-19	25
MW-165	R9	22.5-24	23
MW-165	R10	27.5-28.75	27
MW-165	R11	28.75-29	35
MW-165	R12	32.5-33.25	25
MW-165	R13	33.25-34	41
MW-165	R15	37.5-39	41
MW-165	R16	42.5-44	46
MW-165	R17	47.5-49	36
MW-165	R18	52.5-54	35
MW-165	R19	57.5-59.0	37
MW-167	R2	2.5-4	10
MW-167	R3	5-6.5	30
MW-167	R4	7.5-9.0	34
MW-167	R5	10-11.5	34
MW-167	R6	12.5-14	34
MW-167	R7	17.5-18	30

Anchor Environmental
Middle Waterway Geotech

Moisture Contents
Table 1 (Continued)

Exploration Number	Sample Number	Sample Depth (ft)	Moisture Content %
MW-167	R8	18.0-19.0	24
MW-167	R9	22.5-24	27
MW-167	R10	27.5-28	23
MW-167	R11	28-29	30
MW-167	R12	32.5-34.0	35
MW-167	R13	37.5-39	31
MW-167	R17	48-49.5	34
MW-167	R18	52.5-54	34
MW-167	R19	57.5-59	32

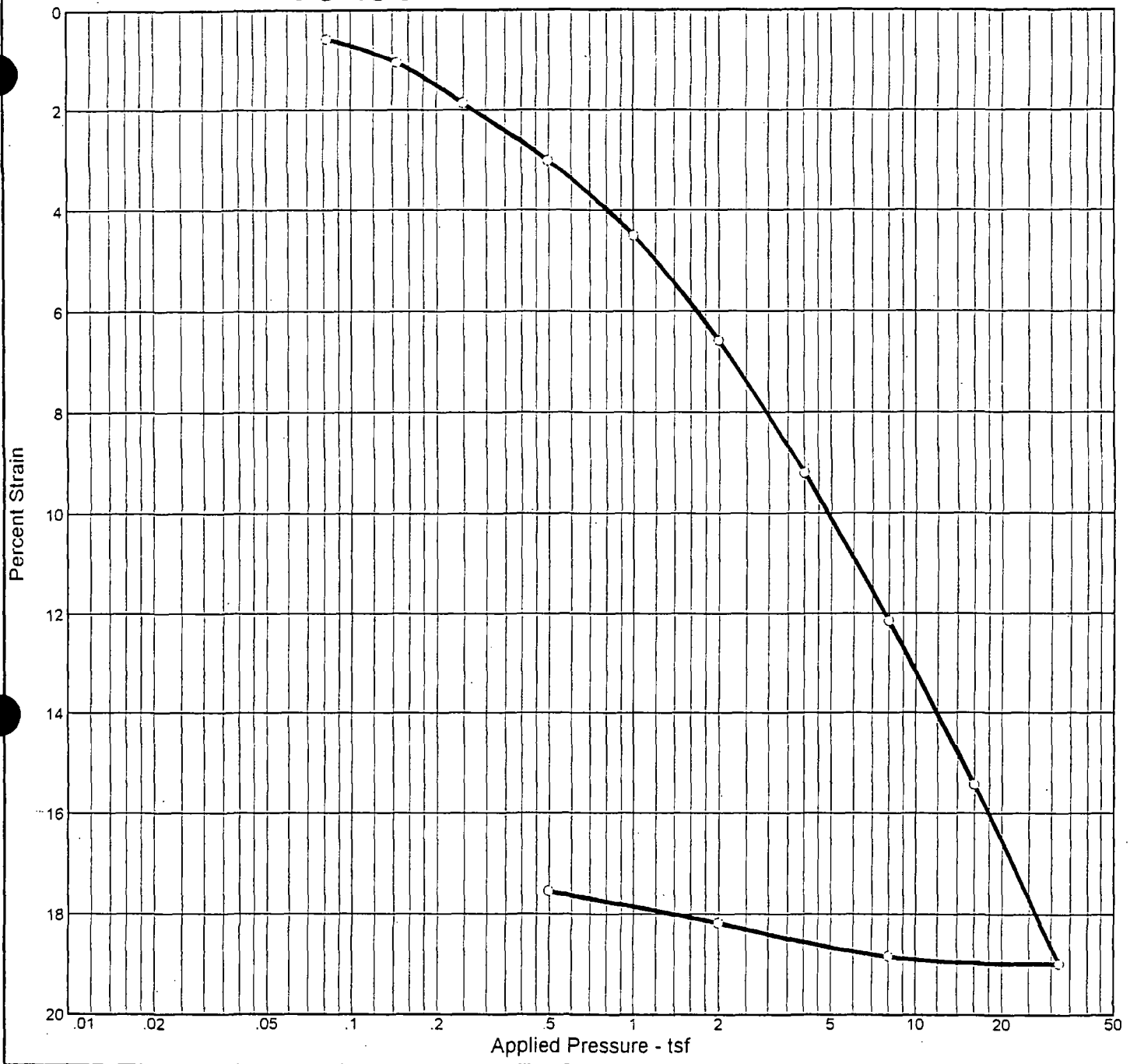
Percent Passing U.S. Sieve Number 200
Table 2

Exploration Number	Sample Number	Sample Depth (ft)	Percent Passing 75 micron
MW-161	R-3	15.0-16.5	68
MW-161	R-6	22.5-24.0	35
MW-161	R-13	52.5-54.0	21
MW-162	R-6	10.0-11.5	24
MW-163	R-6	10.0-11.5	33
MW-163	R-7	12.5-14.0	43
MW-163	R-12	32.5-34.0	13
MW-163	R-15	47.5-49.0	9
MW-164	R-8	20.0-21.5	5
MW-164	R-14	33.5-34.0	40
MW-164	R-20	57.5-58.0	9
MW-167	R-4	7.5-9.0	23
MW-167	R-12	32.5-34.0	60

Specific Gravity
Table 3

Exploration Number	Sample Number	Sample Depth (ft)	Specific Gravity
MW-165	R-7	15.4-15.9	2.72
MW-164	R-16	41.65-41.85	2.72

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Swell Press. (tsf)	Swell %	e_o
Sat.	Moist.											
91.4 %	40.5 %	77.0	37	26	2.72		1.25	0.26				1.206

MATERIAL DESCRIPTION	USCS	AASHTO

Project No. J-1289 **Client:** ANCHOR ENVIRONMENTAL

Project: MIDDLE WATERWAY

99-046-01 Task 14K

Source: MW-164 **Sample No.:** R16 **Elev./Depth:** 41.65-41.85

CONSOLIDATION TEST REPORT

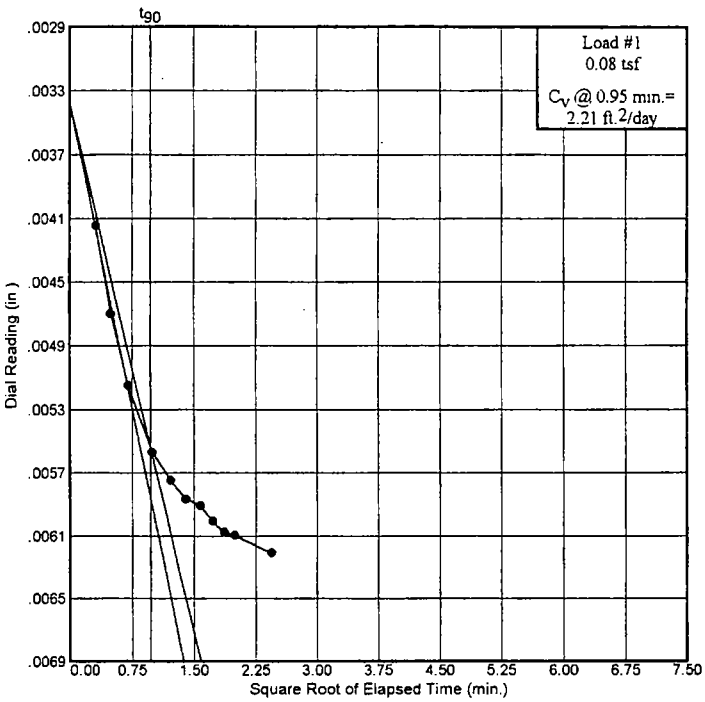
SOIL TECHNOLOGY, INC.

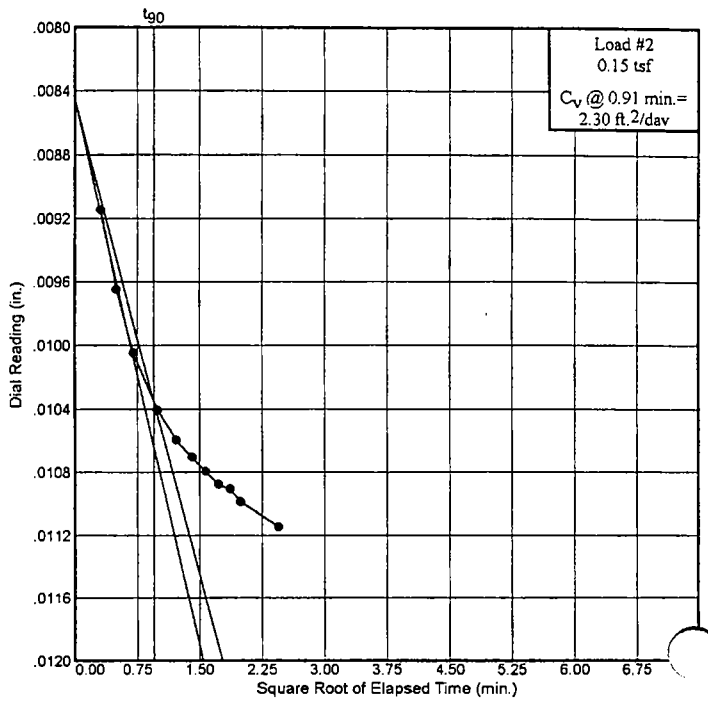
Remarks:

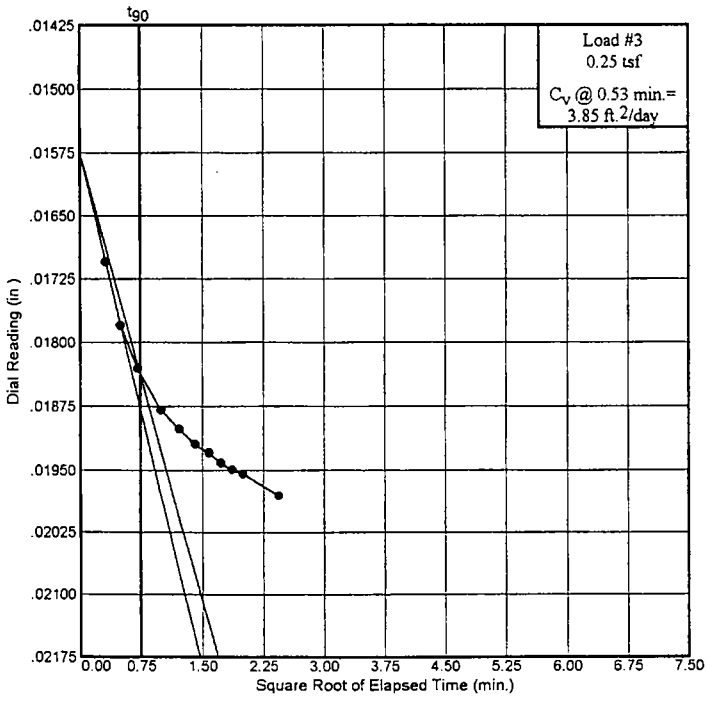
Consol Plot: 1

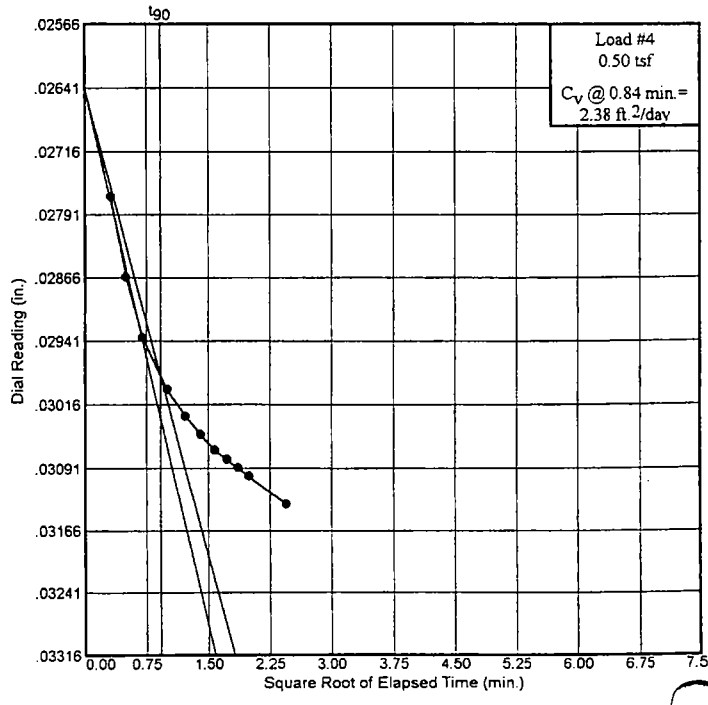
Time Deformation Plot

Project No.: J-1289
Project: MIDDLE WATERWAY
99-046-01 Task 14K
Source: MW-164 Sample No.: R16 Elev./Depth: 41.65-41.85









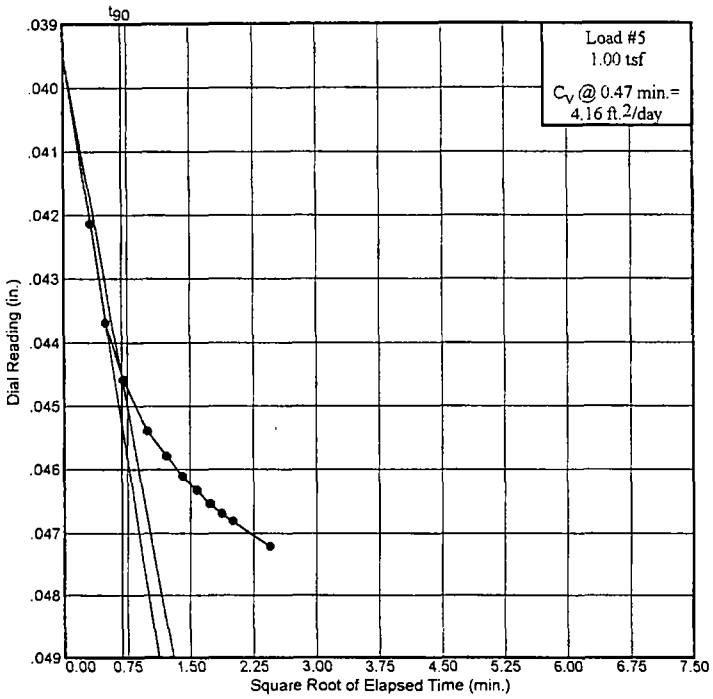
Time Deformation Plot

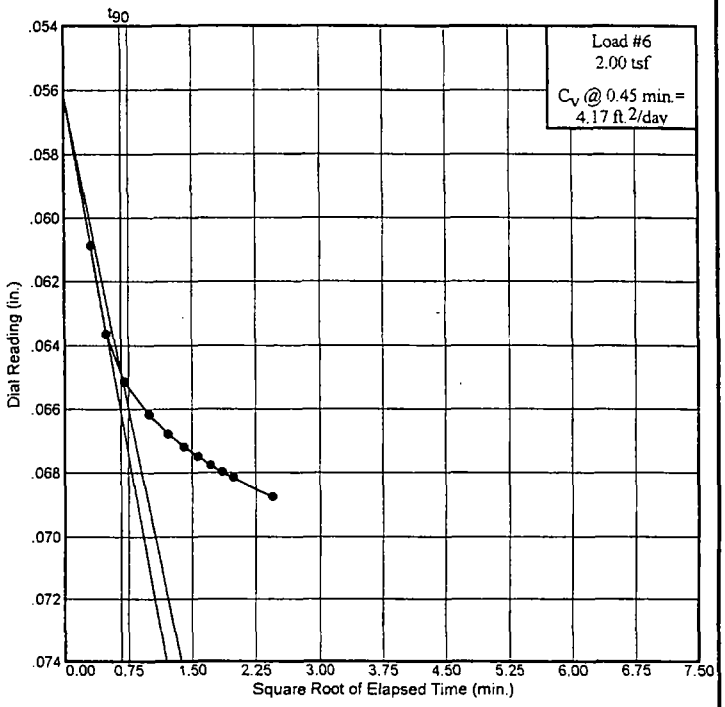
SOIL TECHNOLOGY, INC.

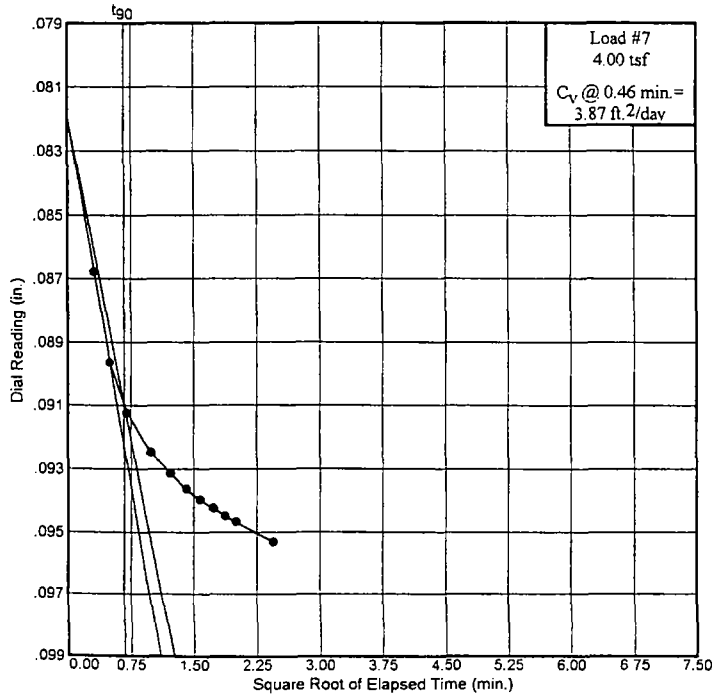
Consol Plot: 2

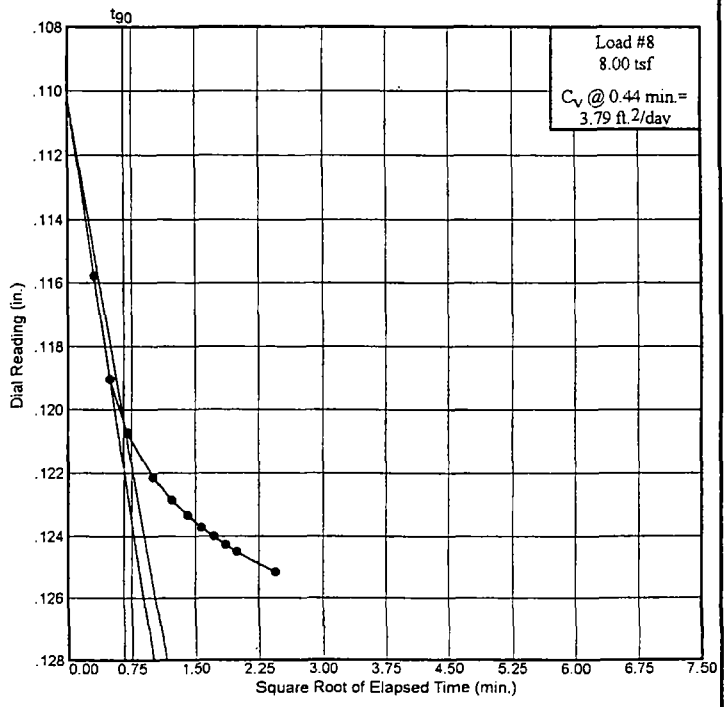
Time Deformation Plot

Project No.: J-1289
Project: MIDDLE WATERWAY
99-046-01 Task 14K
Source: MW-164 Sample No.: R16 Elev./Depth: 41.65-41.85









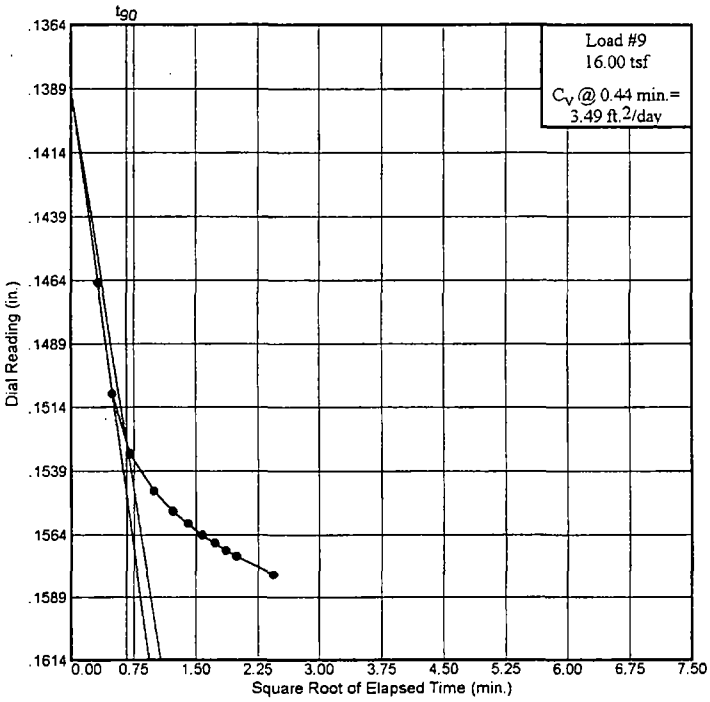
Time Deformation Plot

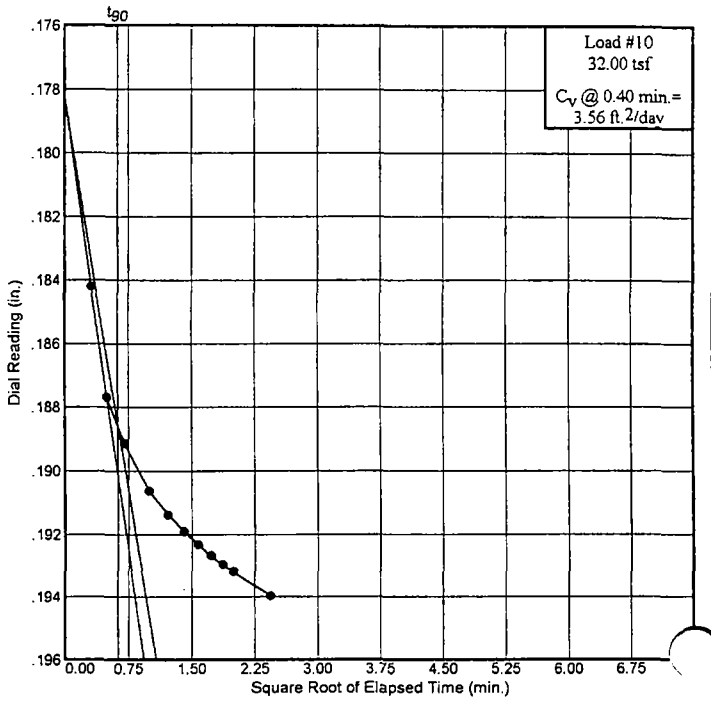
SOIL TECHNOLOGY, INC.

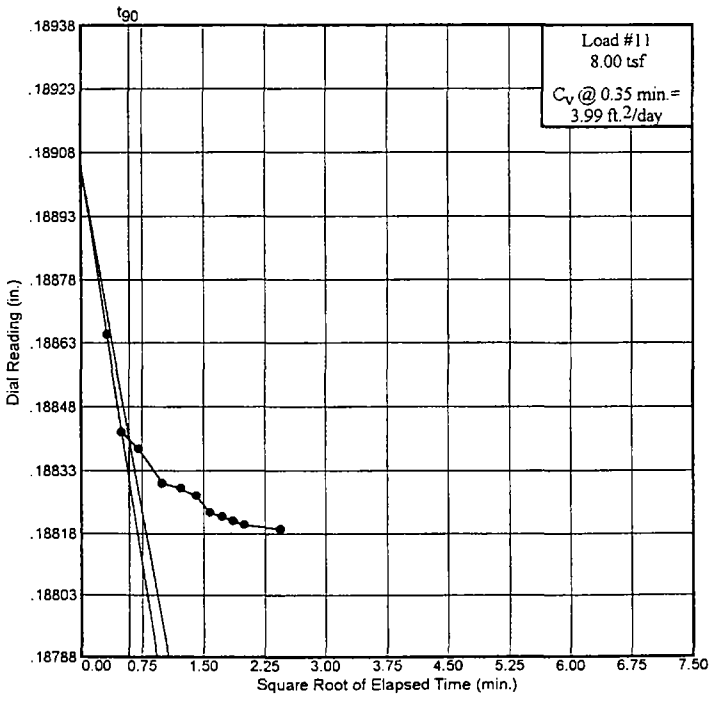
Consol Plot: 3

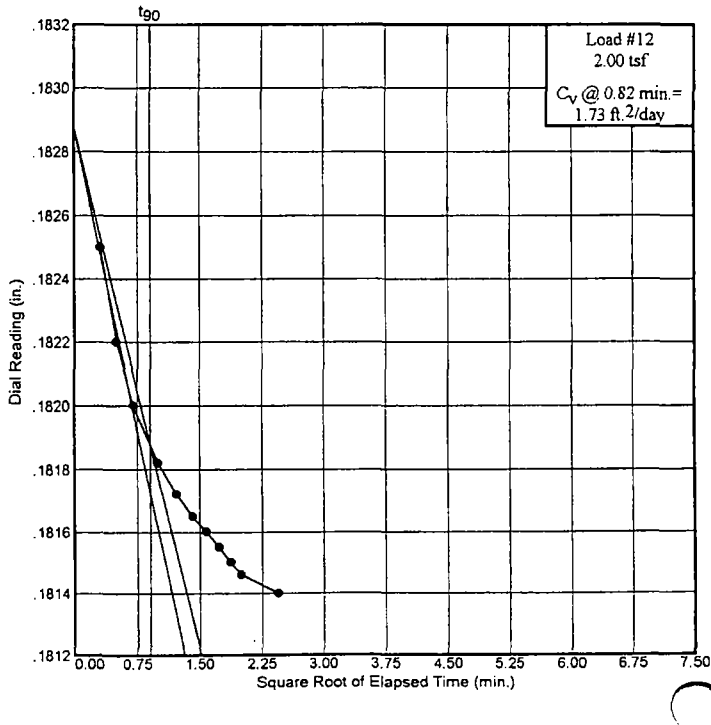
Time Deformation Plot

Project No.: J-1289
Project: MIDDLE WATERWAY
99-046-01 Task 14K
Source: MW-164 Sample No.: R16 Elev./Depth: 41.65-41.85









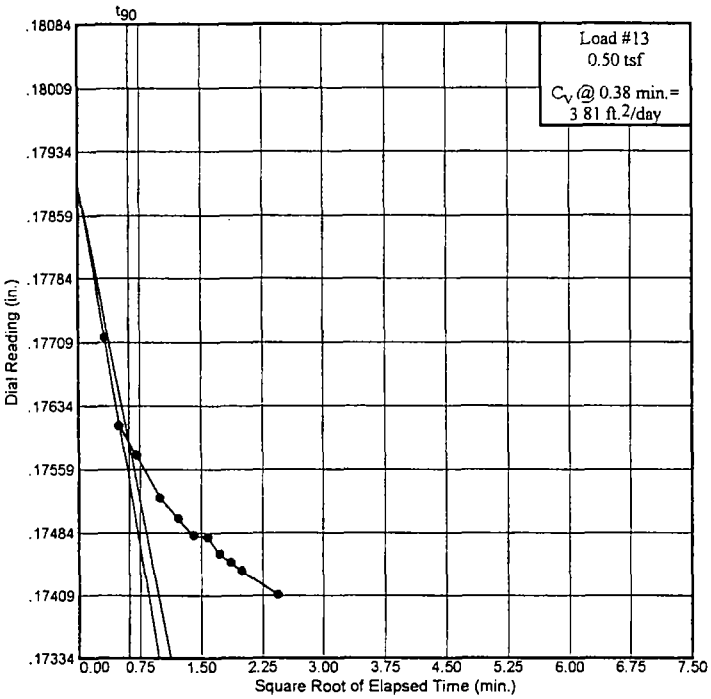
Time Deformation Plot

SOIL TECHNOLOGY, INC.

Consol Plot: 4

Time Deformation Plot

Project No.: J-1289
Project: MIDDLE WATERWAY
99-046-01 Task 14K
Source: MW-164 Sample No.: R16 Elev./Depth: 41.65-41.85

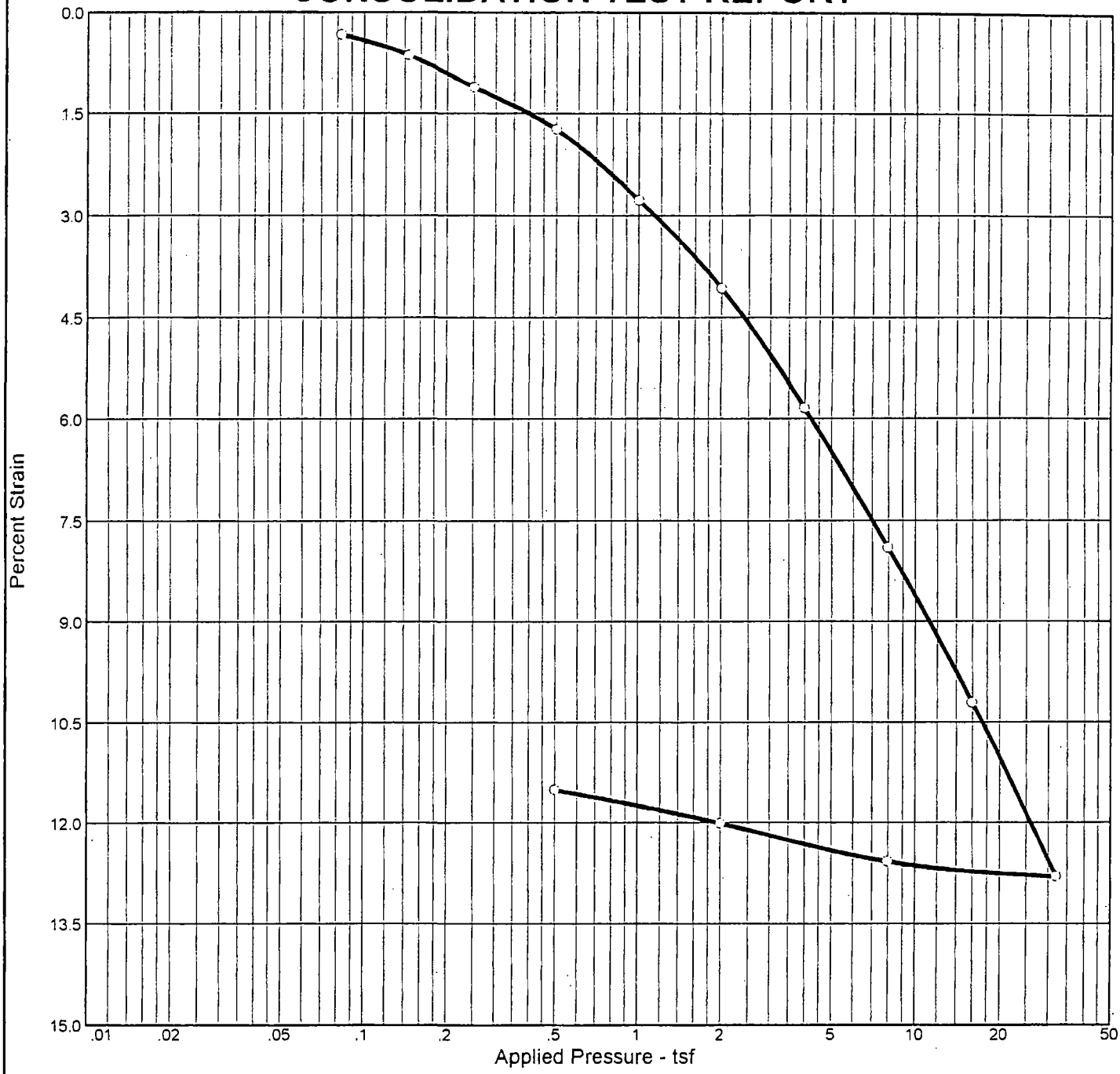


Time Deformation Plot

SOIL TECHNOLOGY, INC.

Consol Plot: 5

CONSOLIDATION TEST REPORT



Natural		Dry Dens.	LL	PI	Sp.	Overburden	P_c	C_c	C_r	Swell Press.	Swell	e_o
Sat.	Moist.	(pcf)			Gr.	(tsf)	(tsf)			(tsf)	%	
97.4 %	26.7 %	97.3	21	20	2.72		2.12	0.15				0.745

MATERIAL DESCRIPTION	USCS	AASHTO

Project No. J-1289 **Client:** ANCHOR ENVIRONMENTAL

Project: MIDDLE WATERWAY

99-046-01 Task 14K

Source: MW-165 **Sample No.:** R7 **Elev./Depth:** 15.95-16.05

CONSOLIDATION TEST REPORT

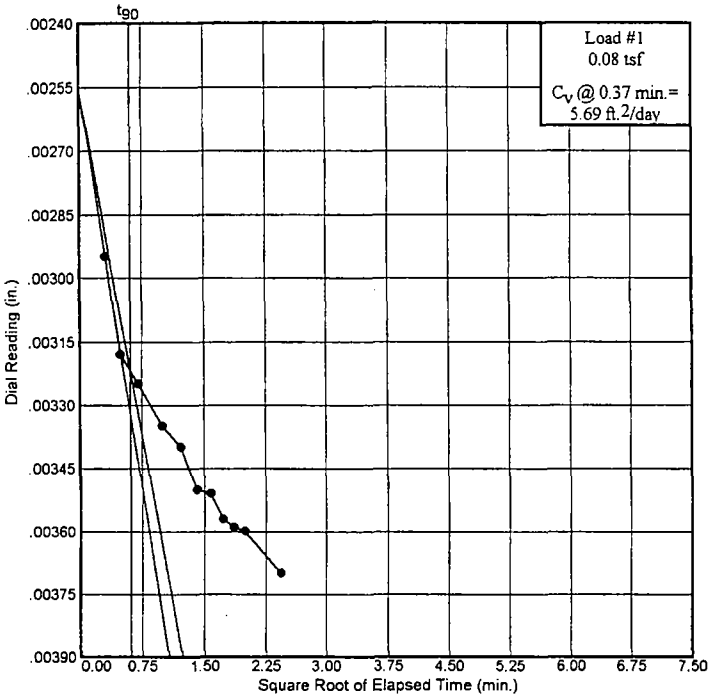
SOIL TECHNOLOGY, INC.

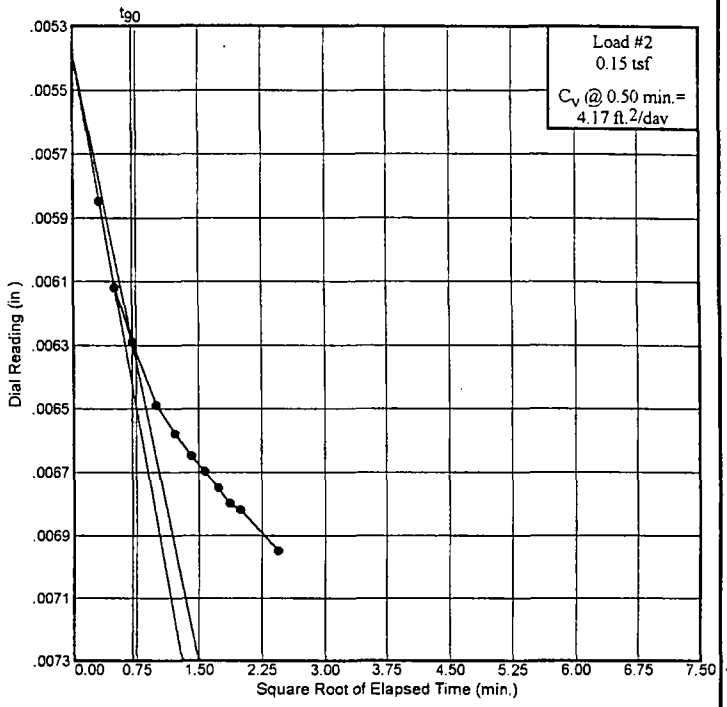
Remarks:

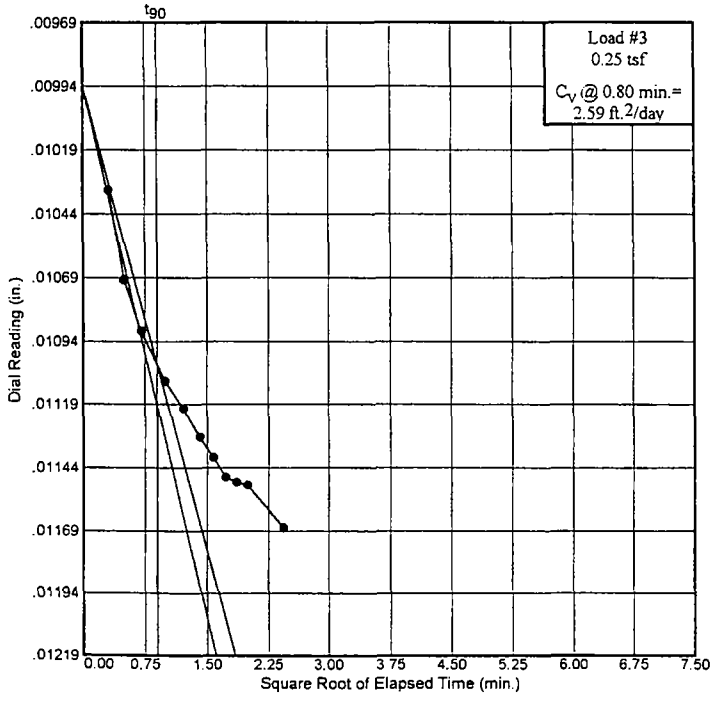
Consol Plot: 6

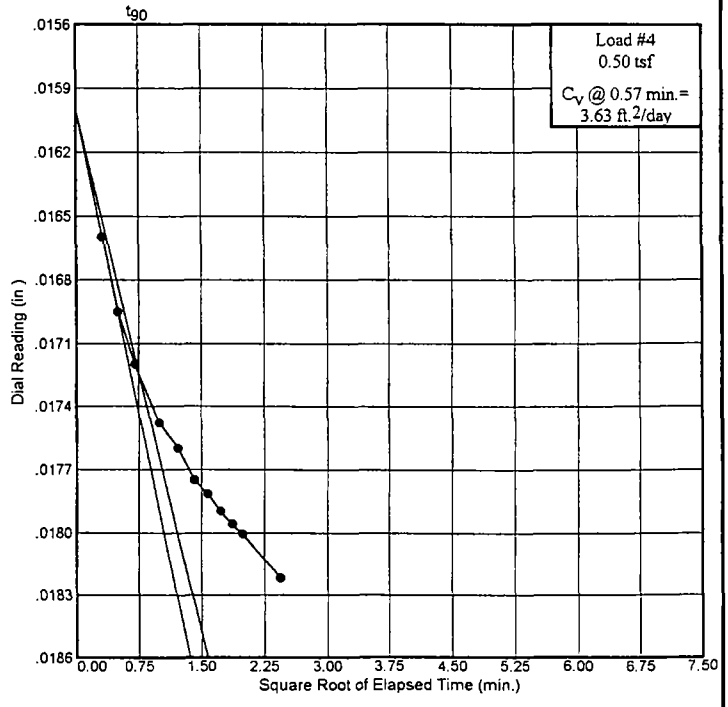
Time Deformation Plot

Project No.: J-1289
Project: MIDDLE WATERWAY
99-046-01 Task 14K
Source: MW-165 Sample No.: R7 Elev./Depth: 15.95-16.05









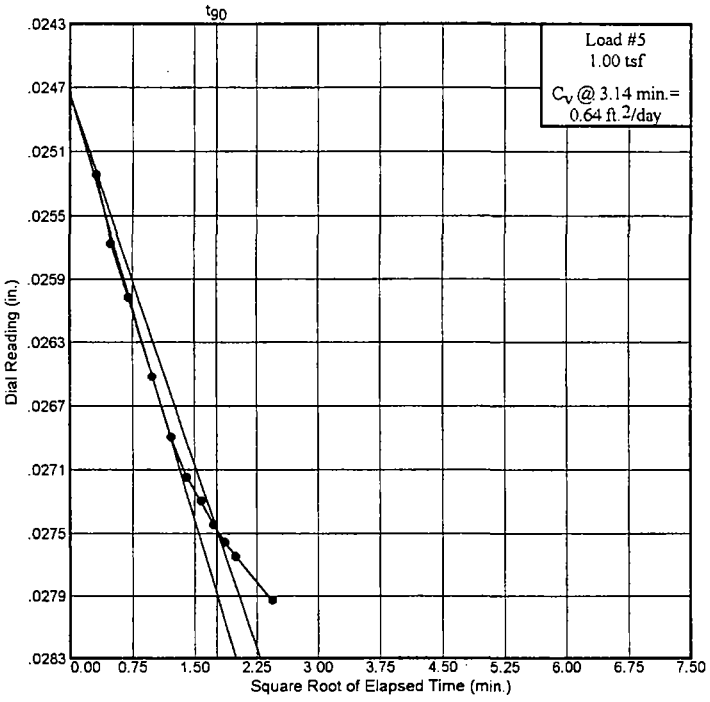
Time Deformation Plot

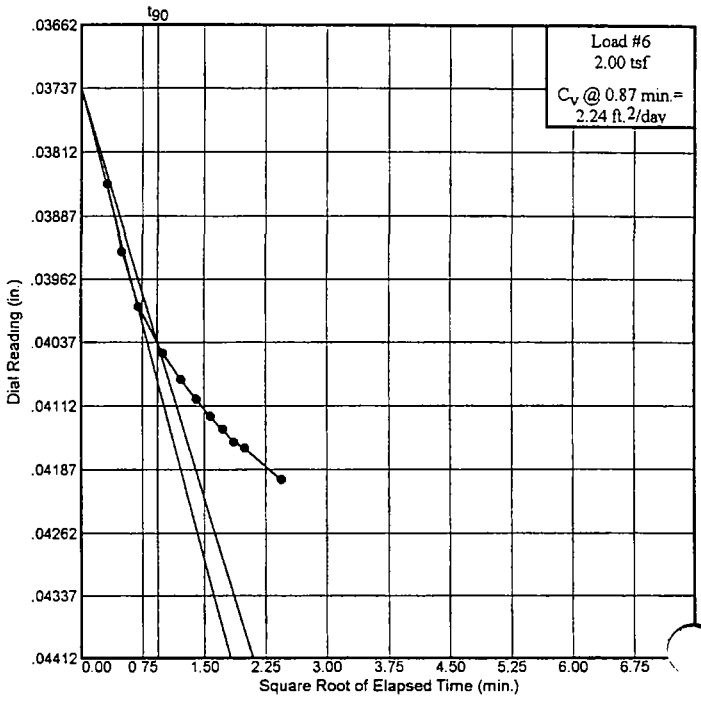
SOIL TECHNOLOGY, INC.

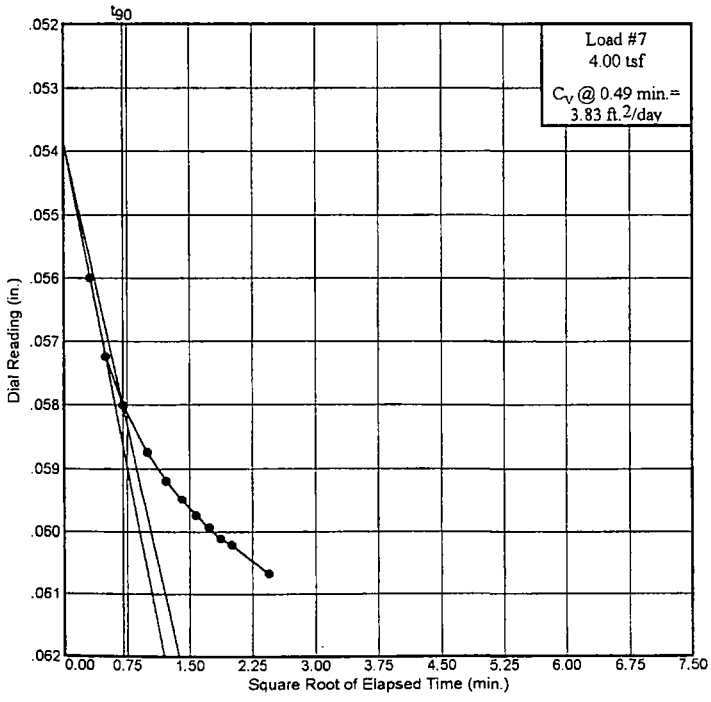
Consol Plot: 7

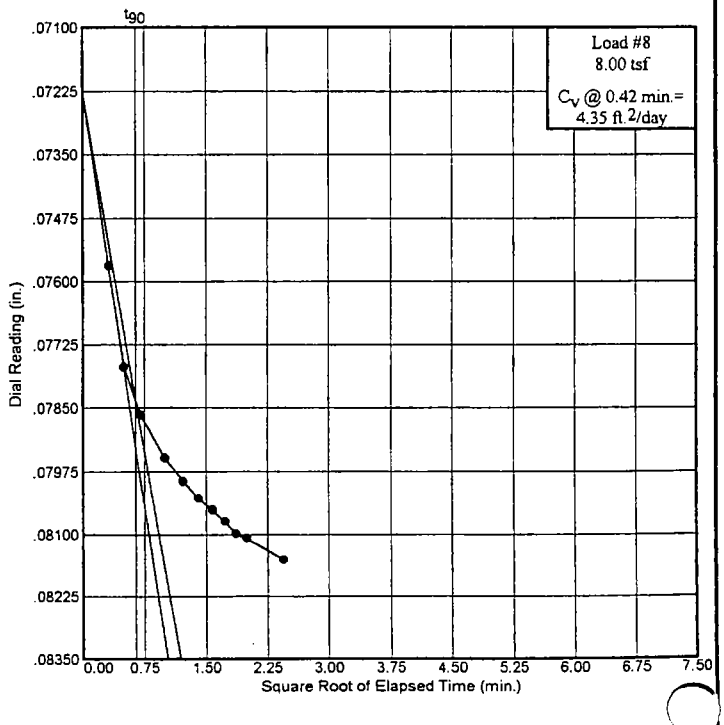
Time Deformation Plot

Project No.: J-1289
Project: MIDDLE WATERWAY
99-046-01 Task 14K
Source: MW-165 Sample No.: R7 Elev./Depth: 15.95-16.05









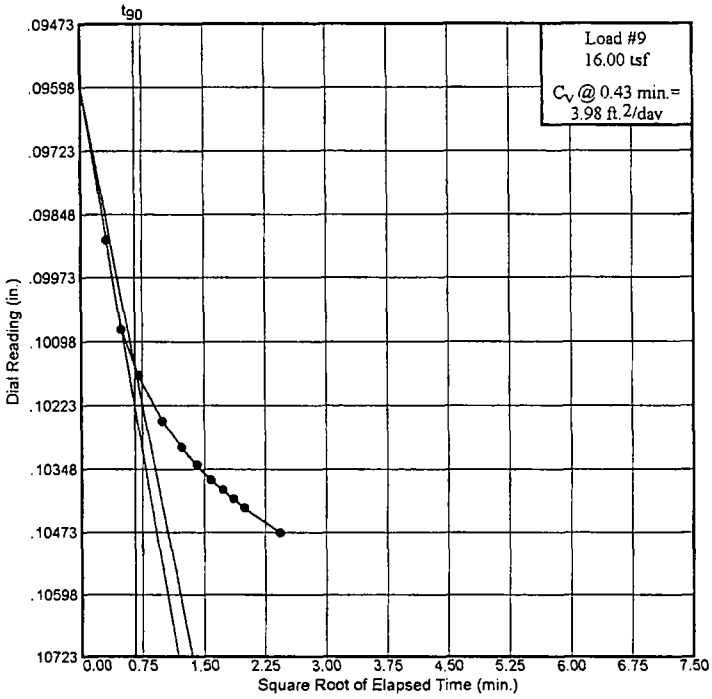
Time Deformation Plot

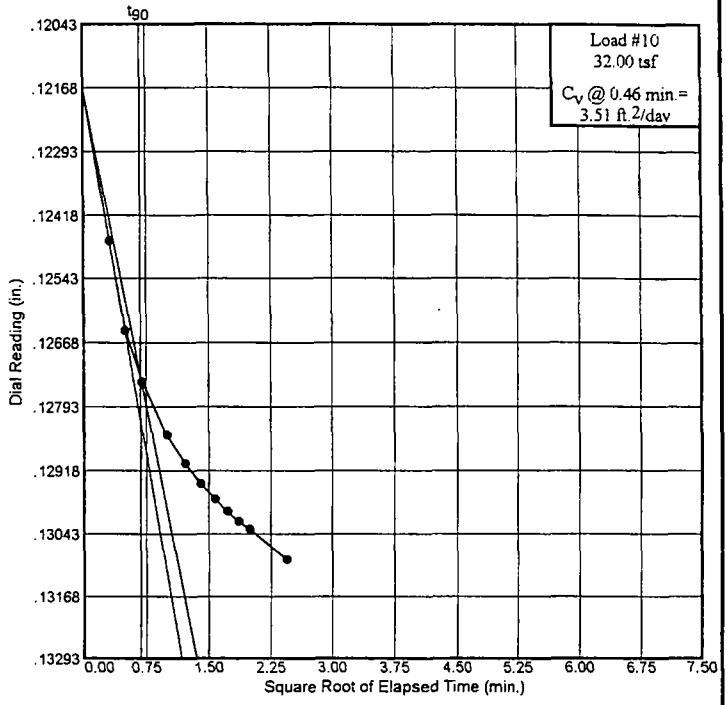
SOIL TECHNOLOGY, INC.

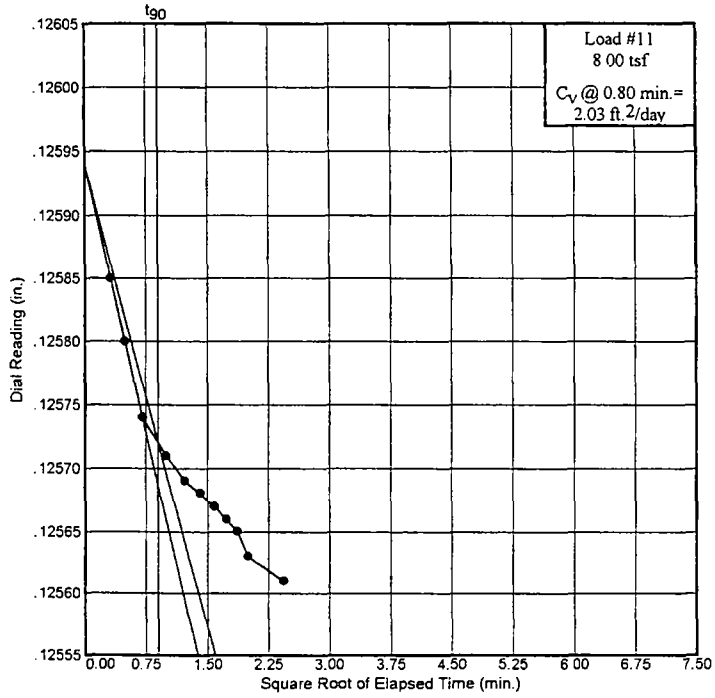
Consol Plot: 8

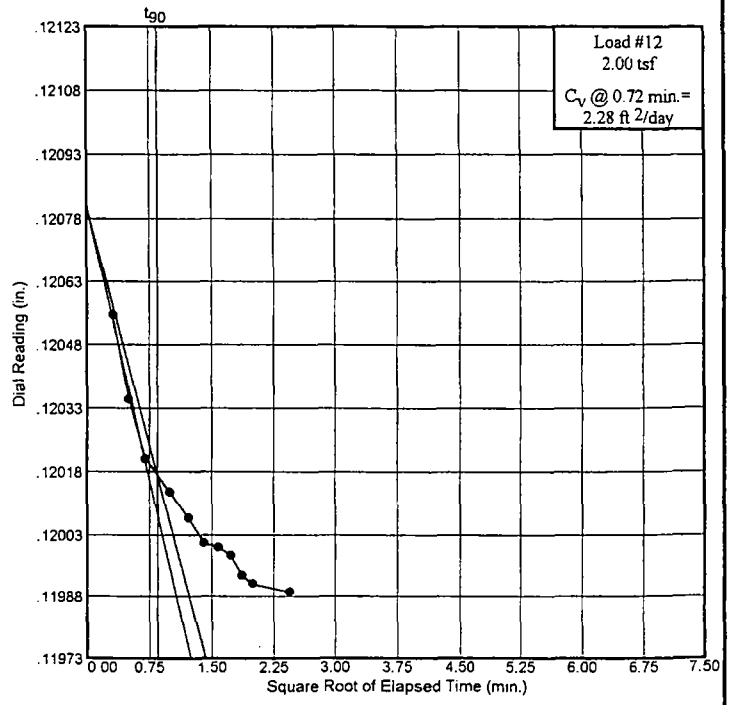
Time Deformation Plot

Project No.: J-1289
Project: MIDDLE WATERWAY
99-046-01 Task 14K
Source: MW-165 Sample No.: R7 Elev./Depth: 15.95-16.05









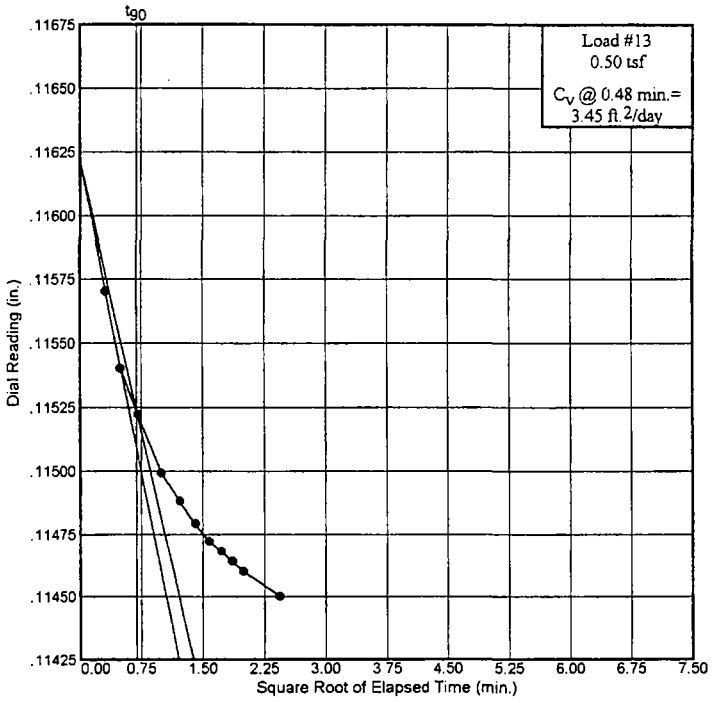
Time Deformation Plot

SOIL TECHNOLOGY, INC.

Consol Plot: 9

Time Deformation Plot

Project No.: J-1289
Project: MIDDLE WATERWAY
99-046-01 Task 14K
Source: MW-165 Sample No.: R7 Elev./Depth: 15.95-16.05

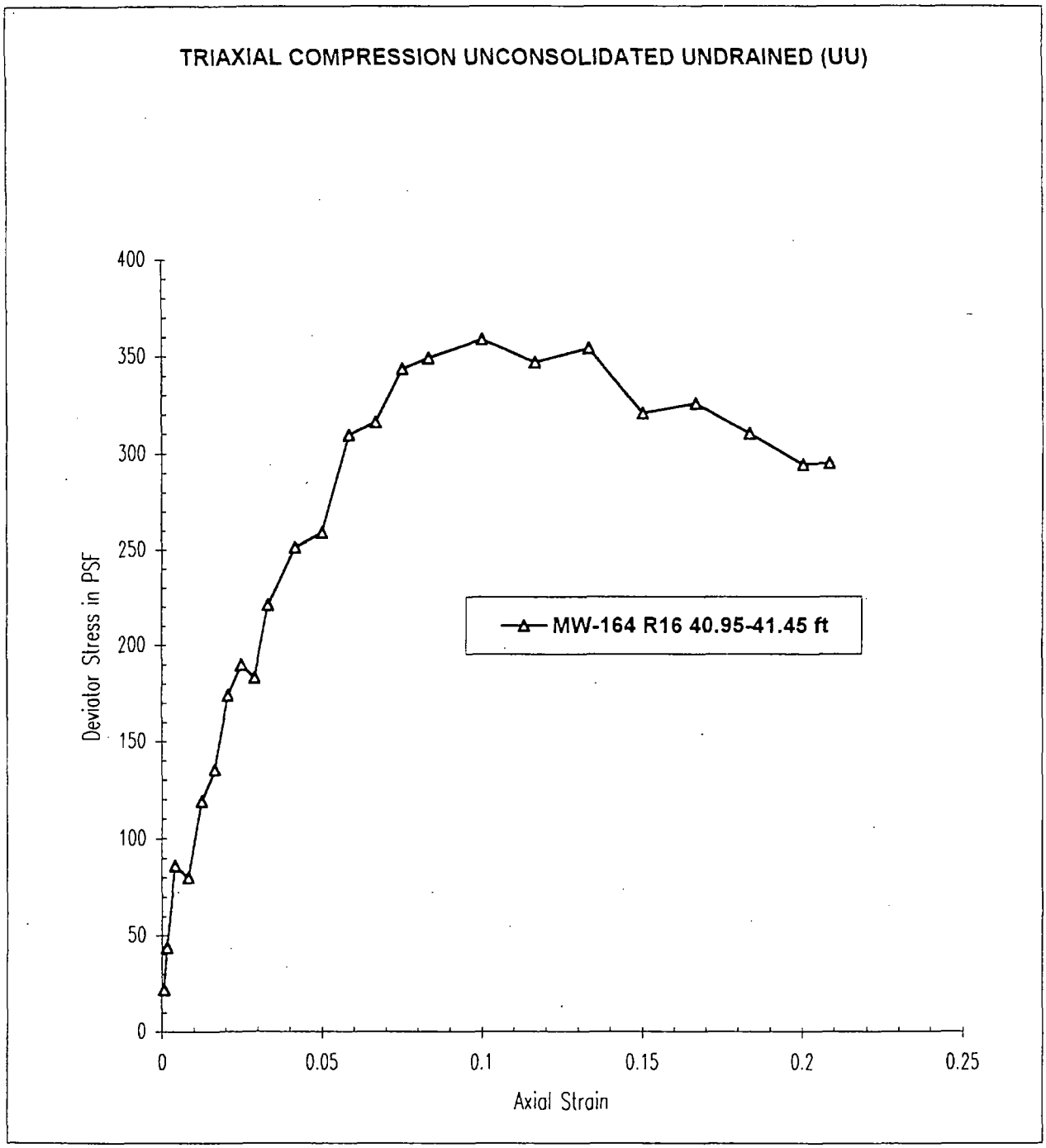


Time Deformation Plot

SOIL TECHNOLOGY, INC.

Consol Plot: 10

Anchor Environmental
Middle Waterway 99-046-01 Task 14K



Symbol	Boring Number	Sample Number	Depth ft	Water Content in Percent				Unit Weight		Cell Pressure psi
				Natural	Liquid Limit	Plastic Limit	Plasticity Index	Wet pcf	Dry pcf	
Δ	MW164	R-16	40.95-41.45	41	2137	1321	816	113	80	27.8

Soil Technology, Inc.
J-1289
UU-1

Anchor Environmental
Middle Waterway 99-046-01 Task 14K

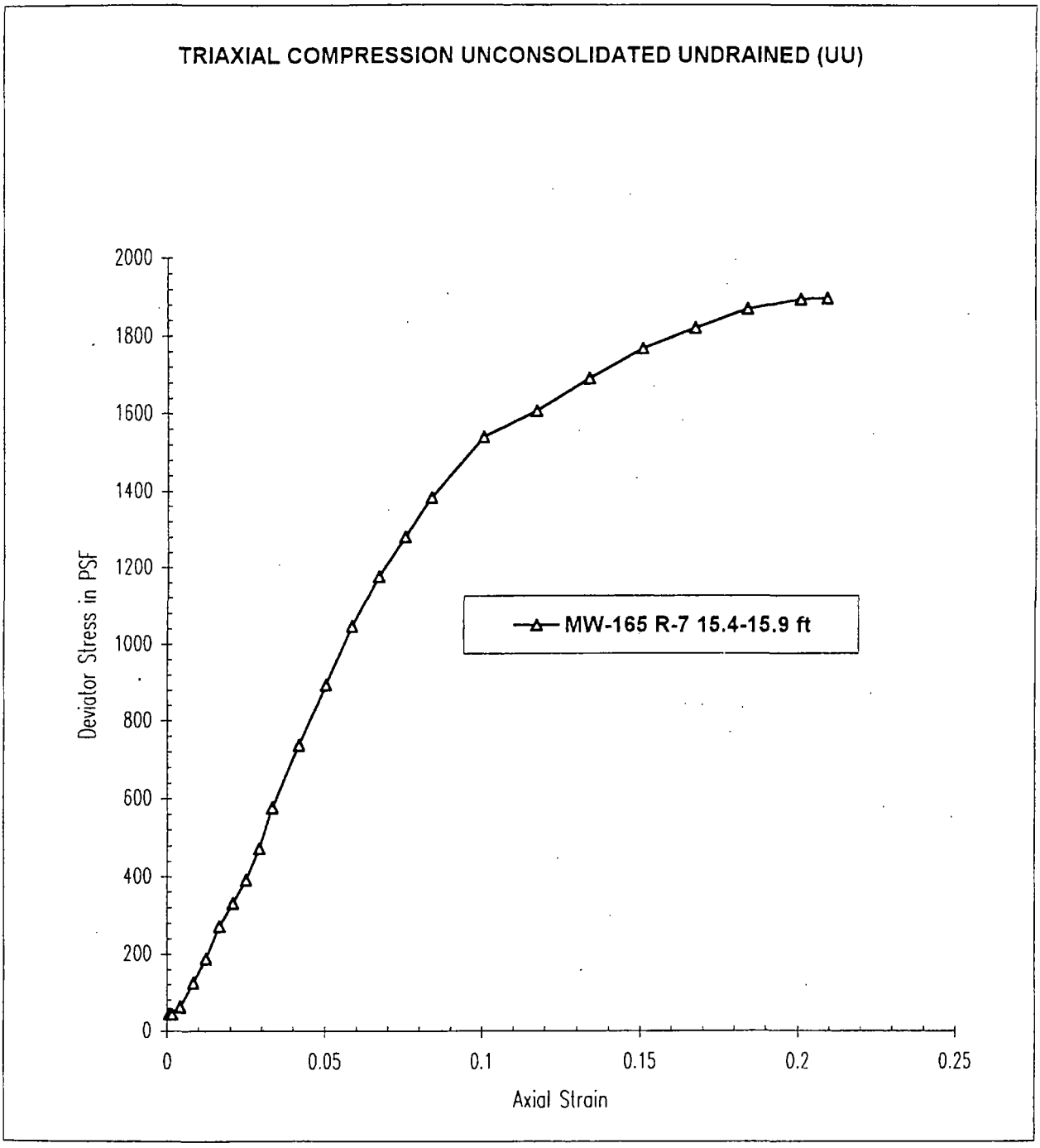
Job #	J-1289	Deflection	Load Read	Strain	Deviator Stress
Exploration #	MW164	READ	lb	Ratio	psf
Sample ID #	R-16	5	6	0.000835	22
Sample Depth (ft)	40.95-41.45	10	7	0.001669	44
Type of Test	UU	25	9	0.004174	86
Cell Pressure (psi)	27.8	50	9	0.008347	80
Strain Rate (in/min)	0.06	75	11	0.012521	119
Initial Platen Reading (mm)	0	100	12	0.016694	135
Initial Load Cell Reading (lbs)	5	125	14	0.020868	174
Date	11/5/99	150	15	0.025042	190
Test by	TP	175	15	0.029215	183
Initial Length (in)	5.99	200	17	0.033389	221
Initial Diameter	2.822	250	19	0.041736	251
Initial Wet Wt	1106.7	300	20	0.050083	259
Moisture Content (decimal)	0.4053	350	23	0.058431	309
Area (ft**2)	0.043435	400	24	0.066778	316
Volume (ft**3)	0.021681	450	26	0.075125	343
Wet Density (pcf)	112.5304	500	27	0.083472	349
Dry Density (pcf)	80.07572	600	29	0.100167	359
Liquid Limit	21	700	30	0.116861	347
Plastic Limit	16	800	32	0.133556	354
Youngs Modulus for membrane(lbs/in2)	200	900	32	0.15025	321
Membrane Thickness in.	0.012	1000	34	0.166945	325
		1100	35	0.183639	310
		1200	36	0.200334	294
		1250	37	0.208681	295

Anchor Environmental
Middle Waterway 99-046-01 Task 14K

			Load		Deviator
Job #	J-1289	Deflection	Read	Strain	Stress
Exploration #	MW-165	READ	lb	Ratio	psf
Sample ID #	R-7	5	3	0.000837	45
Sample Depth (ft)	15.4-15.9	10	3	0.001673	44
Type of Test	UU	25	4	0.004183	63
Cell Pressure (psi)	13.9	50	7	0.008365	125
Strain Rate (in/min)	0.06	75	10	0.012548	187
Initial Platen Reading (mm)	0	100	14	0.016731	271
Initial Load Cell Reading (lbs)	1	125	17	0.020914	332
Date	11/5/99	150	20	0.025096	392
Test by	TP	175	24	0.029279	474
Initial Length (in)	5.977	200	29	0.033462	577
Initial Diameter	2.822	250	37	0.041827	736
Initial Wet Wt	1236.5	300	45	0.050192	893
Moisture Content (decimal)	0.2627	350	53	0.058558	1046
Area (ft**2)	0.043435	400	60	0.066923	1175
Volume (ft**3)	0.021634	450	66	0.075289	1280
Wet Density (pcf)	126.0021	500	72	0.083654	1382
Dry Density (pcf)	99.78781	600	82	0.100385	1539
Liquid Limit	21	700	88	0.117116	1607
Plastic Limit	20	800	95	0.133846	1689
Youngs Modulus for membrane(lbs/in2)	200	900	102	0.150577	1767
Membrane Thickness in.	0 012	1000	108	0.167308	1820
		1100	114	0.184039	1868
		1200	119	0.20077	1894
		1250	121	0.209135	1896

Soil Technology, Inc.
J-1289
UU-4

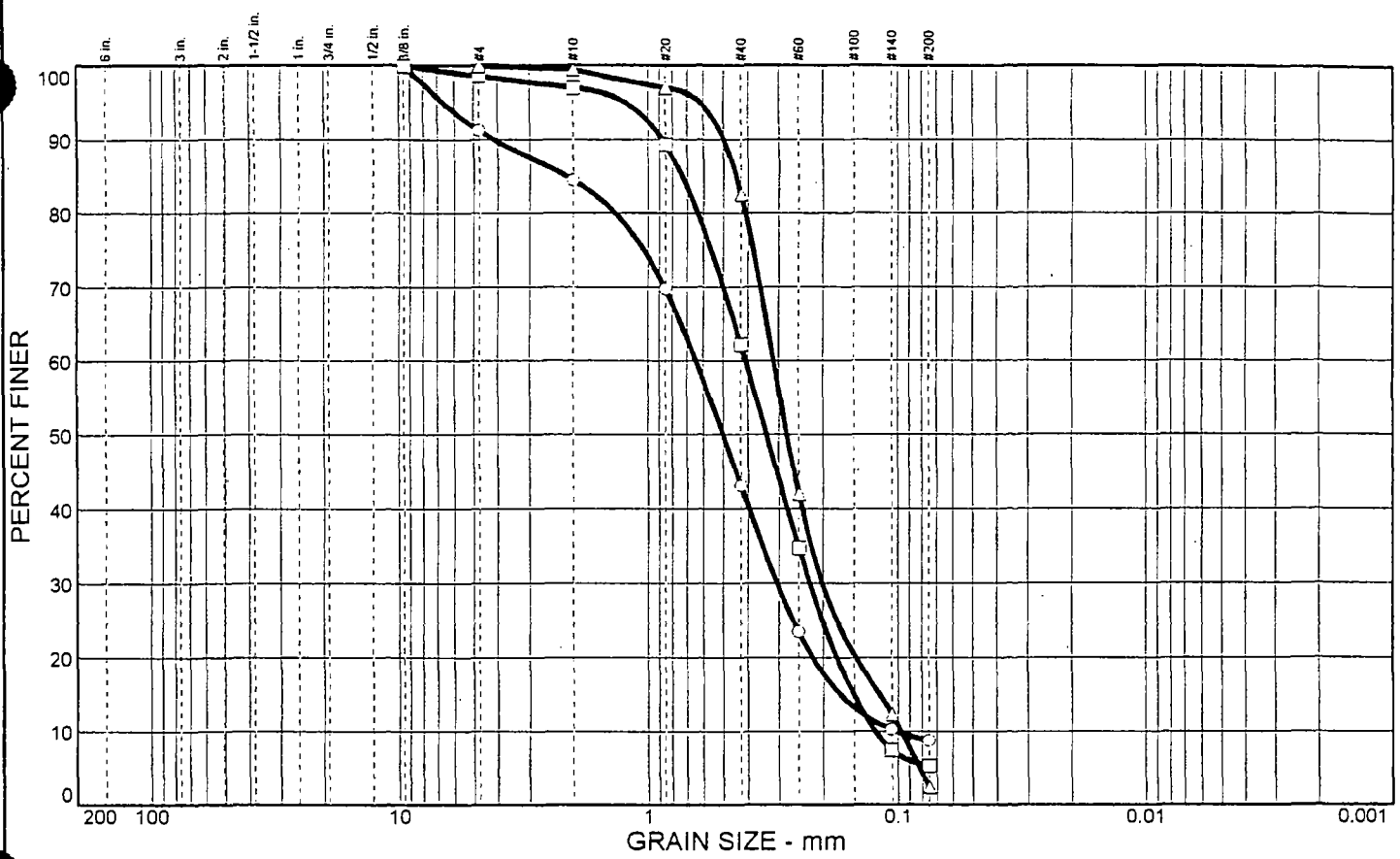
Anchor Environmental
Middle Waterway 99-046-01 Task 14K



Symbol	Boring Number	Sample Number	Depth ft	Water Content in Percent				Unit Weight		Cell Pressure psi
				Natural	Liquid Limit	Plastic Limit	Plasticity Index	Wet pcf	Dry pcf	
Δ	MW-165	R-7	15.4-15.9	26	21	20	1	126	100	13.9

Soil Technology, Inc.
J-1289
UU-3

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		8.8	82.5			SW-SM			
□		1.4	93.3			SP-SM			
△			97.6			SP			

SIEVE inches size	PERCENT FINER ○	□	△
.375	100.0	100.0	
GRAIN SIZE			
D_{60}	0.642	0.407	0.315
D_{30}	0.305	0.225	0.201
D_{10}	0.102	0.124	0.0971
COEFFICIENTS			
C_c	1.42	1.01	1.32
C_u	6.28	3.29	3.24

SIEVE number size	PERCENT FINER ○	□	△
#4	91.2	98.6	100.0
#10	84.4	97.0	99.5
#20	69.7	89.2	97.0
#40	43.1	62.2	82.5
#60	23.4	34.8	42.0
#140	10.2	7.5	12.3
#200	8.7	5.3	2.4

SOIL DESCRIPTION

○ Well-graded sand with silt

□ Poorly graded sand with silt

△ Poorly graded sand

REMARKS:

○ classification based on grainsize only

□ classification based on grainsize only

△ classification based on grainsize only

○ Source: MW-161 Sample No.: R2 Elev./Depth: 12.5-14

□ Source: MW-162 Sample No.: R3 Elev./Depth: 5-6.5

△ Source: MW-163 Sample No.: R10 Elev./Depth: 24.5-26

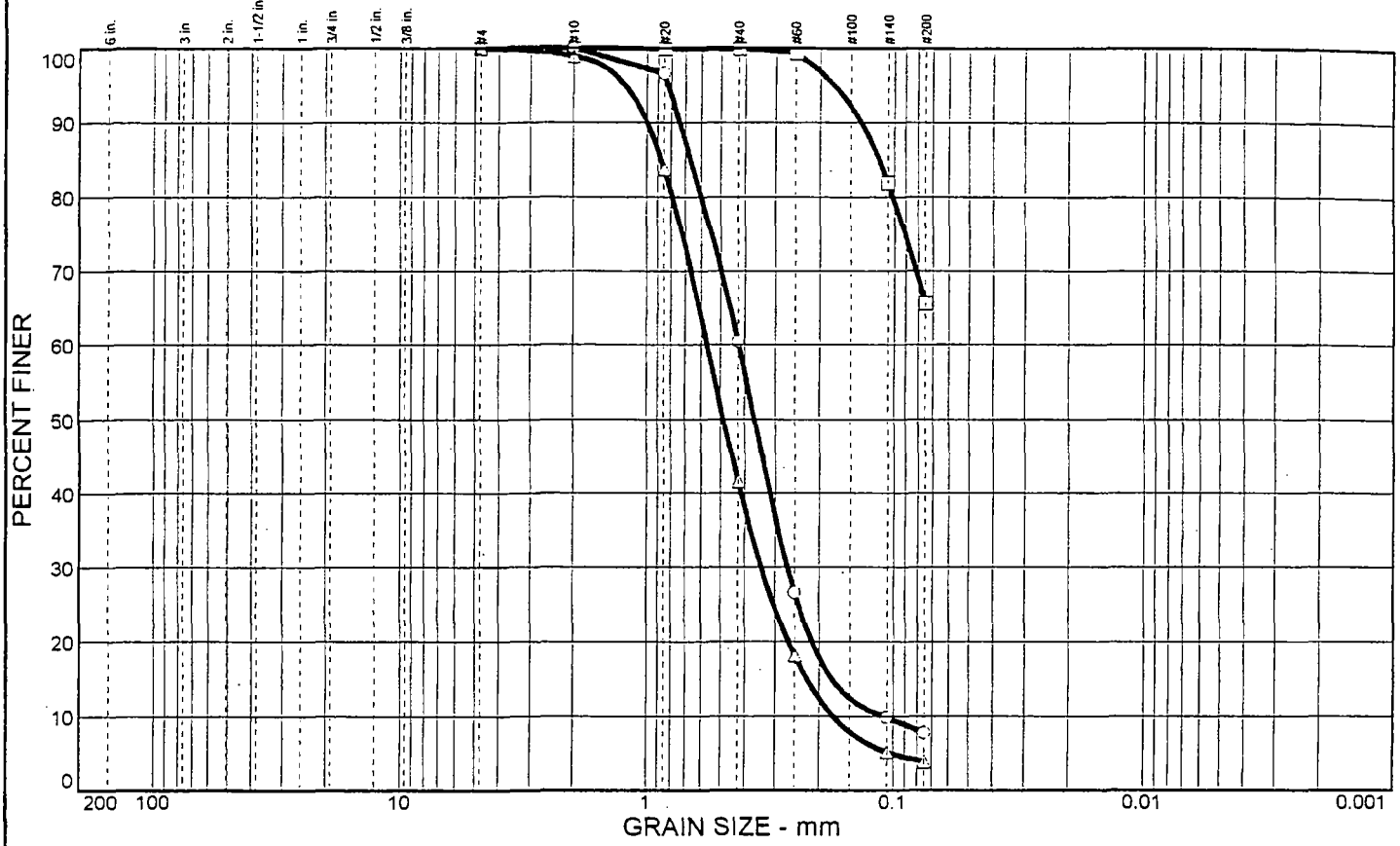
SOIL TECHNOLOGY, INC.

Client: ANCHOR ENVIRONMENTAL

Project: MIDDLE WATERWAY
99-046-01 Task 14K

Project No.: J-1289 Plate 1

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			92.3			SP-SM			
□			34.4			ML			
△			96.1			SP			

SIEVE inches size	PERCENT FINER ○	□	△
GRAIN SIZE			
D_{60}	0.422		0.567
D_{30}	0.267		0.341
D_{10}	0.110		0.175
COEFFICIENTS			
C_c	1.54		1.17
C_u	3.84		3.23

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	100.0	100.0
#10	100.0	100.0	98.9
#20	96.6	99.9	83.8
#40	60.4	99.9	41.6
#60	26.5	99.4	18.1
#140	9.8	81.9	5.2
#200	7.7	65.6	3.9

SOIL DESCRIPTION

○ Poorly graded sand with silt

□ Sandy silt

△ Poorly graded sand

REMARKS:

○ classification based on grainsize only

□ classification based on grainsize only

△ classification based on grainsize only

○ Source: MW-165 Sample No.: R10 Elev./Depth: 27.5-28.75

□ Source: MW-165 Sample No.: R19 Elev./Depth: 57.5-59

△ Source: MW-167 Sample No.: R-8 Elev./Depth: 18-19

SOIL TECHNOLOGY, INC.

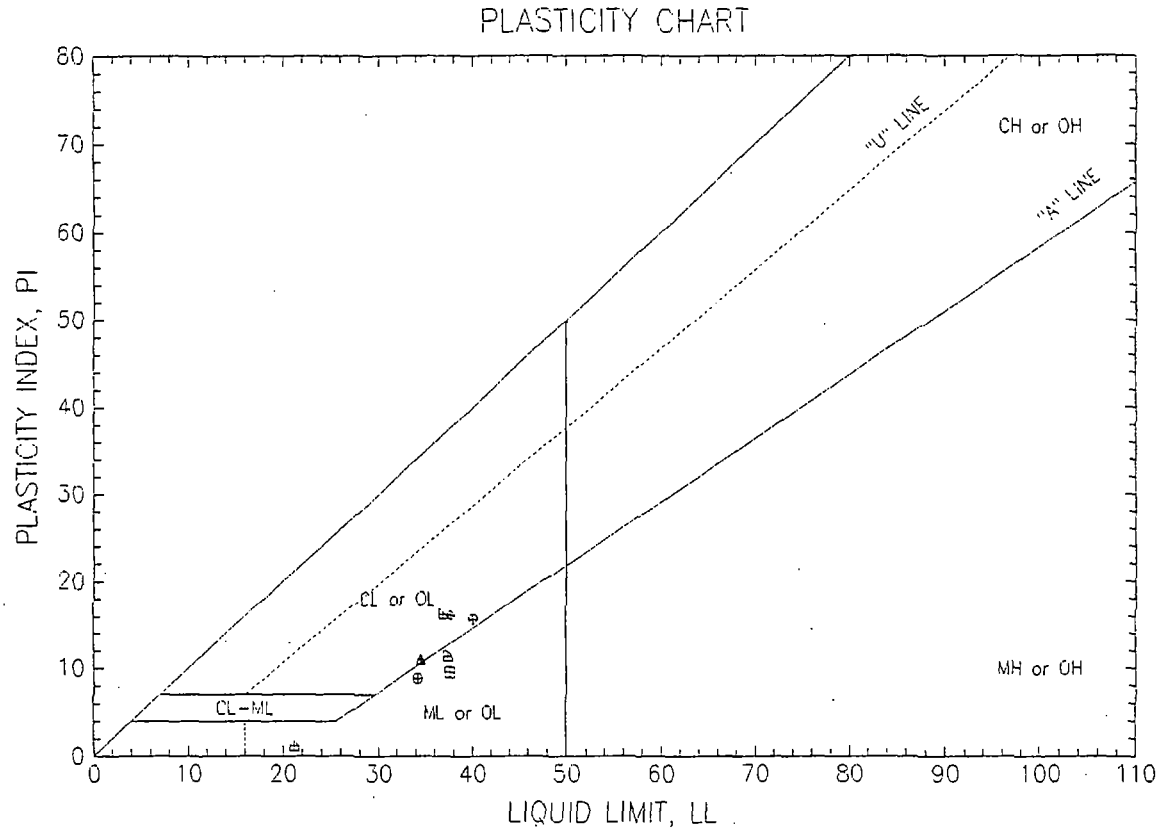
Client: ANCHOR ENVIRONMENTAL

Project: MIDDLE WATERWAY
99-046-01 Task 14K

Project No.: J-1289 Plate 2

Soil Technology, Inc.

Project : Anchor Environmental Middle Waterway 99-046-01
Project No. : J-1289
Location :
Date : Mon Nov 29 1999

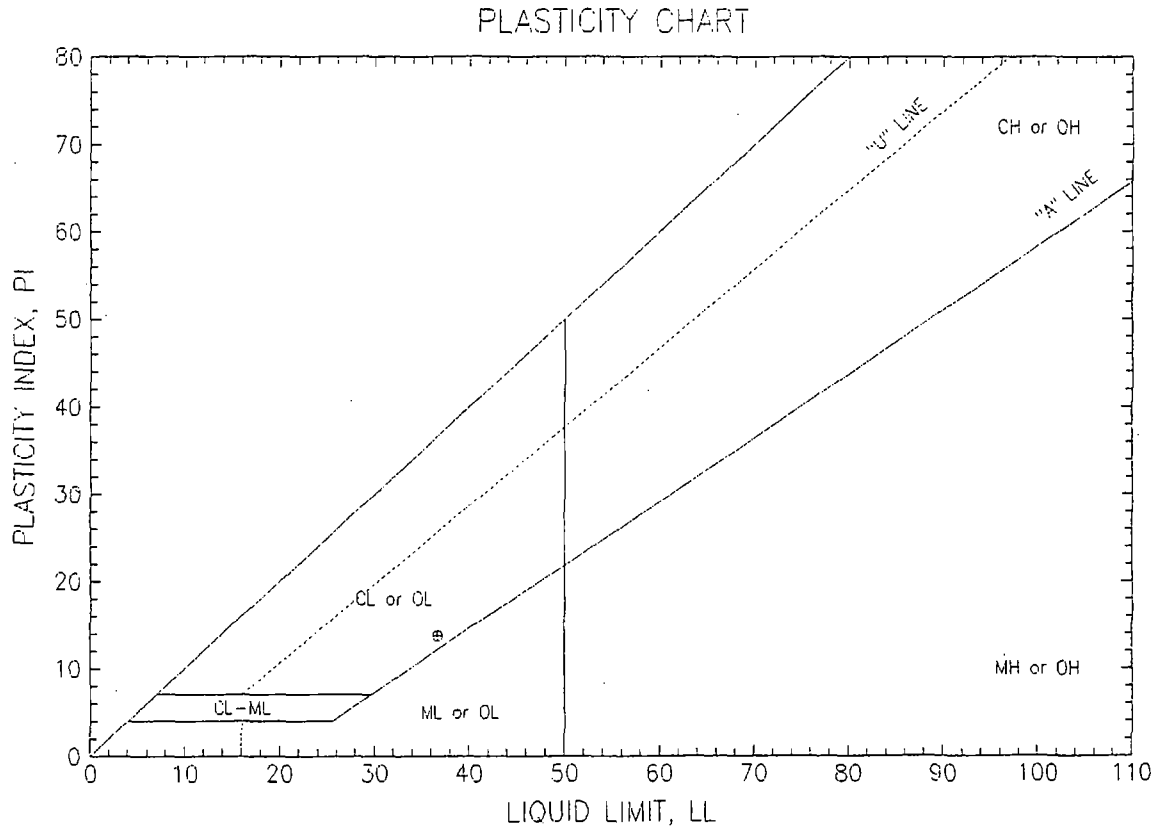


Symbol	Sample Number	Water Content	Liquid Limit	Plastic Limit	Plasticity Index	Soil Classification
○	MW164R15	36	34	25	9	(ML) silt
△	MW165R15	41	34	23	11	(CL) lean clay with sand
□	MW165R13	41	38	28	10	(ML) silt
◇	MW162R13	35	38	22	16	(CL) lean clay with sand
⌂	MW165R7	26	21	20	1	(ML) silt with sand
◸	MW164R16U	41	37	21	16	(CL) lean clay
◻	MW164R16L	41	37	26	11	(ML) silt
◇	MW165R16	46	40	24	16	(CL) lean clay

Figure 1

Soil Technology, Inc.

Project : Anchor Environmental Middle Waterway 99-043-01
Project No. : J-1289
Location :
Date : Mon Nov 29 1999



Symbol	Sample Number	Water Content	Liquid Limit	Plastic Limit	Plasticity Index	Soil Classification
O	MW164R18	42	37	23	14	(CL) lean clay

MW162R5	G.N.P.
MW163R8	G.N.P.
MW167R17	G.N.P.
MW164R21	G.N.P.
MW167R19	G.N.P.
MW164R19	G.N.P.

Figure 2

Appendix F

APPENDIX F

BIOLOGICAL RESULTS

Tacoma Middle Waterway Project
INVERTEBRATE SPECIES CHECKLIST
For Foster Wheeler Environmental Corporation
By Marine Taxonomic Services, Ltd.
December, 1999

Phylum Cnidaria
Class Anthozoa
OrderActiniaria
Suborder Nynantheae
Nynantheae sp. Indeterminate
Phylum Nemertea
Nemertea sp. Indeterminate
Phylum Nematoda
Nematoda sp. Indeterminate
Phylum Annelida
Class Polychaeta
Order Spionida
Family Spionidae
Dipolydora sp. 1
Polydora cornuta Bosc, 1802
Polydora sp. Indeterminate
Prionospio (Minuspio) lighti Maceolek, 1985
Pseudopolydora kempi (Southern, 1921)
Pygospio elegans Claparede, 1863
Spio filicornis Muller, 1776
Streblospio benedicti Webster, 1879
Family Cirratulidae
Tharyx parvus Berkeley, 1929
Order Capitellida
Family Capitellidae
Capitella capitata 'hyperspecies'
Mediomastus sp. Indeterminate
Family Arenicolidae
Abarenicola sp. Indeterminate
Abarenicola sp. Juvenile
Order Opheliida
Family Opheliidae
Armandia brevis (Moore, 1906)
Order Phyllodocida
Family Phyllodocidae
Eteone sp. Indeterminate
Phyllodoce sp. Juvenile
Family Nereidae
Nereis zonata Malmgren, 1867
Platynereis bicanaliculata (Baird, 1863)
Family Glyceridae
Glycera americana Leidy, 1855
Family Goniadidae
Glycinde picna Berkeley, 1927
Glycinde polygnatha Hartman, 1950

Order Terebellida
Family Sabellariidae

- Amphicteis sp. Juvenile
- Order Sabellida
  - Family Sabellidae
    - *Chone duneri* Malmgren, 1867
    - Manayunkia aestuarina (Bourne, 1883)
- Class Oligochaeta
  - Oligochaeta sp. Indeterminate

Phylum Mollusca
- Class Gastropoda
  - Order Cephalaspidea
    - Superfamily Bulloidea
      - Family Haminaeidae
        - Haminaea vesicula Gould, 1855
- Class Bivalvia
  - Order Veneroida
    - Superfamily Lucinoidea
      - Family Lucinidae
        - Parvilucina tenuisculpta (Carpenter, 1864)
      - Family Lasaeidae
        - Rochefortia tumida (Carpenter, 1864)
    - Superfamily Cardioidea
      - Family Cardiidae
        - Clinocardium nuttalli (Conrad, 1837)
      - Family Tellinidae
        - Macoma balthica (Linnaeus, 1758)
        - Macoma inquinata (Deshayes, 1855)
        - Macoma nasuta (Conrad, 1837)
        - Macoma sp. Juvenile
        - Tellina modesta (Carpenter, 1864)
  - Order Myoida
    - Family Myidae
      - Cryptomya californica (Conrad, 1837)
      - Mya arenaria Linnaeus, 1758

Phylum Arthropoda
- Class Insecta
  - Order Diptera
    - Family Chironomidae
      - Chironomidae sp. Juvenile

Subphylum Crustacea
- Class Cirripedia
  - Cirripedia sp. Indeterminate
  - Order Cumacea
    - Family Leuconidae
      - Leucon subnasica Given, 1961
    - Family Nannastacidae
      - Cumella vulgaris Hart, 1930
  - Order Tanaidacea
    - Superfamily Paratanaoidea
      - Family Leptocheliidae
        - Leptochelia dubia (Kroyer, 1842)
      - Family Tanaidae
        - Zeuxo normani (Richardson, 1905)
  - Order Amphipoda
    - Superfamily Corophioidea
      - Family Ampithoidae
        - Ampithoe valida Smith, 1873

Family Anisogammaridae
Eogammarus confervicolus (Stimpson, 1856)
Family Aoroidae
Grandidierella japonica Stephensen, 1938
Family Corophiidae
Corophiidae sp. Indeterminate
Monocorophium sp. Indeterminate
Monocorophium insidiosium (Crawford, 1937)
Order Decapoda
Suborder Reptantia
Family Callianassidae
Neotrypaea californiensis (Dana, 1854)
Phylum Phoronida
Family Phoronidae
Phoronida sp. Indeterminate
Phylum Echinodermata
Class Holothuroidea
Holothuroidea sp. Indeterminate

Tacoma Middle Waterway Project
INVERTEBRATE SPECIES DATA
For Foster Wheeler Environmental Corporation
By Marine Taxonomic Services, Ltd.
December, 1999

		Station	MWBT			
			041R1			
	Rep	A	B	C	D	E
TAXON	NODC CODE					
POLYCHAETA						
Abarenicola sp. Indet.	5001620100					
Abarenicola sp. Juv.	5501620100					
Amphicties sp. Juv.	5001670300					
Armandia brevis	5001580202	1	5		3	4
Capitella capitata"hyperspecies'	5001600101	5	10	14	44	17
Chone duneri	5001700104					
Dipolydora sp. 1						
Eteone sp. Indet.	5001130200	1	1		1	
Glycera americana	5001270104					
Glycinde picta	5001280101	5	3		4	4
Glycinde polygnatha	5001280105					
Manyunkia aestuarina	5001701502		1			
Mediomastus sp. Indet.	5001600400		13		3	4
Nereis zonata	5001240406					
Oligochaeta sp. Indet.		14	36	5	11	39
Phyllodoce sp. Juv.	5001131400	1				
Platynereis bicanaliculata	5001240501					1
Polydora cornuta	5001430411	2	1		3	1
Polydora sp. Indet.	5001430400					1
Prionospio lighti	5001430521	4			1	2
Pseudopolydora kempi	5001431501	26	18	3	17	15
Pygospio elegans	5001431302	10	14	12	8	20
Spio filicornis	5001430701					
Streblospio benedicti	5001431801					
Tharyx parvus	5001500303	6	38	1	13	32
Mollusca						
Clinocardium nuttalli	5515220102		3	1	1	1
Cryptomya californica	5517010101					
Haminaea vesicula	5110120101					
Macoma balthica	5515310116	3				1
Macoma inquinata	5515310115					
Macoma nasuta	5515310114	14	15	5	9	16
Macoma sp. Juv.	5515310100				1	
Mya arenaria	5517010201			1		1
Parvilucina tenuisculpta	5515010101					
Rochefortia tumida	5515100102	2	2	2		1
Tellina modesta	5515310204					
Crustacea						
Ampithoe valida	6169040116					
Cirripedia sp. Indet.	6130000000					
Corophiidae sp. Indet.	6169150000					
Cumella vulgaris	6154080102		2		1	
Eogammarus confervicolus						
Grandidierella japonica	6169150902			1	2	6
Leptochelia dubia	6157020103					
Leucon subnasica	6154040115	7	11	5	8	5
Monocorophium insidiosum	6169150211	2	8		7	7
Monocorophium sp. Indet.		1	3			2
Neotrypaea californiensis	6183040204					
Zeuzo normani						
Miscellaneous						
Chironomidae sp. Juvenile						
Holothuroidea sp. Indet.	8170000000	1				
Nematoda sp. Indet.	4700000000					
Nemertinea sp. Indet.	4300000000		1			
Nynantheae sp. Indet.						
Phoronida sp. Indet.	7700000000					

Tacoma Middle Waterway Project
INVERTEBRATE SPECIES DATA
For Foster Wheeler Environmental Corporation
By Marine Taxonomic Services, Ltd.
December, 1999

		Station	MWBT				
			044R1				
		Rep	A	B	C	D	E
TAXON	NODC CODE						
POLYCHAETA							
Abarenicola sp. Indet.	5001620100		1				1
Abarenicola sp. Juv.	5501620100				2	1	
Amphicties sp. Juv.	5001670300						
Armandia brevis	5001580202						1
Capitella capitata 'hyperspecies'	5001600101		103	89	107	81	81
Chone duneri	5001700104						
Dipolydora sp. 1							
Eteone sp. Indet.	5001130200		20	3	15	6	10
Glycera americana	5001270104			1		1	1
Glycinde picta	5001280101						1
Glycinde polygnatha	5001280105		1				
Manyunkia aestuarina	5001701502						
Mediomastus sp. Indet.	5001600400						1
Nereis zonata	5001240406		1	1			
Oligochaeta sp. Indet.			94	170	46	152	49
Phyllodoce sp. Juv.	5001131400						
Platynereis bicanaliculata	5001240501						
Polydora cornuta	5001430411		3	10	10	7	5
Polydora sp. Indet.	5001430400						
Prionospio lighti	5001430521				1	2	
Pseudopolydora kempi	5001431501		16	15	20	23	38
Pygospio elegans	5001431302		8	11	22	10	18
Spio filicornis	5001430701						
Streblospio benedicti	5001431801						
Tharyx parvus	5001500303		12	12	1	5	4
Mollusca							
Clinocardium nuttalli	5515220102						
Cryptomya californica	5517010101					1	
Haminaea vesicula	5110120101						
Macoma balthica	5515310116			2		2	5
Macoma inquinata	5515310115			1		1	1
Macoma nasuta	5515310114		8	5	3	5	3
Macoma sp. Juv.	5515310100		1				
Mya arenaria	5517010201						
Parvilucina tenuisculpta	5515010101		1	1			
Rochefortia tumida	5515100102				1		1
Tellina modesta	5515310204						
Crustacea							
Ampithoe valida	6169040116						
Cirripedia sp. Indet.	6130000000						
Corophiidae sp. Indet.	6169150000						
Cumella vulgaris	6154080102			2			2
Eogammarus confervicolus							
Grandidierella japonica	6169150902		14	6	9	5	6
Leptochelia dubia	6157020103						
Leucon subnasica	6154040115			6	2	2	3
Monocorophium insidiosum	6169150211			1	3	4	6
Monocorophium sp. Indet.				1			
Neotrypaea californiensis	6183040204					1	
Zeuzo normani					1		
Miscellaneous							
Chironomidae sp. Juvenile				1			
Holothuroidea sp. Indet.	8170000000				1		
Nematoda sp. Indet.	4700000000		1	2			1
Nemertinea sp. Indet.	4300000000						
Nynantheae sp. Indet.			2	1			
Phoronida sp. Indet.	7700000000			1			

Tacoma Middle Waterway Project
INVERTEBRATE SPECIES DATA
For Foster Wheeler Environmental Corporation
By Marine Taxonomic Services, Ltd.
December, 1999

		Station	MWBT				
			153R1				
		Rep	A	B	C	D	E
TAXON	NODC CODE						
POLYCHAETA							
Abarenicola sp. Indet.	5001620100				1		
Abarenicola sp. Juv.	5501620100						
Amphicties sp. Juv.	5001670300					1	
Armandia brevis	5001580202	1	4		2	3	5
Capitella capitata 'hyperspecies'	5001600101	4	57		12	18	42
Chone duneri	5001700104						
Dipolydora sp. 1					1		
Eteone sp. Indet.	5001130200		1		1	2	
Glycera americana	5001270104						
Glycinde picta	5001280101	4	3		4	3	
Glycinde polygnatha	5001280105						
Manyunkia aestuarina	5001701502						
Mediomastus sp. Indet.	5001600400	1	6				1
Nereis zonata	5001240406						
Oligochaeta sp. Indet.		8	36		32	10	15
Phyllodoce sp. Juv.	5001131400					1	
Platynereis bicanaliculata	5001240501						
Polydora cornuta	5001430411	1	1		1	1	
Polydora sp. Indet.	5001430400						
Prionospio lighti	5001430521	1	2			1	1
Pseudopolydora kempi	5001431501	16	42		31	9	19
Pygospio elegans	5001431302	10	17		7	6	8
Spio filicornis	5001430701						
Streblospio benedicti	5001431801						
Tharyx parvus	5001500303	7	78		13	5	38
Mollusca							
Clinocardium nuttalli	5515220102	3	2		4	2	1
Cryptomya californica	5517010101						
Haminaea vesicula	5110120101				1		
Macoma balthica	5515310116						
Macoma inquinata	5515310115	4	3			1	
Macoma nasuta	5515310114	20	12		23	7	8
Macoma sp. Juv.	5515310100		2		2		
Mya arenaria	5517010201				1		
Parvilucina tenuisculpta	5515010101						
Rochefortia tumida	5515100102	12	4		5	2	5
Tellina modesta	5515310204	2					
Crustacea							
Ampithoe valida	6169040116	1					
Cirripedia sp. Indet.	6130000000				1		
Corophiidae sp. Indet.	6169150000						
Cumella vulgaris	6154080102						
Eogammarus confervicolus							
Grandidierella japonica	6169150902	3	5		8	2	2
Leptochelia dubia	6157020103	1					
Leucon subnasica	6154040115	2	2		1	5	5
Monocorophium insidiosum	6169150211		1		4	3	3
Monocorophium sp. Indet.		2	2			8	13
Neotrypaea californiensis	6183040204						
Zeuzo normani							
Miscellaneous							
Chironomidae sp. Juvenile							
Holothuroidea sp. Indet.	8170000000		1				
Nematoda sp. Indet.	4700000000				1		
Nemertinea sp. Indet.	4300000000				1		
Nynantheae sp. Indet.							
Phoronida sp. Indet.	7700000000						

Tacoma Middle Waterway Project
INVERTEBRATE SPECIES DATA
For Foster Wheeler Environmental Corporation
By Marine Taxonomic Services, Ltd.
December, 1999

		Station	MWRH				
			215R1				
		Rep	A	B	C	D	E
TAXON	NODC CODE						
POLYCHAETA							
Abarenicola sp. Indet.	5001620100						2
Abarenicola sp. Juv.	5501620100						
Amphicties sp. Juv.	5001670300						
Armandia brevis	5001580202						
Capitella capitata 'hyperspecies'	5001600101	185	319	138	255	113	
Chone duneri	5001700104	30	17	13	16	6	
Dipolydora sp. 1							
Eteone sp. Indet.	5001130200		1		1	1	
Glycera americana	5001270104						
Glycinde picta	5001280101			1			
Glycinde polygnatha	5001280105						
Manyunkia aestuarina	5001701502	4	5	15	14	11	
Mediomastus sp. Indet.	5001600400						
Nereis zonata	5001240406						
Oligochaeta sp. Indet.		98	142	121	257	151	
Phyllodoce sp. Juv.	5001131400		1				
Platynereis bicanaliculata	5001240501						
Polydora cornuta	5001430411	26	27	22	26	21	
Polydora sp. Indet.	5001430400						
Prionospio lighti	5001430521						
Pseudopolydora kempi	5001431501	2	1	6	5	18	
Pygospio elegans	5001431302	121	267	249	201	407	
Spio filicornis	5001430701	3					
Streblospio benedicti	5001431801	145	104	66	76	66	
Tharyx parvus	5001500303	256	108	193	155	421	
Mollusca							
Clinocardium nuttalli	5515220102						
Cryptomya californica	5517010101		1				
Haminaea vesicula	5110120101						
Macoma balthica	5515310116	1					
Macoma inquinata	5515310115						
Macoma nasuta	5515310114	1	1				
Macoma sp. Juv.	5515310100						
Mya arenaria	5517010201						
Parvilucina tenuisculpta	5515010101						
Rochefortia tumida	5515100102						
Tellina modesta	5515310204						
Crustacea							
Ampithoe valida	6169040116	17	26	21	31	23	
Cirripedia sp. Indet.	6130000000						
Corophiidae sp. Indet.	6169150000	8	5	5	3	4	
Cumella vulgaris	6154080102			1			
Eogammarus confervicolus		14	8	9	11	6	
Grandidierella japonica	6169150902	5	2	1		3	
Leptochelia dubia	6157020103						
Leucon subnasica	6154040115	4	6	1	1	2	
Monocorophium insidiosum	6169150211	302	321	297	177	227	
Monocorophium sp. Indet.		80	14	17	22	14	
Neotrypaea californiensis	6183040204						
Zeuzo normani			1		1	5	
Miscellaneous							
Chironomidae sp. Juvenile							
Holothuroidea sp. Indet.	8170000000	1	6	4	2	3	
Nematoda sp. Indet.	4700000000	3	7	23	3	2	
Nemertinea sp. Indet.	4300000000						
Nynantheae sp. Indet.		56	91	64	19	35	
Phoronida sp. Indet.	7700000000						

Tacoma Middle Waterway Project

BIOMASS MEASUREMENTS IN GRAMS

For Foster Wheeler Environmental Corporation

By Marine Taxonomic Services, Ltd.

December, 1999

Station	Rep	Polys	Molluscs	Crustacea	Misc.
MWBT041R1	A	0.147	0.933	0.003	-----
	B	0.169	0.071	0.023	0.001
	C	0.016	0.740	0.004	-----
	D	0.229	0.062	0.012	-----
	E	0.155	0.132	0.024	-----
MWBT044R1	A	0.313	0.833	0.032	0.006
	B	0.444	0.520	0.017	0.001
	C	0.243	0.010	0.021	-----
	D	0.530	11.789*	3.717**	-----
	E	0.936	0.431	0.011	-----
MWBT153R1	A	0.084	0.222	0.008	-----
	B	0.452	0.158	0.012	-----
	C	0.209	0.172	0.045	0.002
	D	0.053	0.052	0.009	-----
	E	0.220	0.044	0.022	-----
MWRH215R1	A	1.270	0.575	0.585	0.046
	B	1.302	0.660	0.557	0.087
	C	1.292	-----	0.391	0.054
	D	1.247	-----	0.406	0.023
	E	1.904	-----	0.483	0.032

*** Includes 2 large clams**

**** Includes 1 large shrimp**

Tacoma Middle Waterway Project
BULK QA REPORTS
For Foster Wheeler Environmental Corporation
By Marine Taxonomic Services, Ltd.
December, 1999

POLYCHAETA

STATION	ID by HRJ	Count	QA ID by ER	Count
MWBT041R1C	*Capitella capitata 'hyperspecies'*	14		16
	Oligochaeta sp. Indet.	5		5
	Pseudopolydora kempi	3		3
	Pygospio elegans	12		12
	Tharyx parvus	1		1
			Polydora cornuta	1

MOLLUSCA

STATION	ID by SW	Count	QA ID by AF	Count
MWBT041R1D	*Clinocardium nuttalli*	1		1
	Macoma nasuta	9		9
	Macoma sp. Juv.	1	*Macoma inquinata*	1

CRUSTACEA

STATION	ID by RZ	Count	QA ID by CS	Count
MWBT153R1C	*Cirripedia sp. Indet.*	1		
	Grandidierella japonica	8		8
	Leucon subnasica	1		1
	Monocorophium insidiosum	4	*Monocorophium insidiosum*	3
			Monocorophium acherusicum	3

Tacoma Middle Waterway Project

SORTING QA REPORT

For Foster Wheeler Environmental Corporation

By Marine Taxonomic Services, Ltd.

December, 1999

STATION	REP	COUNT POLYCHAETA	MOLLUSCA	CRUSTACEA	MISC	SORTER	P/NP
MWBT041R1	A	0	0	0	0	KJ	P
	B	0	0	0	0	KJ	P
	C	0	0	0	0	KJ	P
	D	0	0	0	0	KJ	P
	E	1	0	0	0	KJ	P
MWBT044R1	A	0	0	0	0	KJ	P
	B	0	0	0	0	KJ	P
	C	0	0	0	0	KJ	P
	D	0	0	0	0	KJ	P
	E	0	0	0	0	KJ	P
MWBT153R1	A	0	0	0	0	KJ	P
	B	1	0	0	0	KJ	P
	C	0	0	0	0	KJ	P
	D	0	0	0	0	KJ	P
	E	0	0	0	0	KJ	P
MWRH215R1	A	0	0	0	0	KJ	P
	B	2	0	0	0	KJ	P
	C	0	0	2	0	KJ	P
	D	0	0	0	0	KJ	P
	E	1	0	0	0	KJ	P

Tacoma Middle Waterway Project

VOUCHER COLLECTION & QA REPORT

For Foster Wheeler Environmental Corporation

By Marine Taxonomic Services, Ltd.

December, 1999

POLYCHAETA

Vial #	Station		ID by HRJ	Count	QA ID by ER
1	MWBT	044R1A	*Abarenicola sp. Indet.*	1	*Abarenicola pacifica*
2	MWBT	044R1D	*Abarenicola sp. Juv.*	1	ID Confirmed
3	MWBT	153R1D	*Amphicties sp. Juv.*	1	ID Confirmed
4	MWBT	044R1E	*Armandia brevis*	1	ID Confirmed
5	MWRH	215R1E	*Capitella capitata 'hyperspecies'*	1	ID Confirmed
6	MWRH	215R1A	*Chone duneri*	1	ID Confirmed
7	MWRH	215R1B	*Eteone sp. Indet.*	1	ID Confirmed
8	MWBT	044R1D	*Glycera americana*	1	ID Confirmed
9	MWBT	044R1A	*Glycinde picta*	1	*Glycinde polygnatha**
10	MWRH	215R1E	*Manyunkia aestarina*	1	ID Confirmed
11	MWBT	044R1E	*Mediomastus sp. Indet.*	1	ID Confirmed
12	MWRH	215R1E	*Oligochaeta sp. Indet.*	1	ID Confirmed
13	MWRH	215R1B	*Phyllodoce sp. Indet.*	1	ID Confirmed
14	MWBT	041R1E	*Platynereis bicanaliculata*	1	ID Confirmed
15	MWBT	044R1D	*Polydora cornuta*	1	ID Confirmed
16	MWBT	153R1C	*Polydora sp. 1*	1	*Dipolydora sp. 1***
17	MWBT	044R1D	*Prionospio lighti*	1	ID Confirmed
18	MWRH	215R1E	*Pseudopolydora kempi*	1	ID Confirmed
19	MWBT	041R1C	*Pygospio elegans*	1	ID Confirmed
20	MWRH	215R1E	*Streblospio benedicti*	1	ID Confirmed
21	MWRH	215R1A	*Tharyx parvus*	1	ID Confirmed

MOLLUSCA

Vial #	Station		ID by SW	Count	QA ID by AF
22	MWBT	041R1B	*Clinocardium nuttalli*	1	ID Confirmed
23	MWRH	215R1B	*Cryptomya californica*	1	ID Confirmed
24	MWBT	153R1C	*Haminoea vesicula*	1	ID Confirmed
25	MWBT	041R1A	*Macoma balthica*	1	ID Confirmed
26	MWBT	153R1D	*Macoma inquinata*	1	ID Confirmed
27	MWBT	041R1B	*Macoma nasuta*	1	ID Confirmed
28	MWBT	153R1C	*Macoma sp. Juv.*	1	ID Confirmed
29	MWBT	153R1C	*Mya arenaria*	1	ID Confirmed
30	MWBT	044R1A	*Parvilucina tenuisculpta*	1	ID Confirmed
31	MWBT	041R1B	*Rochefortia tumida*	1	ID Confirmed
32	MWBT	153R1A	*Tellina modesta*	1	ID Confirmed
33	MWBT	041R1A	*Tellina sp. Juv.*	1	ID Confirmed

CRUSTACEA

Vial #	Station		ID by RZ	Count	QA ID by CS
34	MWBT	153R1A	*Ampithoe lacertosa*	1	*Ampithoe valida***
35	MWBT	153R1C	*Cirripedia sp. Indet.*	1	ID Confirmed
36	MWRH	215R1E	*Corophiidae sp. Indet.*	1	ID Confirmed
37	MWBT	041R1B	*Cumella vulgaris*	1	ID Confirmed
38	MWRH	215R1A	*Eogammarus confervicolus*	1	ID Confirmed
39	MWBT	041R1C	*Grandidierella japonica*	1	ID Confirmed
40	MWBT	153R1A	*Leptochelia dubia*	1	ID Confirmed
41	MWBT	041R1B	*Leucon subnasica*	1	ID Confirmed
42	MWBT	041R1B	*Monocorophium insidiosum*	1	ID Confirmed
43	MWBT	153R1B	*Monocorophium sp. Indet.*	1	ID Confirmed
44	MWBT	044R1D	*Neotrypaea californiensis*	1	ID Confirmed
45	MWBT	044R1C	*Zeuxo normani*	1	ID Confirmed

MISCELLANEOUS

Vial #	Station		ID by SM
46	MWBT	044R1B	*Nynanthaea sp. Indet.*

* Changed locally in the data set

** Changed globally in the data set

Project Name: Middle Waterway Round 1B 1/19/00

Sample ID: MW041		**Replicates:**	5
Alias: Mollusc Abundance			
Mean:	15.800	**Transform Mean:**	15.800
SD:	5.357	**Transform SD:**	5.357

Reference ID: MW215		**Replicates:**	5
Alias: Reference			
Mean:	0.800	**Transform Mean:**	0.800
SD:	1.095	**Transform SD:**	1.095

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	2.5089
SS:	119.6000
K:	5.0000
b:	10.4557
Alpha Level:	0.05
Calculated Value:	0.9140
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	4.6399
Test Residual SD:	1.3371
Reference Residual Mean:	0.9600
Reference Residual SD:	0.2190
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	6.0729
Critical Value:	>= 1.86
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate T
Balanced Design:	Yes
Transformation:	No Transformation
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	4
Experimental Alpha Level:	0.05
Calculated Value:	-6.1339
Critical Value:	>= 2.132
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	19.0000	19.0000	2.0000	2.0000	3.2000	1.2000			-6.8000
2	20.0000	20.0000	2.0000	2.0000	4.2000	1.2000			-4.8000
3	9.0000	9.0000	0.0000	0.0000	6.8000	0.8000			-0.8000
4	11.0000	11.0000	0.0000	0.0000	4.8000	0.8000			-0.8000
5	20.0000	20.0000	0.0000	0.0000	4.2000	0.8000			-0.8000
6									1.2000
7									1.2000
8									3.2000
9									4.2000
10									4.2000
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: Middle Waterway Round 1B

1/19/00

Sample ID: MW044		**Replicates:**	5		
Alias: Mollusc Abundance					
Mean:	8.400	**Transform Mean:**	0.956		
SD:	2.509	**Transform SD:**	0.145		

Reference ID: MW215		**Replicates:**	5
Alias: Reference			
Mean:	0.800	**Transform Mean:**	0.190
SD:	1.095	**Transform SD:**	0.261

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	0.1372
SS:	0.3576
K:	5.0000
b:	0.5618
Alpha Level:	0.05
Calculated Value:	0.8825
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.1029
Test Residual SD:	0.0887
Reference Residual Mean:	0.2290
Reference Residual SD:	0.0522
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	2.7363
Critical Value:	>= 1.86
Variances Homogeneous:	No

Test Results:

Statistic: Approximate T
Balanced Design: Yes
Transformation: Log10 (x + 1.0)

Experimental Hypothesis
Null: x1 >= x2
Alternate: x1 < x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	6
Experimental Alpha Level:	0.05
Calculated Value:	-5.7240
Critical Value:	>= 1.943
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	10.0000	1.0413	2.0000	0.4771	0.0850	0.2862			-0.2573
2	9.0000	1.0000	2.0000	0.4771	0.0436	0.2862			-0.1908
3	4.0000	0.6989	0.0000	0.0000	0.2573	0.1908			-0.1908
4	9.0000	1.0000	0.0000	0.0000	0.0436	0.1908			-0.1908
5	10.0000	1.0413	0.0000	0.0000	0.0850	0.1908			0.0436
6									0.0436
7									0.0850
8									0.0850
9									0.2862
10									0.2862
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: Middle Waterway Round 1B 1/19/00

Sample ID: MW153		**Replicates:**	5
Alias: Mollusc Abundance			
Mean:	25.200	**Transform Mean:**	25.200
SD:	12.949	**Transform SD:**	12.949

Reference ID: MW215		**Replicates:**	5
Alias: Reference			
Mean:	0.800	**Transform Mean:**	0.800
SD:	1.095	**Transform SD:**	1.095

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	5.9630
SS:	675.6000
K:	5.0000
b:	24.8560
Alpha Level:	0.05
Calculated Value:	0.9144
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	10.6400
Test Residual SD:	5.1174
Reference Residual Mean:	0.9600
Reference Residual SD:	0.2190
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	4.2258
Critical Value:	>= 1.86
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate T
Balanced Design:	Yes
Transformation:	No Transformation

Experimental Hypothesis

Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	4
Experimental Alpha Level:	0.05
Calculated Value:	-4.1981
Critical Value:	>= 2.132
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate N[redacted]	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	41.0000	41.0000	2.0000	2.0000	15.8000	1.2000			-13.2000
2	23.0000	23.0000	2.0000	2.0000	2.2000	1.2000			-11.2000
3	36.0000	36.0000	0.0000	0.0000	10.8000	0.8000			-2.2000
4	12.0000	12.0000	0.0000	0.0000	13.2000	0.8000			-0.8000
5	14.0000	14.0000	0.0000	0.0000	11.2000	0.8000			-0.8000
6									-0.8000
7									1.2000
8									1.2000
9									10.8000
10									15.8000
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: Middle Waterway Round 1B

1/19/00

Sample ID: MW041		**Replicates:**	5
Alias: Crustacean Abundance			
Mean:	15.600	**Transform Mean:**	15.600
SD:	7.402	**Transform SD:**	7.402

Reference ID: MW215		**Replicates:**	5
Alias: Reference			
Mean:	339.000	**Transform Mean:**	339.000
SD:	74.263	**Transform SD:**	74.263

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	34.2430
SS:	22,279.2000
K:	5.0000
b:	144.8105
Alpha Level:	0.05
Calculated Value:	0.9412
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	6.0800
Test Residual SD:	2.9312
Reference Residual Mean:	59.2000
Reference Residual SD:	33.6778
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	3.5136
Critical Value:	>= 1.86
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate T
Balanced Design:	Yes
Transformation:	No Transformation
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	4
Experimental Alpha Level:	0.05
Calculated Value:	9.6895
Critical Value:	>= 2.132
Failed to Reject Null Hypo:	No
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	10.0000	10.0000	430.0000	430.0000	5.6000	91.0000			-93.0000
2	24.0000	24.0000	383.0000	383.0000	8.4000	44.0000			-55.0000
3	6.0000	6.0000	352.0000	352.0000	9.6000	13.0000			-9.6000
4	18.0000	18.0000	246.0000	246.0000	2.4000	93.0000			-5.6000
5	20.0000	20.0000	284.0000	284.0000	4.4000	55.0000			2.4000
6									4.4000
7									8.4000
8									13.0000
9									44.0000
10									91.0000
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: Middle Waterway Round 1B 1/19/00

Sample ID: MW044		**Replicates:**	5
Alias: Crustacean Abundance			
[redacted]:	14.800	**Transform Mean:**	1.195
SD:	1.923	**Transform SD:**	0.054

Reference ID: MW215		**Replicates:**	5
Alias: Reference			
Mean:	339.000	**Transform Mean:**	2.522
SD:	74.263	**Transform SD:**	0.098

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	0.0514
SS:	0.0503
K:	5.0000
b:	0.2205
Alpha Level:	0.05
Calculated Value:	0.9667
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.0407
Test Residual SD:	0.0299
Reference Residual Mean:	0.0792
Reference Residual SD:	0.0419
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.6701
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	Log10 (x + 1.0)
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	26.4519
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	No
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	14.0000	1.1760	430.0000	2.6344	0.0198	0.1116			-0.1301
2	16.0000	1.2304	383.0000	2.5843	0.0344	0.0615			-0.0820
3	15.0000	1.2041	352.0000	2.5477	0.0081	0.0249			-0.0679
4	12.0000	1.1139	246.0000	2.3926	0.0820	0.1301			-0.0198
5	17.0000	1.2552	284.0000	2.4548	0.0592	0.0679			0.0081
6									0.0249
7									0.0344
8									0.0592
9									0.0615
10									0.1116
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: Middle Waterway Round 1B

1/19/00

Sample ID: MW153		**Replicates:**	5
Alias: Crustacean Abundance			
Mean:	14.800	**Transform Mean:**	1.175
SD:	5.805	**Transform SD:**	0.159

Reference ID: MW215		**Replicates:**	5
Alias: Reference			
Mean:	339.000	**Transform Mean:**	2.522
SD:	74.263	**Transform SD:**	0.098

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	0.0857
SS:	0.1397
K:	5.0000
b:	0.3658
Alpha Level:	0.05
Calculated Value:	0.9574
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.1236
Test Residual SD:	0.0788
Reference Residual Mean:	0.0792
Reference Residual SD:	0.0419
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.1124
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	Log10 (x + 1.0)
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	16.1188
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	No
Power:	100.0%
Significant Diff for Power:	50

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	9.0000	1.0000	430.0000	2.6344	0.1752	0.1116			-0.1752
2	10.0000	1.0413	383.0000	2.5843	0.1338	0.0615			-0.1338
3	14.0000	1.1760	352.0000	2.5477	0.0008	0.0249			-0.1301
4	18.0000	1.2787	246.0000	2.3926	0.1034	0.1301			-0.0679
5	23.0000	1.3802	284.0000	2.4548	0.2049	0.0679			0.0008
6									0.0249
7									0.0615
8									0.1034
9									0.1116
10									0.2049
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: Middle Waterway Round 1B 1/19/00

Sample ID: MW041		**Replicates:**	5
Alias: Polychaete Abundance			
Mean:	99.600	**Transform Mean:**	99.600
SD:	45.036	**Transform SD:**	45.036

Reference ID: MW215		**Replicates:**	5
Alias: Reference			
Mean:	981.800	**Transform Mean:**	981.800
SD:	152.814	**Transform SD:**	152.814

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	73.0976
SS:	101,522.0000
K:	5.0000
b:	304.1571
Alpha Level:	0.05
Calculated Value:	0.9112
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	35.6800
Test Residual SD:	20.9038
Reference Residual Mean:	107.8400
Reference Residual SD:	93.8901
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.6774
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	No Transformation
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	12.3823
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	No
Power:	15.87%
Significant Diff for Power:	50

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	75.0000	75.0000	870.0000	870.0000	24.6000	111.8000			-157.8000
2	140.0000	40.0000	992.0000	992.0000	40.4000	10.1999			-111.8000
3	35.0000	35.0000	824.0000	824.0000	64.5999	157.8000			-64.5999
4	108.0000	08.0000	1,006.0000	006.0000	8.4000	24.2000			-24.6000
5	140.0000	40.0000	1,217.0000	217.0000	40.4000	235.2000			8.4000
6									10.1999
7									24.2000
8									40.4000
9									40.4000
10									235.2000
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: Middle Waterway Round 1B

1/19/00

Sample ID: MW044		**Replicates:**	5
Alias: Polychaete Abundance			
Mean:	258.600	**Transform Mean:**	258.600
SD:	42.647	**Transform SD:**	42.647

Reference ID: MW215		**Replicates:**	5
Alias: Reference			
Mean:	981.800	**Transform Mean:**	981.800
SD:	152.814	**Transform SD:**	152.814

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	72.7953
SS:	100,684.0000
K:	5.0000
b:	304.1979
Alpha Level:	0.05
Calculated Value:	0.9190
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	33.2800
Test Residual SD:	20.8411
Reference Residual Mean:	107.8400
Reference Residual SD:	93.8901
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.7335
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	No Transformation

Experimental Hypothesis

Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	10.1927
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	No
Power:	15.87%
Significant Diff for Power:	50

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	259.0000	59.0000	870.0000	870.0000	0.3999	111.8000			-157.8000
2	312.0000	12.0000	992.0000	992.0000	53.4000	10.1999			-111.8000
3	224.0000	24.0000	824.0000	824.0000	34.6000	157.8000			-48.6000
4	288.0000	88.0000	1,006.0000	006.0000	29.4000	24.2000			-34.6000
5	210.0000	10.0000	1,217.0000	217.0000	48.6000	235.2000			0.3999
6									10.1999
7									24.2000
8									29.4000
9									53.4000
10									235.2000
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: Middle Waterway Round 1B 1/19/00

Sample ID: MW153	**Replicates:** 5
Alias: Polychaete Abundance	
Mean: 118.800	**Transform Mean:** 118.800
SD: 78.289	**Transform SD:** 78.289

Reference ID: MW215	**Replicates:** 5
Alias: Reference	
Mean: 981.800	**Transform Mean:** 981.800
SD: 152.814	**Transform SD:** 152.814

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	78.7820
SS:	117,925.6000
K:	5.0000
b:	333.1989
Alpha Level:	0.05
Calculated Value:	0.9414
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	55.3600
Test Residual SD:	47.9404
Reference Residual Mean:	107.8400
Reference Residual SD:	93.8901
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.1131
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	No Transformation

Experimental Hypothesis

Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	11.2388
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	No
Power:	14.69%
Significant Diff for Power:	50

Replicate	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	53.0000	53.0000	870.0000	870.0000	65.8000	111.8000			-157.8000
2	247.0000	47.0000	992.0000	992.0000	128.1999	10.1999			-111.8000
3	105.0000	05.0000	824.0000	824.0000	13.8000	157.8000			-65.8000
4	60.0000	60.0000	1,006.0000	006.0000	58.8000	24.2000			-58.8000
5	129.0000	29.0000	1,217.0000	217.0000	10.1999	235.2000			-13.8000
6									10.1999
7									10.1999
8									24.2000
9									128.1999
10									235.2000
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

TOXICITY TEST NO. 590-5

TOXICITY TEST REPORT

TEST IDENTIFICATION

Test No.: 590-5

Title: *Rhepoxynius abronius* 10-day sediment toxicity test.

Protocol: NAS-XXX-RA4, April 9, 1996. Revised October 31, 1997. Complies with: Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments (PSEP 1995), with modifications as specified by the Puget Sound Dredged Disposal Analysis Program.

STUDY MANAGEMENT

Study Sponsor: Foster Wheeler Environmental, 10900 N.E. 8th St., Suite 1300, Bellevue, WA 98004

Sponsor's Study Monitor: Mr. Gary Braun

Testing Laboratory: Northwestern Aquatic Sciences, P.O. Box 1437, Newport, Oregon 97365.

Test Location: Newport Laboratory.

Laboratory's Study Personnel: M.S. Redmond, M.S., Proj. Mngr./Study Dir.; L.K. Nemeth, B.A., QA Officer; R.S. Caldwell, Ph.D., Sr. Aq. Toxicol.; G.J. Irissarri, Aq. Toxicol.; R.M. Singleton, M.A., Sr. Tech; E. Coffey, B.S., Sr. Tech.; G. Hayes, B.S., Tech.

Study Schedule:

Test Beginning: 10-5-99, 1630 hrs.

Test Ending: 10-15-99, 1115 hrs.

Disposition of Study Records: All specimens, raw data, reports and other study records are stored according to Good Laboratory Practice regulations at Northwestern Aquatic Sciences, 3814 Yaquina Bay Rd., Newport, OR 97365.

Good Laboratory Practices: The test was conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

Statement of Quality Assurance: The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol and standard operating procedures. This report is an accurate reflection of the raw data.

TEST MATERIAL

Control Sediment: The control sediment (NAS Sample No. 4286F) was collected by Doug Henderson from West Beach, Whidbey Island, Washington, on 9-29-99, sieved through a 0.5 mm screen, and received with the test organism shipment on 10-1-99. The interstitial salinity was 30.0 ppt. Control sediment was stored at 4°C in the dark, and then homogenized before use in the test.

Test Sediments: Unidentified marine sediments. Details are as follows:

NAS Sample No.	4231F	4232F	4233F	4234F
Foster Wheeler No.	MWAT042R1	MWAT045R1	MWAT044R1	MWAT047R1
Collection Date	9-21-99	9-21-99	9-22-99	9-22-99
Receipt Date	9-23-99	9-23-99	9-23-99	9-23-99
Interstitial salinity (ppt)	24.5	24.0	27.0	27.0

NAS Sample No.	4235F	4245F	4246F	4272F
Foster Wheeler No.	MWAT153R1	MWAT041R1	MWAT046R1	MWAS034R1
Collection Date	9-22-99	9-23-99	9-23-99	9-27-99
Receipt Date	9-23-99	9-25-99	9-25-99	9-29-99
Interstitial salinity (ppt)	27.5	21.0	28.5	30.5

NAS Sample No.	4273F	4274F	4275F
Foster Wheeler No.	MWAS037R1	MWRC213R1	MWRC214R1
Collection Date	9-27-99	9-27-99	9-27-99
Receipt Date	9-29-99	9-29-99	9-29-99
Interstitial salinity (ppt)	29.5	29.5	30.0

Storage: Samples were placed under nitrogen and stored at 4°C in the dark in capped containers until used.
Treatments: Homogenized.

TEST WATER

Source: Yaquina Bay, Oregon
Date of Collection: 10-4-99
Water Quality: Salinity 28.0 ppt
Pretreatment: Filtered to ≤0.40 µm, salinity-adjusted with Milli-Q® de-ionized water, and aerated.

TEST ORGANISMS

Species: *Rhepoxynius abronius*, amphipod
Size/Weight: adult
Source: Doug Henderson, Kirkland, WA. Animals were collected from West Beach, Whidbey Island, WA. and received on 10-1-99.
Acclimation: Average conditions during acclimation were: temperature, 15.1 ± 1.2°C; salinity 29.9 ± 0.9 ppt; dissolved oxygen, 6.6 ± 1.5 mg/L; pH 7.7 ± 0.4; photoperiod, constant illumination.

TEST PROCEDURES AND CONDITIONS

Test Chambers: 1 L borosilicate glass beakers covered with watch glasses.
Test Volumes: 175 ml of test or control sediment; 950 ml total volume.
Replicates/Treatment: 5 (plus one water quality replicate, and two sacrificial replicates for days 0 and 5 interstitial ammonia and sulfide measurements)
Sediment Salinity Adjustment: Yes
Organisms/Treatment: 100 (20/replicate)
Water Volume Changes per 24 hr: None
Aeration: Yes, at least 2 cm above the sediment surface.
Feeding: None.
Acceptance Criteria: Results are valid if mean control mortality does not exceed 10%, and does not exceed 20% in any one replicate. Additionally, mortality in the reference sediments must be ≤20% over the negative control.
Effects Criteria: 1) mortality after 10 days, 2) daily emergence of amphipods from the test sediments, and 3) failure of surviving amphipods to rebury at the end of the exposure period. Death is defined as no visible appendage movement or response to tactile stimulation.
Water Quality and Other Test Conditions: Ammonia-N was measured in the pore water of the bulk test sediments upon receipt. Ammonia-N was measured in the interstitial water of one sacrificial test chamber per treatment on days 0, 5, and 10, and sulfide was measured in the interstitial water on days 0 and 10. Pore water was obtained by centrifugation. The temperature, dissolved oxygen, salinity, and pH were measured in water quality beakers of each sample daily. Ammonia-N and sulfide were measured in the overlying water of the water quality beaker on days 0 and 10. Sulfide and ammonia-N analyses were by the methylene blue (EPA Method 376.2) and salicylate (Clin. Chim. Acta 14:403, 1996) colorimetric methods, respectively; samples were not distilled prior to analysis. The values of individual water quality measurements are to be found in the raw data (Appendix II). The photoperiod was constant light.

DATA ANALYSIS METHODS

The percent amphipod mortality and percent of surviving amphipods failing to rebury at the end of the test was determined from the final observations according to the formulas:

Percent Mortality = 100 x ([initial amphipods - surviving amphipods]/initial amphipods)
Percent Survivors not Reburied = 100 x ([surviving amphipods - number survivors reburied]/surviving amphipods)
Percent Total Effective Mortality = 100 x ([initial amphipods - surviving amphipods]+ [surviving amphipods - number survivors reburied])/initial amphipods

Another endpoint was the sum of observed daily sediment emergence events in a test beaker throughout the test. Control and treatment means and standard deviations for the biological endpoints described above and for water quality data were computed using Microsoft EXCEL 2000.

Values for two endpoints, mortality and total effective mortality, for the test sediments were statistically compared against each of the two reference sediments using BioStat ver. 2.0 (U.S. Army Corps of Engineers, Seattle District). An arcsine transformation was performed before analysis. Following transformation and determination of normality and homogeneity of variances, Student's T-Test was conducted at the 0.05 level of significance. Statistical comparisons were not required, and were not performed, for the emergence and reburial endpoints.

PROTOCOL DEVIATIONS

1. The overlying water salinity values were found to exceed the specified limits of 28 ± 1 ppt in several water quality beakers on day 3 of the test (to 30.5 ppt), and in a considerable number of beakers on day 8 of the test (to 32.0 ppt). In all instances when this occurred, the salinities were readjusted back to the normal range for the test. These salinity deviations are not considered to be serious and should not adversely affect the test results.
2. Due to an oversight, no final interstitial salinity measurements were recorded. There is no reason to suspect that final interstitial salinities would have deviated significantly from 28.0 ppt.
3. Temperature in several beakers exceeded the specified range of 15.0 ± 1.0 °C on days 0-4 and day 8 (maximum value 16.3 °C). These are minor deviations and are not likely to affect the test results.

REFERENCE TOXICANT TEST

The reference toxicant test is a standard multi-concentration toxicity test using cadmium as $CdCl_2 \bullet 2½ H_2O$, to evaluate the performance of the test organisms used in the sediment toxicity test. The performance is evaluated by comparing the results of this test with historical results obtained at the laboratory. Reference toxicant test raw data and the applicable control chart are included in Appendix III.

Test No.: 999-1084
Reference Toxicant and Source: $CdCl_2 \bullet 2.5H_2O$, Mallinckrodt, Lot No. TNZ, 1.0 mg/ml stock prepared 7-24-99.
Test Date: 10-5-99
Dilution Water Used: Yaquina Bay, Oregon, seawater
Result: 96-hr LC50, 1.54 mg/L Cd. This result is within the laboratory's control chart warning limits (0.00 - 2.81 mg/L).

RESULTS AND CONCLUSIONS

Water quality data are summarized in Table 1. The means and standard deviations of the mortality, reburial and emergence responses for each sediment are summarized in Table 2. Tables 3 and 4 summarize the interstitial ammonia-N and sulfide concentrations in the sediments of sacrificial beakers on days 0, 5, and 10.

The test met the acceptability criterion for control survival; mean survival in the control was 100.0%. Control survival was 100% in individual replicates. The reference sediments met the performance requirement that mortality in the reference sediments must be ≤20% over the negative control. Sample MWRC213R1 had 8.0% mortality and sample MWRC214R1 had 4.0% mortality, both less than 20% over the control mortality of 0.0%. Since the control and reference sediment performance criteria were met, the reference toxicant test results were within control chart limits, and since no major protocol deviations were encountered, it is concluded that the test developed results satisfactory for reaching management decisions.

Percent mortality in sample MWAS034R1 (12.0%) was significantly greater than that in reference sediment MWRC214R1 (4.0%). Percent total effective mortality for the same sample (MWAS034R1, 16.0%) was also significantly greater than in the reference sediment MWRC214R1 (4.0%). Additionally, percent total effective mortality in sample MWAT041R1 (11.0%) was significantly different from that in reference MWRC214R1 (4.0%). No other comparisons showed significant differences.

STUDY APPROVAL

Michele S. Redmond 12-9-99
Project Manager/Study Director Date

Julie R. Fiore 12099
Quality Assurance Unit Date

Richard S. Caldwell 12/9/99
Manager, Toxicology Date

Table 1. Summary of overlying water quality conditions prevailing during the *Rhepoxynius abronius* 10-day test.

Water Quality Parameter	Mean ± SD	Minimum	Maximum	N
Temperature (°C)	15.8 ± 0.2	15.3	16.3	132
Dissolved Oxygen (mg/L)	8.1 ± 0.1	7.8	8.4	132
Salinity (ppt)	29.0 ± 0.9	27.5	32.0	207
pH	8.1 ± 0.2	7.4	8.6	132
Total Sulfide (mg/L)	---	<0.02	<0.02	24
Total Ammonia-N (mg/L)	---	<0.5	3.5	24

Table 2. Means and standard deviations (n=5) of sediment emergence, 10-day percent mortality, percent failure to rebury, and percent total effective mortality of *Rhepoxynius abronius* exposed to sediments.

Sample Description	Emergence [1] (no./repl.)	Percent Mortality		Percent Survivors Failing to Rebury	Percent Total Effective Mortality	
Control (NAS #4286F)	0.0 ± 0.0	0.0 ± 0.0		0.0 ± 0.0	0.0 ± 0.0	
MWAT042R1 (NAS #4231F)	5.6 ± 7.4	9.0 ± 6.5		2.4 ± 3.2	11.0 ± 8.9	
MWAT045R1 (NAS #4232F)	3.4 ± 3.4	4.0 ± 4.2		0.0 ± 0.0	4.0 ± 4.2	
MWAT044R1 (NAS #4233F)	11.6 ± 5.3	8.0 ± 5.7		5.6 ± 9.6	13.0 ± 12.0	
MWAT047R1 (NAS #4234F)	7.4 ± 2.6	0.0 ± 0.0		8.5 ± 11.3	8.5 ± 11.3	
MWAT153R1 (NAS #4235F)	3.4 ± 3.9	4.0 ± 5.5		2.1 ± 2.9	6.0 ± 6.5	
MWAT041R1 (NAS #4245F)	11.4 ± 7.4	8.0 ± 4.5		3.4 ± 5.0	11.0 ± 8.2	b
MWAT046R1 (NAS #4246F)	8.6 ± 3.7	3.0 ± 4.5		2.1 ± 4.7	5.0 ± 7.1	
MWAS034R1 (NAS #4272F)	8.4 ± 5.8	12.0 ± 7.6	b	4.3 ± 4.4	16.0 ± 5.5	b
MWAS037R1 (NAS #4273F)	13.8 ± 5.5	5.0 ± 5.0		1.0 ± 2.2	6.0 ± 4.2	
MWRC213R1 (NAS #4274F)	17.4 ± 7.7	8.0 ± 10.4		4.7 ± 6.5	12.0 ± 13.5	
MWRC214R1 (NAS #4275F)	1.0 ± 0.7	4.0 ± 4.2		0.0 ± 0.0	4.0 ± 4.2	

Emergence and reburial endpoints were not statistically analyzed.

[1] Daily emergence counts include all amphipods observed on or above the sediment surface whether living or dead.

[a] Significantly different ($p \leq 0.05$) from reference sediment MWRC213R1.

[b] Significantly different ($p \leq 0.05$) from reference sediment MWRC214R1.

Table 3 Sediment interstitial ammonia-N for sediments tested for 10 days with the amphipod *Rhepoxynius abronius*.

	Ammonia-N (mg/L)		
Sample Description	Day 0	Day 5	Day 10
Control (NAS #4286F)	<2.5	<2.5	2.5
MWAT042R1 (NAS #4231F)	12.5	12.5	5.0
MWAT045R1 (NAS #4232F)	7.5	7.5	2.5
MWAT044R1 (NAS #4233F)	2.5	2.5	2.5
MWAT047R1 (NAS #4234F)	2.5	5.0	2.5
MWAT153R1 (NAS #4235F)	5.0	2.5	2.5
MWAT041R1 (NAS #4245F)	2.5	2.5	2.5
MWAT046R1 (NAS #4246F)	7.5	5.0	2.5
MWAS034R1 (NAS #4272F)	5.0	2.5	5.0
MWAS037R1 (NAS #4273F)	<2.5	<2.5	2.5
MWRC213R1 (NAS #4274F)	5.0	2.5	2.5
MWRC214R1 (NAS #4275F)	12.5	7.5	2.5

Table 4 Sediment interstitial sulfide for sediments tested for 10 days with the amphipod *Rhepoxynius abronius*.

	Sulfide (mg/L)		
Sample Description	Day 0	Day 5	Day 10
Control (NAS #4286F)	<1.0	---	<0.5
MWAT042R1 (NAS #4231F)	<1.0	---	<0.5
MWAT045R1 (NAS #4232F)	<1.0	---	<0.5
MWAT044R1 (NAS #4233F)	<1.0	---	<0.5
MWAT047R1 (NAS #4234F)	<1.0	---	<0.5
MWAT153R1 (NAS #4235F)	<1.0	---	<0.5
MWAT041R1 (NAS #4245F)	<1.0	---	<0.5
MWAT046R1 (NAS #4246F)	<1.0	---	<0.5
MWAS034R1 (NAS #4272F)	<1.0	---	<0.5
MWAS037R1 (NAS #4273F)	<1.0	---	<0.5
MWRC213R1 (NAS #4274F)	1.75	---	<0.5
MWRC214R1 (NAS #4275F)	<1.0	---	<0.5

TEST PROTOCOL

AMPHIPOD, RHEPOXYNIUS ABRONIUS
10-DAY SOLID PHASE SEDIMENT BIOASSAY

1. INTRODUCTION

1.1 Purpose of Study: The purpose of this study is to identify marine test sediments that are toxic to a benthic marine amphipod.

1.2 Summary of Method: The 10-day static test is performed using adult amphipods obtained from a wild population by dredging. Test sediments are placed in the bottom of 1 liter glass beakers used as test vessels which are then filled with clean seawater. Five replicate containers for each test sediment, reference site sediment, and the collection site control sediment, each containing 20 test organisms, are employed. Mortality, emergence from the sediment during exposure, and failure to rebury in clean sediment after the test are the response criteria used. The mean ± S.D. for each treatment and test endpoint is given in the final report. Between-treatment comparisons may be made with Student's t-test, Wilcoxon's Two-Sample test, or Mann-Whitney U test, where each treatment is compared to the control or the reference sediment.

2. STUDY MANAGEMENT

2.1 Sponsor's Name and Address:

_____
_____
_____

2.2 Sponsor's Study Monitor:

_____

2.3 Name of Testing Laboratory:
Northwestern Aquatic Sciences
Yaquina Bay Road, P.O. Box 1437
Newport, OR 97365

2.4 Test Location: _____

2.5 Laboratory's Personnel to be Assigned to the Study:
Project Manager/Technical Director: _____
Qual. Assurance Officer: _____
Aquatic Biologist: _____
Aquatic Biologist: _____

2.6 Proposed Testing Schedule: Tests to begin within 14 days (8 weeks with samples under nitrogen for PSDDA) of sample collection. Reference toxicant test to be run concurrently.

2.7 Good Laboratory Practices: The test is conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

3. TEST MATERIAL

The test materials are marine sediments with interstitial water salinity of at least 25 ppt (at least 15 ppt for dredged material which is then salinity-adjusted). The collected sediments are placed in solvent and acid cleaned 1 L glass jars fitted with TFE-lined screw caps. The jars are filled completely so that there is no air space. At the laboratory, the samples may be stored at 4°C in the dark in the original sealed containers for up to 14 days (8

weeks with samples under nitrogen for PSDDA) prior to testing. A negative control sediment is from a clean site (the amphipod collection site), normally in Yaquina Bay, OR. In addition, a reference sediment, a clean sediment with physical characteristics similar to the test sediments, may also be employed as a control.

4. TEST WATER

Test water is filtered Yaquina Bay seawater adjusted to a salinity of 28 ppt. The water is pumped daily from Yaquina Bay into a 6000 gal seasoned fiberglass reservoir from which it is supplied under pump pressure to the laboratory. Filtration is accomplished using a sand filter followed by a medium porosity (10-25 um) cartridge filter, then a ≤0.45µm filter. An alternative seawater supply of similar quality may be used. Seawater should be held at ≤15°C for ≤2 days prior to test initiation.

5. TEST ORGANISMS

5.1 Species: Marine amphipod, Rhepoxynius abronius.

5.2. Source: Field collected from the lower portion of Yaquina Bay, OR in fine to medium size clean sand (mean grain size 0.16 mm) along the edge of the channel by short tows of a stainless steel biological dredge. Surface and bottom seawater salinity and temperature are measured at the collection site, and sediment temperature is recorded from the first and last dredge sample. The dredged sediments are sieved in the field using a 1.0 mm screen and the recovered amphipods, along with miscellaneous debris, are washed into plastic pails of fresh seawater and returned promptly to the laboratory. Alternatively, amphipods may be collected from Whidbey Island, WA.

5.3. Laboratory Handling: Pails containing the amphipods are placed in a laboratory seawater tray for temperature control and supplied with gentle aeration. As soon as possible after collection, amphipods and associated animals and detritus, are removed from the holding vessel using a fine mesh aquarium dip net and placed into pyrex glass sorting trays. The test organisms are picked from the detritus using a large bore eye dropper and 100 amphipods each are placed into small plastic freezer containers (9 cm x 9 cm x 6 cm) holding a 1 cm layer of clean sediment from the collection area. Freezer containers are immersed in a seawater tray provided with a continual flow of fresh seawater and held, under constant illumination for at least 2 days, but no longer than 10 days prior to the beginning of the test.

5.4 Age at Study Initiation: Adult

6. DESCRIPTION OF TEST SYSTEM

6.1 Test Chambers and Environmental Control: Test chambers used in the toxicity test are 1000 ml glass beakers. The beakers are covered with lids to minimize evaporation of volatile compounds. Test chambers are maintained at constant temperature by partial immersion in a temperature-controlled water bath or room. Minimal aeration (approx. 100 bubbles/min.) is supplied through a glass pipet with the tip placed not closer than 2 cm above the sediment surface. The test is performed under continuous illumination.

6.2 Cleaning: All laboratory glassware, including test chambers, is cleaned as described in EPA/600/4-90/027. New glassware and test systems are soaked 15 minutes in tap water and scrubbed with detergent (or cleaned in automatic dishwasher); rinsed twice with tap water; carefully rinsed once with fresh, dilute (10%, V:V) hydrochloric or nitric acid to remove scale, metals, and bases; rinsed twice with deionized water; rinsed once with acetone to remove organic compound (using a fume hood or canopy); and rinsed three times with deionized water. Test systems and chambers are rinsed again with dilution water just before use.

7. EXPERIMENTAL DESIGN AND TEST PROCEDURES

7.1 Experimental Design: An experimental design is used consisting of exposure of test organisms to a number of test sediments, one or more reference sediments, and to the collection site control sediment. Each treatment consists of five replicate test chambers each containing 20 animals. Blind, random testing is used.

7.2 Preparation of Test Sediments: Test sediments are checked to be sure that the interstitial salinities are ≥ 25 ppt. If interstitial salinities are satisfactory, the sediments may be used without further treatment. For estuarine dredged material designated for ocean disposal, interstitial water salinities below 25 ppt (15 to 24 ppt) may be adjusted as specified in the Puget Sound protocols. If the sediments are not dredged material for ocean disposal and the interstitial water salinities are <25 ppt, the Eohaustorius estuarius bioassay should be used.

Each test sediment is mixed thoroughly using a non-contaminating implement, then an aliquot (175 ml) sufficient to make a 2-cm-deep layer is added to each test beaker, and the surface is smoothed. Bubbles are removed from the sediment by gently tapping each beaker against the palm of the hand. The sediment layer in each beaker is temporarily covered with a circular disc of plastic sheeting to protect the sediment layer during addition of seawater. Seawater at the test temperature and salinity is carefully poured into the beaker to the 750 ml mark, and the disc is then gently removed. The beakers are then placed into the water bath and covered with watchglasses. Constant illumination is provided by overhead lights. Water in the test beakers is aerated without disturbing the sediments. The test system is then allowed to temperature equilibrate overnight.

7.3 Beginning the Test: Amphipods are wet sieved, using a 0.5 mm sieve, from the holding sediment and impartially distributed to a series of containers each holding 20 amphipods. Enough amphipods are counted out at a time to add animals to one replicate set (e.g. replicate 1 of all test sediments, controls, etc.). Once amphipods are added to a replicate, animals that do not burrow into the test sediment within a few minutes are removed and replaced with healthy amphipods. Animals are added sequentially to the remaining replicates in the same manner. Following addition of amphipods to the test chambers, additional water is added to achieve a final volume of 950 ml.

7.4 Effects Criteria: Effect criteria are 1) mortality after 10 days, 2) daily emergence of amphipods from the test sediments, and 3) failure of amphipods to rebury in sediment at the end of the exposure period (optional for PSEP; required for PSDDA). Death is defined as no visible appendage movement or response to tactile stimulation.

7.5 Test Conditions: Test containers are maintained at a constant 15 ± 1°C. The test salinity is 28 ± 1 ppt. The dissolved oxygen concentration in each test container must be greater than 5 mg/L throughout the 10-day test. Each beaker is supplied with oil-free compressed air provided at a rate of approximately 100 bubbles per minute through disposable glass pipettes positioned with their tips approximately 2 cm above the sediment surface. Each beaker is covered by a glass watchglass to minimize evaporation and the possibility of cross contamination between beakers. Because phoxocephalid amphipods are known to migrate into the water column for the purposes of reproduction and dispersion under dark conditions, the test is conducted under constant illumination.

7.6 Feeding: Animals are not fed at any time before or during the test.

7.7 Test Duration, Type and Frequency of Observations, and Methods: The duration of the sediment toxicity test is 10 days. The type and frequency of observations to be made are summarized as follows:

TYPE OF OBSERVATION	TIMES OF OBSERVATION
Biological Data	
Emergence from sediment	daily
Survival	end of test
Reburial (optional PSEP; required PSDDA)	end of test
Physical and Chemical Data	
Sediment interstitial salinity	at test beginning & end
Salinity, dissolved oxygen,	at test beginning & end

pH, and temperature of overlying water (in all beakers)	
Salinity, dissolved oxygen, pH, and temperature of overlying water (1 repl. only)	daily (days 1 through 9)
Ammonia and sulfides in overlying water (optional, 1 repl.)	at test beginning & end
Temperature (in separate control beaker)	daily
Check air and lights	daily

The presence of amphipods that have emerged from the sediments is recorded daily. Any other unusual observations are recorded. No amphipods are removed at any time until the termination of the test. The bioassay is terminated after 10 days of sediment exposure. Floating or dead amphipods are recorded after which the sediment is wet sieved through a 0.5 mm screen to recover buried amphipods. The number of surviving amphipods is recorded. If the reburial endpoint is to be evaluated, surviving amphipods from each beaker are transferred to dishes containing a 2-cm layer of control sediment and observed under constant illumination. The numbers of amphipods able to bury after a 1-hour exposure period are then recorded.

Dissolved oxygen is measured directly in test beakers using a polarographic oxygen probe calibrated in air-saturated freshwater. The pH is measured using a properly calibrated pH meter with scale divisions of 0.1 pH units. Temperature is measured using a calibrated mercury thermometer or a telethermometer. Salinity is measured using a refractometer. Ammonia-N is measured using the HACH Model FF-3 test kit (ammonia-N detection limit 0.1 mg/L). Sulfide is measured using the HACH Hydrogen Sulfide Test Kit Model HS-WR (sulfide detection limit 0.01 mg/L). Any observed changes in sediment color or the formation of a sediment discontinuity layer is also recorded.

7.8 Criteria of Test Acceptance: For the test to be considered acceptable, the minimum survival of organisms in the control treatment at the end of the test must be 90%. Also, mortality in the reference sediments must be ≤20% over the negative control (optional).

8. DATA ANALYSIS

The mean and standard deviation are calculated for each endpoint employed (e.g. mortality) and for each treatment (i.e. test sediment). Between treatment comparisons may be made using a Student's t-test, Wilcoxon's Two-Sample test, or Mann-Whitney U test, where each treatment is compared to the control or the reference sediment. An arcsine-square root transformation of proportional data, and tests for normality and heterogeneity of variances, are performed prior to statistical comparisons. An estimate of total effective mortality (optional) may also be calculated by summing percent mortality and percent failure to rebury.

9. REPORTING

A report of the test results must include the following information: name and identification of the test; the investigator and laboratory; sediment holding temperature data; information on the test sediment including the interstitial salinity for control, reference and test sediments; information on the source of seawater used; detailed information about the test organisms including acclimation conditions; a description of the experimental design and test chambers and other test conditions including water quality; information about any aeration that may have been required; definition of the effects criteria and other observations; unusual responses, if any, in the control treatment; daily emergence for each beaker and the 10-day mean and S.D. for each treatment; failure to rebury for each beaker and the mean and S.D. for each treatment; 10-day mortality and total effective mortality (optional) in each beaker and the mean and S.D. for each treatment; 96-hr LC50 with reference toxicant; a description of data analysis methods employed and documentation of statistical test results; any unusual information about the test or deviations from procedures.

10. STUDY DESIGN ALTERATION

Amendments made to the protocol must be approved by the sponsor and study director and should include a description of the change, the reason for the change, the date the change took effect, and the dated signatures of the study director and sponsor. Any deviations in the protocol must be described and recorded in the study raw data.

11. REFERENCED PROCEDURES

ASTM. 1992. Standard guide for conducting 10-day sediment toxicity tests with marine and estuarine amphipods. ASTM Standard Method No. E 1367-92. Am. Soc. Test. Mat., Philadelphia, PA.

Puget Sound Dredged Disposal Analysis (PSDDA). 1989. Management plan report - unconfined open-water disposal of dredged material, Phase II - (north and south Puget Sound). Puget Sound Dredged Disposal Analysis, Army Corps of Engineers, Seattle, WA.

Puget Sound Estuary Program. 1995. Recommended guidelines for conducting laboratory bioassays on Puget Sound sediments. Prepared for U.S. Env. Prot. Agency, Region 10, Office of Puget Sound, Seattle, WA and Puget Sound Water Quality Authority, P.O. Box 40900, Olympia, WA.

Snedecor, G.W. and W.G. Cochran. 1967. Statistical methods. Sixth Ed., The Iowa State Univ. Press. Ames, Iowa., 593 pp.

Weber, C.I. (Ed.) 1991. Methods for measuring the acute toxicity of effluents to freshwater and marine organisms (Fourth Edition). EPA/600/4-90/027.

12. APPROVALS

_____ for _____
Name Date

_____ for **NORTHWESTERN AQUATIC SCIENCES**
Name Date

APPENDIX II

RAW DATA

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-RA-

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster-Wheeler Investigator reviewed MLR pg. 1-~~103~~ 102 MLR 12-9-99

STUDY MANAGEMENT

Client: Foster Wheeler Environmental, 10900 NE 8th St., Suite 1300, Bellevue, WA 98004

Client's Study Monitor: Mr. Gary Braun

Testing Laboratory: Northwestern Aquatic Sciences

Test Location: Newport Laboratory

Laboratory's Study Personnel:

Proj. Man./Study Dir. M.S. Redmond MLR

QA Officer L.K. Nemeth

1. Erin Coffey 2. G.J. IRISSARRI GJI

3. Geoffrey Hayes GH 4. Robert Singleton RWS

Study Schedule:

Test Beginning: 10-5-99 16:30 Test Ending: 10-15-99 1115

TEST MATERIAL

General description (see sample logbook/chain-of-custody for details):

NAS Sample No.:	4231F	4232F	4233F	4234F	4235F
Description:	MWAT042R1	MWAT045R1	MWAT044R1	MWAT047R1	MWAT153R1
Collection Date:	9-21-99	9-21-99	9-22-99	9-22-99	9-22-99
Receipt Date:	9-23-99	9-23-99	9-23-99	9-23-99	9-23-99
Inters.Salinity (ppm):	24.5	24.0	27.0	27.0	27.5

NAS Sample No.:	4245F	4246F	4272F	4273F	4274F
Description:	MWAT041R1	MWAT046R1	MWAS034R1	MWAS037R1	MWRC213R1
Collection Date:	9-23-99	9-23-99	9-27-99	9-27-99	9-27-99
Receipt Date:	9-25-99	9-25-99	9-29-99	9-29-99	9-29-99
Inters.Salinity (ppm):	21.0	28.5	30.5	29.5	29.5

NAS Sample No.:	4275F	4286F			
Description:	MWRC214R1	control			
Collection Date:	9-27-99	9-29-99			
Receipt Date:	9-29-99	10-1-99			
Inters.Salinity (ppm):	30.0	30.0			

NAS Sample No.:					
Description:					
Collection Date:					
Receipt Date:					
Inters.Salinity (ppm):					

NAS Sample No.:					
Description:					
Collection Date:					
Receipt Date:					
Inters.Salinity (ppm):					

Revised 12-30-92

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-RA4
MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster - Wheeler Investigator

SEDIMENT DESCRIPTIONS--SUPLEMENTAL NOTES

Sample No.	Description
4286F	Gray course sand; sieved through 0.5mm screen.
~~4287F~~	~~Gray course sand~~ not used in this test MSR 10-6-99
4232F	dark brown sandy mud
4231F	DARK GRAY, FINE, WOOD PIECES AND PLANT DEBRIS
4233F	Dark brown sandy mud
4245F	Dark brown sandy mud
4235F	dark brown sandy mud
4234F	DARK GRAY GREEN FINE MUD + FINE SAND
4272F	Dark gray/light black, fine mud
4246F	dark brown mud
4273F	DARK GRAY, FINE MUD
4274F	Dark brown sandy mud
4275F	light brown sandy mud

Samples 4272F, 4273F, 4274F, 4275F were placed under nitrogen upon receipt. Samples 4232F, 4231F, 4233F, 4245F, 4235F, 4234F and 4246F were placed under nitrogen on 9-29-99 MSR

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-RA4
MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator _____

TEST ORGANISMS

Species: Rhepoxynius abronius Date Collected: 9-29-99
Source: collected West Beach, Whidbey Island, WA (Doug Henderson)
Field Conditions (interstitial) When Collected: Temp 12°C Salinity –
Acclimation Data:

Date	Temp (°C)	DO (mg/L)	pH	Sal (ppt)	Comments
10-1-99	13.3	4.8	7.2	30.5	receiving water
10-3-99	15.4	6.2	7.9	30.5	
10-4-99	15.8	7.6	7.9	30.0	
10-5-99	15.9	8.0	7.9	28.5	
Mean	15.1	6.6	7.7	29.9	
S.D.	1.2	1.5	0.4	0.9	
(N)	4	4	4	4	

TEST PROCEDURES AND CONDITIONS

Test chambers: 1 L glass beakers covered w/ watchglasses
Test volumes: 175 ml of test sediment; ~~1000~~ 950 ml total volume MLR 10-5-99
Replicates/treatment: (5) 5 * Organisms/treatment: (100) 100 MLR 10-5-99
Test water changes: None Aeration: Yes, ~~3 cm below water surface~~ at least 2cm above sediment surface
Feeding: None
Beaker placement: Total randomization

MISCELLANEOUS NOTES

* Three additional replicates were included for water quality purposes as follows:

(1) a replicate w/o animals, sacrificed on day 0 for interstitial ammonia and sulfide measurements

(2) a replicate w/ animals, sacrificed on day 5 for interstitial ammonia and sulfide measurements

(3) a replicate w/ animals, used for daily overlying water quality measurements and sacrificed at test termination for interstitial ~~and~~ ammonia and sulfide measurements.

Salinity adjustment of interstitial water performed as per PSEP 1995 as required RZ 10/5/99

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator _____

Control Sediment: 0.5-mm sieved sand from West Beach, Whidbey Island, WA; received w/ test organisms shipment 10-1-99 NAS #4286P.

Randomization chart:

1	3	6						93	96
2	2	5	→	→	→	→	→	92	95
3	1	4						91	94
4									
5									

Trailer NORTH SIDE upper Shelf

Randomization chart:

1									
2									
3									
4									
5									

Randomization chart:

1									
2									
3									
4									
5									

TEST WATER

Source: Yaquina Bay, Oregon sea water

Date of Collection: 10-4-99 Salinity (ppt) 28.0 pH -

Treatments: filtered to ≤0.40 µm, salinity-adjusted w/ Milli-Q deionized water, aerated.

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator ____________

DAILY RECORD SHEET

Day 0 (10/5/99) M/GOH Temperature beaker 16.5 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
1	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	OK	
2									
3									
4	/////	/////	/////	/////	/////	/////	/////		
5									
6									
* 7	16.1	8.0	28.0	7.8	<0.02				
8									
9									
10	/////	/////	/////	/////	/////	/////	/////		
11									
12									
* 13	16.2	8.0	28.0	7.8	<0.02				
14									
15									
16									
17									
18									
19									
20	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
21									
* 22	16.1	8.0	28.0	7.8	<0.02				
* 23	16.0	8.0	28.0	7.6	<0.02				
* 24	16.0	8.0	28.0	7.9	<0.02				
25									
26	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
27									
28	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
29									
30									
31									
32									
33									
34									
35									
36									
37	/////	/////	/////	/////	/////	/////	/////		
38									
39									
40									
41									
42	/////	/////	/////	/////	/////	/////	/////		
43	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
44									
45	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
46									
* 47	15.7	8.0	28.0	7.8	<0.02				

* water quality beakers XXX day 5 sacrificial beakers

///// day 0 sacrificial beakers

Revised 12-30-92

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator _____

DAILY RECORD SHEET

Day Ø (10/5/99) [illegible] Temperature beaker 1 GWI 16.5 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
* 48	15.7	8.0	28.5	7.9	<0.02			OK	
49									
50									
51									
52	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXXX		
53									
54									
55									
56									
57									
58									
59	////	////	////	////	////	////	////		
60									
61									
* 62	15.6	8.0	28.0	7.9	<0.02				
63									
64	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
65									
66									
67									
68									
69	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
70									
71	////	////	////	////	////	////	////		
72									
73									
74									
* 75	15.5	8.0	28.0	7.8	<0.02				
76	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
77									
* 78	15.5	7.9	28.0	7.9	<0.02				
79	////	////	////	////	////	////	////		
80									
81									
82	////	////	////	////	////	////	////		
83									
84	////	////	////	////	////	////	////		
85									
86									
87									
88	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
89									
* 90	15.5	8.0	28.0	7.8	<0.02				
91	////	////	////	////	////	////	////		
92									
* 93	15.6	8.1	28.0	8.0	<0.02				
94	////	////	////	////	////	////	////		
95	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
96	////	////	////	////	////	////	////		

* water quality beakers xxxx day 5 sacrificial beakers

//// day Ø sacrificial beakers

Revised 12-30-92

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator _____

DAILY RECORD SHEET

Day 1 (10/6 PM) [illegible] Temperature beaker 16.1 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
1	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXXXX	OK	
2							0		
3							0		
4	//////	//////	//////	//////	//////	//////	//////		
5							0		
6							0		
* 7	15.9	8.0	28.0	8.2			0		
8							0		
9							0		
10	//////	//////	//////	//////	//////	//////	//////		
11							3		
12							0		
* 13	16.1	8.1	28.0	8.1			0		
14							0		
15							0		
16							1		
17							0		
18							0		
19							0		
20	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXXXX		
21							0		
* 22	15.9	8.0	28.0	8.1			1		
* 23	16.0	8.1	28.0	8.1			0		
* 24	15.9	8.0	28.5	8.1			0		
25							1		
26	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXXXX		
27							0		
28	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXXXX		
29							0		
30							0		
31							0		
32							0		
33							0		
34							0		
35							0		
36							0		
37	//////	//////	//////	//////	//////	//////	//////		
38							0		
39							0		
40							0		
41							1		
42	//////	//////	//////	//////	//////	//////	//////		
43	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXXXX		
44							0		
45	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXXXX		
46							1		
* 47	15.8	8.1	29.0	8.1			1		

* water quality beakers XXX day 5 sacrificial beakers

///// day Ø sacrificial beakers

Revised 12-30-92

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator ________

DAILY RECORD SHEET

Day 1 (10/6/99) [illegible] Temperature beaker 16.1 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments	Marking
* 48	15.9	8.1	29.0	8.1			1	OK		
49							1			
50							0			
51							0			
52										XXX
53							0			
54							0			
55							0			
56							1			
57							0			
58							0			
59										////
60							0			
61							0			
* 62	15.8	8.0	28.0	8.1			0			
63							2			
64										XXX
65							0			
66							0			
67							0			
68							0			
69										XXX
70							1			
71										////
72							0			
73							0			
74							0			
* 75	15.7	8.1	28.5	8.0			0			
76										XXX
77							0			
* 78	15.8	8.1	28.5	8.1			0			
79										////
80							0			
81							0			
82										////
83							0			
84										////
85							0			
86							0			
87							0			
88										XXX
89							1			
* 90	15.7	8.2	27.5	8.1			0			
91										////
92							0			
* 93	15.8	8.2	28.0	8.2			0			
94										////
95										XXX
96								↓		////

* water quality beakers xxx day 5 sacrificial beakers

//// day Ø sacrificial beakers

Revised 12-30-92

NORTHWESTERN AQUATIC SCIENCES — PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator

DAILY RECORD SHEET

Day 2 (10/7/99) RMS/GH Temperature beaker 16.5 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
1	XXX	XXX	XXX	XXX	XXX	XXX	XXX	OK	
2							0		
3							0		
4	///	///	///	///	///	///	///		
5							1		
6							0		
* 7	16.1	8.3	28.0 28.5	8.3			0		
8							2		
9							0		
10	///	///	///	///	///	///	///		
11							0		
12							0		
* 13	16.2	8.4	28.0	8.3			0		
14							1		
15							0		
16							1		
17							2		
18							0		
19							2		
20	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
21			28.5 @6				0		
* 22	16.1	8.3	29.0	8.3			0		
* 23	16.1	8.3	29.0	8.3			0		
* 24	16.1	8.4	29.0	8.3			0		
25							1		
26	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
27							0		
28	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
29							0		
30							0		
31							0		
32							3		
33							0		
34							2		
35							0		
36							0		
37	///	///	///	///	///	///	///		
38							0		
39							0		
40							0		
41							1		
42	///	///	///	///	///	///	///		
43	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
44							0		
45	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
46							3		
* 47	15.9	8.3	28.5	8.4			1	↓	

* water quality beakers XXX day 5 sacrificial beakers

/// day 0 sacrificial beakers

Revised 12-30-92

NORTHWESTERN AQUATIC SCIENCES — PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator

DAILY RECORD SHEET

Day 2 (6/7/99) RMS/[illegible] Temperature beaker 16.5 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
* 48	16.0	8.3	29.0	8.2			0	OK	
49							1		
50							0		
51							0		
52	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
53							0		
54							0		
55							0		
56							1		
57							0		
58							1		
59	////	////	////	////	////	////	////		
60							0		
61							0		
* 62	15.8	8.3	29.0	8.3			0		
63							2		
64	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
65							0		
66							1		
67							0		
68							0		
69	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
70							0		
71	////	////	////	////	////	////	////		
72							0		
73							0		
74							1		
* 75	15.7	8.4	29.0	8.2			0		
76	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
77							0		
* 78	15.7	8.3	28.5	8.2			0		
79	////	////	////	////	////	////	////		
80							0		
81							0		
82	////	////	////	////	////	////	////		
83							1		
84	////	////	////	////	////	////	////		
85							0		
86							1		
87							0		
88	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
89							0		
* 90	15.8	8.4	28.0	8.2			0		
91	////	////	////	////	////	////	////		
92							0		
* 93	15.8	8.3	28.0	8.3			0		
94	////	////	////	////	////	////	////		
95	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
96	////	////	////	////	////	////	////		

* water quality beakers
//// day 0 sacrificial beakers
xxxx day 5 sacrificial beakers.

Revised 12-30-92

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator

DAILY RECORD SHEET

Day ~~2~~ 3 (10/~~7~~ 8/99) RMS/2/GOH Temperature beaker 16.5 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
1								OK	
2							0		
3							0		
4									
5							0		
6							0		
* 7	16.2	7.9	~~30.0~~ 29.5	8.1			0		adj w/ MilliQ to 28.0
8			29.5				1		adj w/ MilliQ to 28.0
9							0		
10									
11							1		
12			28.0				1		
* 13	16.3	8.0	~~29.5~~	8.1			0		
14			~~28.0~~ 29.0				0		
15							0		
16							0		
17							0		
18							0		
19							1		
20									
21			29.5				0		adj w/ MilliQ to 28.0
* 22	16.3	8.0	28.5	8.1			0		
* 23	16.1	8.0	28.5	8.1			0		
* 24	16.1	8.0	28.5	8.1			0		
25							0		
26									
27							0		
28									
29			30.0				0		adj w/ MilliQ to 28.0
30							0		
31							0		
32			29.5				0		adj. w/ MilliQ to 28.0
33							0		
34			29.5				1		adj. w/ MilliQ to 28.0
35							1		
36							0		
37									
38							0		
39							0		
40							0		~~adj~~
41			29.5				1		adj. w/ MilliQ to 28.0
42									
43									
44							0		
45									
46							RMS 3		
* 47	16.0	8.0	28.5	8.1			2		

* water quality beakers XXX day 5 sacrificial beakers

//// day Ø sacrificial beakers

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NORTHWESTERN AQUATIC SCIENCES — PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator ____________

DAILY RECORD SHEET

Day 3 (10/18/99) RWS / ~ /1006 — Temperature beaker 16.5 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
* 48	15.9	8.0	29.0	8.1			0	ok	
49							0		
50			30.0				0		adj. w/MilliQ to 28.0
51							0		
52	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
53							0		
54							0		
55			30.0				0		adj. w/MilliQ to 28.0
56							1		
57							1		
58							2		
59	////	////	////	////	////	////	////		
60							0		
61							0		
* 62	15.8	8.0	29.5	8.1			0		adj. w MilliQ to 28.0
63							2		
64	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
65							0		
66							2		
67							1		
68			30.5				0		adj. w/MilliQ to 28.0
69	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
70							1		
71	////	////	////	////	////	////	////		
72							0		
73			29.5				0		adj. w/MilliQ to 28.0
74							1		
* 75	15.9	8.0	29.0	8.0			1		
76	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
77							0		
* 78	15.8	8.0	29.5	8.1			1		adj. w MilliQ to 28.0
79	////	////	////	////	////	////	////		
80							0		
81							0		
82	////	////	////	////	////	////	////		
83			29.5				0		adj. w/MilliQ to 28.0
84	////	////	////	////	////	////	////		
85			30.0				0		adj. w/MilliQ to 28.0
86							0		
87							1		
88	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
89			29.5				1		adj. w MilliQ to 28.0
* 90	15.8	8.1	29.0	8.1			0		
91	////	////	////	////	////	////	////		
92			29.5				1		adj. w/MilliQ to 28.0
* 93	15.8	8.1	28.5	8.2			0		
94	////	////	////	////	////	////	////		
95	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
96	////	////	////	////	////	////	////		

* water quality beakers — XXXX day 5 sacrificial beakers

//// day Φ sacrificial beakers

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MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator ____________

DAILY RECORD SHEET

Day 4 (10/9/99) RMS Temperature beaker 17.0 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
1	XXX	XXX	XXX	XXX	XXX	XXX	XXX	ok	
2							0		
3							0		
4	////	////	////	////	////	////	////		
5							0		
6							0		
* 7	16.0	8.1	28.0	8.0			0		
8							3		
9							0		
10	////	////	////	////	////	////	////		
11							1		
12							0		
* 13	16.0	8.1	29.0	8.0			1		
14							0		
15							0		
16							0		
17							0		
18							0		
19							1		
20	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
21							0		
* 22	16.1	8.0	28.5	8.0			0		
* 23	15.9	8.0	29.0	8.0			0		
* 24	15.9	8.0	28.5	8.0			0		
25							1		
26	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
27							0		
28	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
29							0		
30							0		
31							0		
32							1		
33							0		
34							0		
35							0		
36							0		
37	////	////	////	////	////	////	////		
38							0		
39							1		
40							0		
41							1		
42	////	////	////	////	////	////	////		
43	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
44							0		
45	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
46							2 3		
* 47	15.6	8.1	28.0	8.0			1		

* water quality beakers XXX day 5 sacrificial beakers

//// day 0 sacrificial beakers

Revised 12-30-92

NORTHWESTERN AQUATIC SCIENCES　　　　PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator ____________

DAILY RECORD SHEET

Day 4 (10/9/99) kms　　　　Temperature beaker 17.0 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
* 48	15.7	8.1	28.0	8.0			1	OK	
49							0		
50							0		
51							0		
52	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
53							1		
54							0		
55							0		
56							0		
57							0		
58							0		
59	////	////	////	////	////	////	////		
60							2		
61							0		
* 62	15.7	8.1	28.0	8.0			0		
63							0		
64	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
65							0		
66							1		
67							2		
68							0		
69	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
70							4		
71	////	////	////	////	////	////	////		
72							1		
73							2		
74							0		
* 75	15.7	8.0	28.0	7.9			0		
76	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
77							0		
* 78	~~17.9~~ 15.6	8.0	27.5	7.9			1		
79	////	////	////	////	////	////	////		
80							0		
81							0		
82	////	////	////	////	////	////	////		
83							0		
84	////	////	////	////	////	////	////		
85							0		
86							3		
87							4		
88	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
89							0		
* 90	15.6	8.1	28.0	7.9			1		
91	////	////	////	////	////	////	////		
92							1		
* 93	15.6	8.0	28.0	8.1			0		
94	////	////	////	////	////	////	////		
95	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
96	////	////	////	////	////	////	////	↓	

* water quality beakers　　　　xxx day 5 sacrificial beakers

//// day Φ sacrificial beakers

　　　　Revised 12-30-92

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator _____

DAILY RECORD SHEET

Day 5 (10/10 PM) Rms Temperature beaker 17.0 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
1	XXX	XXX	XXX	XXX	XXX	XXX	XXX	OK	
2							0		
3							0		
4	///	///	///	///	///	///	///		
5							0		
6							0		
* 7	15.8	8.1	28.5	7.4			0		
8							1		
9							2		
10	///	///	///	///	///	///	///		
11							0		
12							0		
* 13	15.8	8.1	28.0	7.8			0		
14							0		
15							1		
16							0		
17							0		
18							0		
19							1		
20	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
21							0		
* 22	15.9	8.1	28.5	7.8			1		
* 23	15.8	8.1	28.5	7.8			0		
* 24	15.7	8.2	29.0	7.9			0		
25							1		
26	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
27							0		
28	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
29							0		
30							0		
31							1		
32							2		
33							1		
34							1		
35							0		
36							0		
37	///	///	///	///	///	///	///		
38							0		
39							0		
40							0		
41							1		
42	///	///	///	///	///	///	///		
43	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
44							0		
45	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
46							3		
* 47	15.7	8.1	28.0	7.9			4	V	

* water quality beakers XXX day 5 sacrificial beakers

/// day 0 sacrificial beakers

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator ____________

DAILY RECORD SHEET

Day 5 (10/10/99) [illegible] Temperature beaker 17.0 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
* 48	15.7	8.2	28.5	8.0			0	OK	
49							1		
50							0		
51							0		
52	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
53							2		
54							0		
55							0		
56							0		
57							0		
58							0		
59	////	////	////	////	////	////	////		
60							0		
61							0		
* 62	15.5	8.1	27.5	7.9			0		
63							2		
64	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
65							0		
66							0		
67							3		
68			29.0				0		
69	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
70							2		
71	////	////	////	////	////	////	////		
72							1		
73							0		
74							0		
* 75	15.6	8.2	28.0	7.9			1		
76	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
77							1		
* 78	15.6	8.2	28.0	7.9			0		
79	////	////	////	////	////	////	////		
80							0		
81							0		
82	////	////	////	////	////	////	////		
83							2		
84	////	////	////	////	////	////	////		
85							0		
86							3		
87							2		
88	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
89							0		
* 90	15.5	8.1	28.0	8.0			2		
91	////	////	////	////	////	////	////		
92							1		
* 93	15.5	8.1	28.0	8.0			0		
94	////	////	////	////	////	////	////		
95	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
96	////	////	////	////	////	////	////		

* water quality beakers XXXX day 5 sacrificial beakers.

//// day Ø sacrificial beakers

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NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator ____________

DAILY RECORD SHEET

Day 6 (10/11/1991) Temperature beaker 16.1 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
1	XXX							OK	
2							0		
3							0		
4	////								
5							1		
6							1		
* 7	16.0	7.8	29.0	8.3			0		
8							2		
9							3		
10	////								
11							0		
12							1		
* 13	16.1	7.8	28.5	8.3			0		
14							1		
15							3		
16							0		
17							1		
18							0		
19							2		
20	XXX								
21							1		
* 22	16.1	7.8	29.0	8.3			0		
* 23	16.1	7.9	29.0	8.2			0		
* 24	16.0	7.8	29.0	8.3			0		
25							1		
26	XXX								
27							1		
28	XXX								
29							0		
30							0		
31							1		
32							3		
33							0		
34							2		
35							0		
36							0		
37	////								
38							0		
39							0		
40							1		
41							2		
42	////								
43	XXX								
44							0		
45	XXX								
46							3		
* 47	16.0	8.0	29.0	8.3			2		

* water quality beakers XXX day 5 sacrificial beakers

//// day 0 sacrificial beakers

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NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator ______

DAILY RECORD SHEET

Day 6 (10/11 1999) [illegible]

Temperature beaker 16.1 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
* 48	16.0	7.8	29.0	8.4			1	OK	
49							1		
50							0		
51							0		
52	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
53							4		
54							0		
55							0		
56							2		
57							0		
58							1		
59	////	////	////	////	////	////	////		
60							2		
61							0		
* 62	16.0	7.8	28.5	8.2			0		
63							1		
64	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
65							0		
66							2		
67							4		
68							0		
69	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
70							2		
71	////	////	////	////	////	////	////		
72							3		
73							0		
74							1		
* 75	15.9	7.8	29.0	8.2			2		
76	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
77							1		
* 78	15.9	7.8	28.0	8.1			1		
79	////	////	////	////	////	////	////		
80							0		
81							0		
82	////	////	////	////	////	////	////		
83							2		
84	////	////	////	////	////	////	////		
85							0		
86							2		
87							0		
88	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
89							0		
* 90	15.9	7.9	28.0	8.1			1		
91	////	////	////	////	////	////	////		
92							1		
* 93	15.9	7.8	28.5	8.3			0		
94	////	////	////	////	////	////	////		
95	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
96	////	////	////	////	////	////	////		

* water quality beakers

XXX day 5 sacrificial beakers

//// day Ø sacrificial beakers

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NORTHWESTERN AQUATIC SCIENCES — PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator

DAILY RECORD SHEET

Day 6 (10/17/99 12 EST/PWS) Temperature beaker 16.0 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
1	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	OK	
2							0		
3							0		
4	////	////	////	////	////	////	////		
5							1		
6							0		
* 7	15.7	8.1	29.0	8.1			0		
8							0		
9							0		
10	////	////	////	////	////	////	////		
11							0		
12							0		
* 13	15.8	8.2	29.0	8.1			2		
14							1		
15							1		
16									
17							1		
18							0		
19							3		
20	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
21							1		
* 22	15.9	8.2	28.5	8.1			0		
* 23	15.9	8.2	28.5	8.1			0		
* 24	15.9	8.2	28.0	8.2			0		
25							4		
26	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
27							0		
28	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
29							0		
30							0		
31							1		
32							3		
33							0		
34							2		
35							0		
36							0		
37	////	////	////	////	////	////	////		
38							0		
39							0		
40							0		
41							3		
42	////	////	////	////	////	////	////		
43	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
44							0		
45	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
46							2		
* 47	15.8	8.1	28.0	8.2			1	V	

* water quality beakers

XXX day 5 sacrificial beakers

//// day 0 sacrificial beakers

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator _____

DAILY RECORD SHEET

Day 7 (10/12/95) RWS/GRG Temperature beaker 16.0 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
* 48	15.8	8.1	28.5	8.4			1	OK	
49							1		
50							0		
51							0		
52	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
53							0		
54							0		
55							0		
56							0		
57							0		
58							2		
59	////	////	////	////	////	////	////		
60							1		
61							0		
* 62	15.7	8.0	27.5	8.1			0		
63							1		
64	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
65							0		
66							1		
67							2		
68							0		
69	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
70							2		
71	////	////	////	////	////	////	////		
72							0		
73							0		
74							0		
* 75	15.7	8.1	28.0	8.1			1		
76	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
77							1		
* 78	15.6	8.0	27.5	8.0			2		
79	////	////	////	////	////	////	////		
80							0		
81							0		
82	////	////	////	////	////	////	////		
83							2		
84	////	////	////	////	////	////	////		
85							0		
86							1		
87							1		
88	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
89							1		
* 90	15.7	8.2	28.0	8.1			1		
91	////	////	////	////	////	////	////		
92							1		
* 93	15.6	8.2	28.0	8.2			0		
94	////	////	////	////	////	////	////		
95	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
96	////	////	////	////	////	////	////		

* water quality beakers

//// day 0 sacrificial beakers

XXXX day 5 sacrificial beakers.

Revised 12-30-92

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator ____________

DAILY RECORD SHEET

Day 8 10/13/99 RWS/[illegible] Temperature beaker 17.0 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
1	XXX	XXX	XXX	XXX	XXX	XXX	XXX	ok	
2			32.0				1		adj. w milli Q to 28.0
3			30.0				0		adj. w milli Q to 28.0
4	////	////	////	////	////	////	////		
5			30.5				3		adj. w milli Q to 27.5
6			31.0				2		adj. w milli Q to 28.0
* 7	16.1	7.8	29.5	8.3			0		adj. w milli Q to 28.0
8			30.0				1		adj. w milli Q to 27.5
9			30.5				2		adj. w milli Q to 28.0
10	////	////	////	////	////	////	////		
11			29.0				3		
12			30.0				2		adj. w milli Q to 28.5
* 13	16.3	8.0	29.5	8.3			1		adj. w milli Q to 28.5
14			29.5				1		adj. w milli Q to 28.0
15			30.0				2		adj. w milli Q to 28.0
16			31.0				~~0~~ 3 RWS		adj. w milli Q to 28.0
17			30.0				3		adj. w milli Q to 28.0
18			30.0				1		adj. w milli Q to 28.0
19			29.0				1		
20	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
21			29.0				1		
* 22	16.2	8.1	30.0	8.3			0		adj. w milli Q to 28.0
* 23	16.2	8.1	30.0	8.2			0		adj. w milli Q to 27.5
* 24	16.2	8.1	30.0	8.5			0		adj. w milli Q to 27.5
25			30.0				3		adj. w milli Q to 27.5
26	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
27			30.0				1		adj. w milli Q to 27.5
28	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
29			29.0				0		
30			29.0				0		
31			31.0				1		adj. w milli Q to 27.5
32			30.0				4		adj. w milli Q to 28.0
33			30.0				0		adj. w milli Q to 27.5
34			30.0				1		adj. w milli Q to 27.5
35			30.0				1		adj. w milli Q to 27.5
36			31.0				0		adj. w milli Q to 27.5
37	////	////	////	////	////	////	////		
38			30.5				0		Fly in beaker Removed adj. w Milli Q to 28.0
39			30.5				0		adj. w milli Q to 27.5
40			31.0				2		Fly in beaker removed adj. w milli Q to 27.5
41			29.5				5		adj. w milli Q to 27.5 Fly in beaker removed
42	////	////	////	////	////	////	////		
43	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
44			30.5				0		adj. w milli Q to 28.0 ~~Fly~~ [illegible]
45	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
46			30.5				3		adj. w/milli Q to 27.5
* 47	16.1	8.1 ~~20.5~~	29.5	8.3			1	↓	adj. w/milli Q to 27.5

* water quality beakers XXX day 5 sacrificial beakers

//// day 0 sacrificial beakers

Revised 12-30-92

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator ______

DAILY RECORD SHEET

Day 8 (10/13/99) n/RNS/[illegible] Temperature beaker 17.0 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
* 48	16.1	8.1	30.0	8.6			0	OK	adj. w milli Q to 28.0
49			29.5				2		adj. w milli Q to 28.0
50			29.0				0		
51			29.0				0		
52	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
53			30.5				0		adj. w milli Q to 28.0
54			30.0				0		adj. w milli Q to 27.0
55			30.0				0		adj. w milli Q to 28.5
56			30.0				2		adj. w milli Q to 28.0
57			30.0				3		adj. w milli Q to 27.5
58			30.5				4		adj. w milli Q to 28.5
59	////	////	////	////	////	////	////		
60			30.0				1		adj. w milli Q to 28.5
61			31.0				0		adj. w milli Q to 29.5
* 62	~~16.~~ 15.9	8.1	30.0	8.2			0		adj. w milli Q to 28.0
63			30.5				3		adj. w milli Q to 28.0
64	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
65			30.0				0		adj. w milli Q to 28.0
66			30.5				0		adj. w/ milli Q to 28.0
67			30.0				3		adj. w milli Q to 27.5
68			29.5				0		adj. w milli Q to 28.5
69	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
70			30.5				4		adj. w milli Q to 28.0
71	////	////	////	////	////	////	////		
72			30.0				1		adj. w milli Q to 28.0 [illegible]
73			29.0				0	off	Air - Reestablished ~~adj. w milli Q to~~
74			29.0				1	ok	
* 75	15.9	8.2	30.0	8.2			1		adj. w/ milli Q to 28.0
76	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
77			30.0				2		adj. w milli Q to 28.0
* 78	15.8	8.1	29.0	8.1			6		
79	////	////	////	////	////	////	////		
80			31.0				0		adj. w milli Q to 28.0
81			30.0				1		adj. w milli Q to 28.0
82	////	////	////	////	////	////	////		
83			28.5				2		
84	////	////	////	////	////	////	////		
85			28.0				0		
86			28.0				3		
87			29.5				0		adj. w milli Q to 27.5
88	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
89			28.5				1		
* 90	15.9	8.2	29.5	8.2			2		adj. w milli Q to 28.0
91	////	////	////	////	////	////	////		
92			28.0				1		
* 93	15.8	8.2	29.5	8.3			0		adj. w milli Q to 28.0
94	////	////	////	////	////	////	////		
95	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
96	////	////	////	////	////	////	////		

* water quality beakers

xxx day 5 sacrificial beakers

//// day Ø sacrificial beakers

Revised 12-30-92

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator

DAILY RECORD SHEET

Day 9 (10/14/99) Temperature beaker 16.0 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
1	XXX	XXX	XXX	XXX	XXX	XXX	XXX	OK	
2							0		
3							0		
4	/////	/////	/////	/////	/////	/////	/////		
5							0		
6							3		
* 7	15.5	8.0	28.0	8.3			0		
8							1		
9							3		
10	/////	/////	/////	/////	/////	/////	/////		
11							2		
12							1		
* 13	15.7	8.1	28.0	8.3			3		
14							0		
15							1		
16							1		
17							1		
18							2		
19							3		
20	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
21							2		
* 22	15.8	8.0	28.0	8.3			1		
* 23	15.7	8.0	28.5	8.2			0		
* 24	15.7	8.0	28.5	8.5			0		
25							2		
26	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
27							0		
28	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
29							0		
30							0		
31							0		
32							2		
33							0		
34							1		
35							1		
36							0		
37	/////	/////	/////	/////	/////	/////	/////		
38							0		
39							0		
40							1		
41							2		
42	/////	/////	/////	/////	/////	/////	/////		
43	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
44							1		
45	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
46							1		
* 47	15.6	8.0	28.5	8.3			1		

* water quality beakers

XXX day 5 sacrificial beakers

///// day 0 sacrificial beakers

NORTHWESTERN AQUATIC SCIENCES — PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator _____

DAILY RECORD SHEET

Day 9 (10/14/99) n / [illegible] Temperature beaker 16.0 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
* 48	15.7	8.0	28.5	8.6			1	OK	
49							0		
50							0		
51							0		
52	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
53							2		
54							2		
55							0		
56							4		
57							1		
58							3		
59	////	////	////	////	////	////	////		
60							1		
61							0		
* 62	15.6	8.0	28.0	8.2			0		
63							3		
64	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
65							0		
66							3		
67							1		
68							0		
69	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
70							4		
71	////	////	////	////	////	////	////		
72							2		
73							1		
74							2		dead fly removed
* 75	15.6	8.0	28.0	8.2			0		
76	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
77							1		
* 78	15.6	7.9	28.0	8.1			5		
79	////	////	////	////	////	////	////		
80							1		
81							0		
82	////	////	////	////	////	////	////		
83							3		
84	////	////	////	////	////	////	////		
85							0		
86							2		
87							0		
88	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
89							2		
* 90	15.6	8.0	28.0	8.1			1		
91	////	////	////	////	////	////	////		
92							1		
* 93	15.6	8.0	28.0	8.2			0		
94	////	////	////	////	////	////	////		
95	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		
96	////	////	////	////	////	////	////		

* water quality beakers
//// day 0 sacrificial beakers
XXXX day 5 sacrificial beakers.

Revised 12-30-92

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator _____

DAILY RECORD SHEET

Day 10 (10/15/99) ~1600 Temperature beaker 15.4 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
1	XXX	XXX	XXX	XXX	XXX	XXX	XXX	OK	
2							0		
3							0		
4	///	///	///	///	///	///	///		
5							1		
6							1		
* 7	15.3	8.1	29.0	8.3	<0.02		0		
8							3		
9							0		
10	///	///	///	///	///	///	///		
11							1		
12							1		
* 13	15.5	8.1	28.5	8.3	<0.02		1		
14							3		
15							2		
16							2		
17							~~10~~		
18							~~7~~ 1		
19							7		
20	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
21							5		
* 22	15.5	8.1	29.0	8.2	<0.02		3		
* 23	15.7	8.2	29.0	8.1	<0.02		0		
* 24	15.6	8.0	29.0	8.5	<0.02		0		
25							1		
26	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
27							0		
28	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
29							0		
30							1		
31							0		
32							3		
33							0		
34							0		
35							0		
36							0		
37	///	///	///	///	///	///	///		
38							0		
39							0		
40							1		
41							0		
42	///	///	///	///	///	///	///		
43	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
44							0		
45	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
46							2		
* 47	15.5	8.0	29.0	8.2	<0.02		0	V	

* water quality beakers XXX day 5 sacrificial beakers

/// day 0 sacrificial beakers

Revised 12-30-92

NORTHWESTERN AQUATIC SCIENCES — PROTOCOL NO. NAS-XXX-RA4

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator

DAILY RECORD SHEET

Day 10 (10/15/99) 2/696 Temperature beaker 15.4 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	No. Emerged	Air	Comments
* 48	15.5	8.1	29.0	8.5	<0.02		2	OK	
49							0		
50							0		
51							0		
52	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx		
53							3		
54							0		
55							0		
56							4		
57							4		
58							3		
59	////	////	////	////	////	////	////		
60							2		
61							1		
* 62	15.4	8.1	29.0	8.1	<0.02		0		
63							5		
64	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx		
65							1		
66							6		
67							2		
68							0		
69	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx		
70							2		
71	////	////	////	////	////	////	////		
72							2		
73							1		
74							0		
* 75	15.4	8.1	29.0	8.2	<0.02		2		
76	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx		
77							2		
* 78	15.4	8.1	29.0	8.1	<0.02		3		
79	////	////	////	////	////	////	////		
80							0		
81							0		
82	////	////	////	////	////	////	////		
83							2		
84	////	////	////	////	////	////	////		
85							0		
86							3		
87							0		
88	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx		
89							1		
* 90	15.3	8.1	28.5	8.2	<0.02		3		
91	////	////	////	////	////	////	////		
92							1		
* 93	15.3	8.1	29.0	8.2	<0.02		0		
94	////	////	////	////	////	////	////		
95	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx		
96	////	////	////	////	////	////	////		

* water quality beakers
//// day 0 sacrificial beakers
xxxx day 5 sacrificial beakers.

Revised 12-30-92

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-5 Client Foster Wheeler Investigator _____

DAY 10 TEST TERMINATION SHEET

Beaker No.	Interstitial salinity (ppt)	Number of survivors	Number Reburied	Initial
1				
2		18	17	〃
3		20	20	RMS
4				
5		19	19	GAH
6		18	17	〃
7		~~18~~ GAH		~~GAH~~
8		20	19	RMS
9		18	14	GAH
10				
11		19	19	RMS
12		18	18	〃
13				
14		19	19	〃
15		22	16	GAH ← assumed that there were 22 amphipods added initially MSR 11-24-99
16		20	20	RMS
17		20	20	〃
18		18	18	RMS
19		19	19	GJI
20				
21		19	17	GAH
22				
23				
24				
25		19	19	〃
26				
27		20	20	GJI
28				
29		20	20	GJI
30		18	16	〃
31		18	17	GAH
32		18	18	GJI
33		20	19	RMS
34		20	20	〃
35		20	18	GAH
36		19	19	GJI
37				
38		19	19	〃
39		20	20	RMS
40		19	19	GJI
41		18	18	〃
42				
43				
44		19	19	GAH
45				
46		18	18	RMS
47				
48				

MARINE AMPHIPOD 10-DAY SOLID PHASE SEDIMENT TEST

Test No 590-5 Client Foster Wheeler Investigator

DAY 10 TEST TERMINATION SHEET

Beaker No.	Interstitial salinity (ppt)	Number of survivors	Number Reburied	Initial
49		18	18	GJ
50		20	20	〃
51		20	20	RMS
52				
53		15	15	〃
54		18	18	GJ
55		20	20	GOH
56		15	13	〃
57		17	16	RMS
58		18	18	GJ
59				
60		20	20	〃
61		20	20	GOH
62				
63		20	18	GJ
64				
65		20	20	RMS
66		19	17	GOH
67		17	16	GJ
68		20	20	〃
69				
70		19	19	〃
71				
72		18	18	GJ
73		18	18	RMS
74		17	16	〃
75				
76				
77		20	20	GJ
78				
79				
80		20	20	GOH
81		19	19	〃
82				
83		20	20	GJ
84				
85		20	20	〃
86		17	16	RMS
87		20	19	GOH
88				
89		20	20	〃
90				
91				
92		20	20	GJ
93				
94				
95				
96				

10/4/99

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: Foster Wheeler Interstitial water & samples

	Sample description	PBLK	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	4231F		0.2															QCSTD (NH3N)			
2	4232F			0.2														Nom.		Meas	
3	4233F				0.2													10		10.0	
4	4234F					0.2												3		3.0	
5	4235F						0.2											1		1.0	
6	4245F							0.2													
7	4246F								0.2												
8	4272F									0.2											
9	4273F										0.2										
10	4274F											0.2									
11																					
12																					
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater	5.0	4.8	→								→									
	Measured concentration (mg/L)	<0.1	0.4	0.3	0.1	0.3	0.2	0.1	0.2	0.1	<0.1	0.1									
	x multiplier	1.0	25	→								→									
	Final concentration (mg/L)	<0.1	10.0	7.5	2.5	7.5	5.0	2.5	5.0	2.5	<2.5	2.5									

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

Sulfide

RSC 10/5/99

ANALYSIS BENCHSHEET - SULFIDE

Description of analytical group: 590-5 Rhepoxynius test. Day 0 interstitial water Sampled and analyzed 10-5-99.

	Sample description	RLK	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Beaker # 4		1.0																		
2	10			1.0																	
3	37				1.0																
4	42					1.0															
5	59						1.0														
6	71							1.0													
7	79								1.0												
8	82									1.0											
9	84										1.0										
10	91											1.0									
11	94												1.0								
12	96													1.0							
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater or DI water	5.0	4.0	→																	
	Measured concentration (mg/L)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.35	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2							
	x multiplier	1.0	5.0	→																	
	Final concentration (mg/L)	<0.2	<1.0	→				1.75	<1.0	→											

Add sufficient seawater to make 5 ml. Then add 0.2 ml sulfuric acid reagent (stir), followed by 0.2 ml dichromate reagent (stir)

DJL 10/22/99

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: 590-5 Foster Wheeler — Rhepoxynius
Day Ø — Overlying Water (10-5-99)

	Sample description	BLK	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	7		1.0												dupl.				QC Std (NH_3 N)		
2	13			1.0															Nom.		Meas.
3	22				1.0										1.0				10		10.5
4	23					1.0										1.0			3		3.5
5	24						1.0												1		1.0
6	47							1.0													
7	48								1.0												
8	62									1.0											
9	75										1.0										
10	78											1.0									
11	90												1.0								
12	93													1.0							
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater	5.0	4.0 →																		
	Measured concentration (mg/L)	<0.1	0.2	0.1	0.2	0.2	0.3	0.4	0.1	<0.1	0.1	<0.1	0.1	0.2	0.2	0.2					
	x multiplier	1.0	5.0 →																		
	Final concentration (mg/L)	<0.1	1.0	0.5	1.0	1.0	1.5	2.0	0.5	<0.5	0.5	<0.5	0.5	1.0	1.0	1.0					

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

1 of 1

DSE 10/5/99

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: 590-5 Foster Wheeler – Rhepoxynius Day 0 interstitial water (10-5-99)

	Sample description	BLK	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	4		0.2															QC	Std	(NH3	N)
2	10			0.2														mg/L		mg/L	
3	37				0.2													10		10.5	
4	42					0.2												3		3.0	
5	59						0.2											1		1.0	
6	71							0.2													
7	79								0.2												
8	82									0.2											
9	84										0.2										
10	91											0.2									
11	94												0.2								
12	96													0.2							
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater	5.0	4.8	→										→							
	Measured concentration (mg/L)	<0.1	0.1	0.1	0.1	0.3	0.5	0.2	0.3	0.2	0.5	<0.1	0.2	<0.1							
	x multiplier	1.0	25	→										→							
	Final concentration (mg/L)	<0.1	2.5	2.5	2.5	7.5	12.5	5.0	7.5	5.0	12.5	<2.5	5.0	<2.5							

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

RR 10/22/99

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: 590-5 Foster Wheeler - Chesapeake Day 5 Interstitial water (10-10-99)

	Sample description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19 (pH)	20 (Sal)
1	1		0.2												QC Std (NH_3-N)					7.6	29.0
2	20			0.2											Nom		Meas			7.7	28.5
3	26				0.2										10		10.0			7.7	28.0
4	28					0.2									3		3.0			7.4	28.0
5	47						0.2								1		1.0			7.4	27.0
6	45							0.2												7.0	28.0
7	52								0.2											7.1	27.0
8	64									0.2										7.4	28.5
9	69										0.2									7.6	29.0
10	76											0.2								7.4	29.0
11	PP												0.2							7.5	28.0
12	95													0.2						7.8	29.0
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater	5.0	4.8	→										→							
	Measured concentration (mg/L)	<0.1	<0.1	0.1	0.5	0.1	0.2	<0.1	0.1	0.1	0.1	0.2	0.3	0.3							
	x multiplier	1.0	25	→										→							
	Final concentration (mg/L)	<0.1	<2.5	2.5	12.5	2.5	5.0	<2.5	2.5	2.5	2.5	5.0	7.5	7.5							

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

ANALYSIS BENCHSHEET - SULFIDE

Description of analytical group: 590-5 Rhepoxynius Day 5 interstitial water. Sampled and analyzed 10-10-99 MSR

	Sample description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
* 1	BKr #1	1.0																			
2	20		1.0																		
3	26			1.0																	
4	28				1.0																
5	43					1.0															
6	45						1.0														
7	52							1.0													
8	64								1.0												
9	69									1.0											
10	76										1.0										
11	88											1.0									
12	95												1.0								
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater ~~or~~ DI water	4.0	→																		
	Measured concentration (mg/L)	<0.1	→																		
	x multiplier	5	→																		
	Final concentration (mg/L)	<0.5	→																		

Add sufficient seawater to make 5 ml. Then add 0.2 ml sulfuric acid reagent (stir), followed by 0.2 ml dichromate reagent (stir)

33a ~~103~~ = MSR 12-9-99

* sample obtained by letting material settle in capped centrifuge tubes; remaining samples obtained by centrifugation – MSR 10-0-99

BKr 10/15/99

ANALYSIS BENCHSHEET - SULFIDE

Description of analytical group: 590-5 Rhepoxynius test. Day 10 interstitial water. Sampled and analyzed 10-15-99.

	Sample description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	BKr 7		1.0																		
2	13			1.0																	
3	22				1.0																
4	23					1.0															
5	24						1.0														
6	47							1.0													
7	48								1.0												
8	62									1.0											
9	75										1.0										
10	78											1.0									
11	90												1.0								
12	93													1.0							
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater or DI water	5.0	4.0	→																	
	Measured concentration (mg/L)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1							
	x multiplier	1.0	5.0	→																	
	Final concentration (mg/L)	<0.1	<0.5	→																	

Add sufficient seawater to make 5 ml. Then add 0.2 ml sulfuric acid reagent (stir), followed by 0.2 ml dichromate reagent (stir)

10/22/99

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: 590-5 Foster Wheeler — Rhepoxynius Day 10 Overlying Water (10/15/99)

	Sample description	BLK	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	7		1.0																Desid (NH3/N)		
2	13			1.0															Nom.		Meas.
3	22				1.0														10		10.5
4	23					1.0													3		3.5
5	24						1.0								1.6				1		1.0
6	47							1.0								1.0					
7	48								1.0												
8	62									1.0											
9	75										1.0										
10	78											1.0									
11	90												1.0								
12	93													1.0							
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater	5.0	4.0	→	→	→	→	→	→	→	→	→	→	→	→	→					
	Measured concentration (mg/L)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.7	<0.1	<0.1	<0.1	<0.1	<0.1					
	x multiplier	1.0	5.0	→	→	→	→	→	→	→	→	→	→	→	→	→					
	Final concentration (mg/L)	<0.1	<0.5	→	→	→	→	→	0.5	<0.5	3.5	<0.5	→	→	∿						
															dupl.						

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

11/9/99

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: 590-5 Foster Wheeler + Rhepox 10-day Interstitial water (10-15-99)

	Sample description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	7		0.2															QC Std (NH3N)			
2	13			0.2														Nom.		Meas.	
3	22				0.2													10		10.0	
4	23					0.2												3		3.0	
5	24						0.2											1		1.0	
6	47							0.2													
7	48								0.2												
8	62									0.2											
9	75										0.2										
10	78											0.2									
11	90												0.2								
12	93													0.2							
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater	5.0	4.8	→																	
	Measured concentration (mg/L)	<0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1							
	x multiplier	1.0	25	→																	
	Final concentration (mg/L)	<0.1	2.5	2.5	2.5	2.5	2.5	5.0	2.5	2.5	~~2.5~~ 5.0	2.5	2.5	2.5							

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

Amphioid Collection Data Sheet	
Sold to	Northwestern Aquatic Sciences Attn: Michele Redmond 3814 Yaquina Bay Road Newport, OR 97365
Species	Rhepoxynius abronius
Field Collection Notes	
Location	West Beach, Whidbey Island, WA
Date Collected	9/29/99
Number Collected	2,000 +
Interstitial Temperature	12°C
Interstitial Salinity	—
pH (overlying water)	7.9
Notes	
Holding Conditions	
Temperature	15°C
Notes	Included 1 gal 0.5 mm sieved sand NAS # 4286F
Shipping Date	9/30/99

Supplier: Doug Henderson, Kirkland, WA

Test Number 590-5

Marine Amphipod Test - *Rhepoxynius abronius*
Randomization Key

[redacted] 10/1/99

96 beakers.

has already been 0.5-mm sieved.

BKR	NAS SMPL	CLIENT DESCRIP	REPL	
68	4286F	control	1	
50	4286F	control	2	
85	4286F	control	3	
55	4286F	control	4	
29	4286F	control	5	
62	4286F	control	6	water quality beaker
1	4286F	control	7	day 5 sacrificial beaker
96	4286F	control	8	day 0 sacrificial beaker
18	4231F	MWAT042R1	1	
36	4231F	MWAT042R1	2	
86	4231F	MWAT042R1	3	
74	4231F	MWAT042R1	4	
51	4231F	MWAT042R1	5	
47	4231F	MWAT042R1	6	water quality beaker
26	4231F	MWAT042R1	7	day 5 sacrificial beaker
84	4231F	MWAT042R1	8	day 0 sacrificial beaker
5	4232F	MWAT045R1	1	
27	4232F	MWAT045R1	2	
65	4232F	MWAT045R1	3	
38	4232F	MWAT045R1	4	
49	4232F	MWAT045R1	5	
22	4232F	MWAT045R1	6	water quality beaker
88	4232F	MWAT045R1	7	day 5 sacrificial beaker
79	4232F	MWAT045R1	8	day 0 sacrificial beaker
58	4233F	MWAT044R1	1	
40	4233F	MWAT044R1	2	
60	4233F	MWAT044R1	3	
67	4233F	MWAT044R1	4	
9	4233F	MWAT044R1	5	
90	4233F	MWAT044R1	6	water quality beaker
28	4233F	MWAT044R1	7	day 5 sacrificial beaker
10	4233F	MWAT044R1	8	day 0 sacrificial beaker
77	4234F	MWAT047R1	1	
17	4234F	MWAT047R1	2	
87	4234F	MWAT047R1	3	
35	4234F	MWAT047R1	4	
15	4234F	MWAT047R1	5	
93	4234F	MWAT047R1	6	water quality beaker
43	4234F	MWAT047R1	7	day 5 sacrificial beaker
37	4234F	MWAT047R1	8	day 0 sacrificial beaker
72	4235F	MWAT153R1	1	
33	4235F	MWAT153R1	2	
61	4235F	MWAT153R1	3	
39	4235F	MWAT153R1	4	
31	4235F	MWAT153R1	5	
23	4235F	MWAT153R1	6	water quality beaker
69	4235F	MWAT153R1	7	day 5 sacrificial beaker
94	4235F	MWAT153R1	8	day 0 sacrificial beaker

BKR	NAS SMPL	CLIENT DESCRIP	REPL	
19	4245F	MWAT041R1	1	
25	4245F	MWAT041R1	2	
30	4245F	MWAT041R1	3	
11	4245F	MWAT041R1	4	
57	4245F	MWAT041R1	5	
13	4245F	MWAT041R1	6	water quality beaker
52	4245F	MWAT041R1	7	day 5 sacrificial beaker
4	4245F	MWAT041R1	8	day 0 sacrificial beaker
83	4246F	MWAT046R1	1	
73	4246F	MWAT046R1	2	
21	4246F	MWAT046R1	3	
92	4246F	MWAT046R1	4	
89	4246F	MWAT046R1	5	
7	4246F	MWAT046R1	6	water quality beaker
76	4246F	MWAT046R1	7	day 5 sacrificial beaker
42	4246F	MWAT046R1	8	day 0 sacrificial beaker
66	4272F	MWAS034R1	1	
53	4272F	MWAS034R1	2	
2	4272F	MWAS034R1	3	
6	4272F	MWAS034R1	4	
12	4272F	MWAS034R1	5	
75	4272F	MWAS034R1	6	water quality beaker
64	4272F	MWAS034R1	7	day 5 sacrificial beaker
82	4272F	MWAS034R1	8	day 0 sacrificial beaker
8	4273F	MWAS037R1	1	
41	4273F	MWAS037R1	2	
34	4273F	MWAS037R1	3	
14	4273F	MWAS037R1	4	
32	4273F	MWAS037R1	5	
78	4273F	MWAS037R1	6	water quality beaker
45	4273F	MWAS037R1	7	day 5 sacrificial beaker
91	4273F	MWAS037R1	8	day 0 sacrificial beaker
70	4274F	MWRC213R1	1	
63	4274F	MWRC213R1	2	
46	4274F	MWRC213R1	3	
56	4274F	MWRC213R1	4	
16	4274F	MWRC213R1	5	
48	4274F	MWRC213R1	6	water quality beaker
20	4274F	MWRC213R1	7	day 5 sacrificial beaker
71	4274F	MWRC213R1	8	day 0 sacrificial beaker
80	4275F	MWRC214R1	1	
44	4275F	MWRC214R1	2	
54	4275F	MWRC214R1	3	
3	4275F	MWRC214R1	4	
81	4275F	MWRC214R1	5	
24	4275F	MWRC214R1	6	water quality beaker
95	4275F	MWRC214R1	7	day 5 sacrificial beaker
59	4275F	MWRC214R1	8	day 0 sacrificial beaker

Endpoints Data Entry and Calculations File

INIT=initial number
SURV=number survivors
REBUR=number survivors which reburied
MORT=number dead=INIT-SURV
NOBURY=number survivors not reburied=SURV-REBUR

TEM=total effective mortality=MORT+NOBURY
INIT=initial number of amphipods
SURV=number of surviving amphipods
REBUR=number of surviving amphipods reburying
PSURV=%survival=100(SURV/INIT)
PMORT=%mortality=100(MORT/INIT)
PBURY=%reburial=100(REBUR/SURV)
PNOBURY=%survivors not reburied=100(NOBURY/SURV)
PTEM=%total effective mortality=100(TEM/INIT)

Data entry verified 10-26-99 by LKN 12/6/99

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL	INIT	SURV	REBUR	MORT	NOBURY	TEM	PSURV	PMORT	PBURY	PNOBURY	PTEM
1	68	4286F	control	1	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0
2	50	4286F	control	2	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0
3	85	4286F	control	3	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0
4	55	4286F	control	4	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0
5	29	4286F	control	5	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0
6	62	4286F	control	6	20	water quality beaker									
7	1	4286F	control	7	20	day 5 sacrificial beaker									
8	96	4286F	control	8		day 0 sacrificial beaker									
9	18	4231F	MWAT042R1	1	20	18	18	2	0	2	90.0	10.0	100.0	0.0	10.0
10	36	4231F	MWAT042R1	2	20	19	19	1	0	1	95.0	5.0	100.0	0.0	5.0
11	86	4231F	MWAT042R1	3	20	17	16	3	1	4	85.0	15.0	94.1	5.9	20.0
12	74	4231F	MWAT042R1	4	20	17	16	3	1	4	85.0	15.0	94.1	5.9	20.0
13	51	4231F	MWAT042R1	5	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0
14	47	4231F	MWAT042R1	6	20	water quality beaker									
15	26	4231F	MWAT042R1	7	20	day 5 sacrificial beaker									
16	84	4231F	MWAT042R1	8		day 0 sacrificial beaker									
17	5	4232F	MWAT045R1	1	20	19	19	1	0	1	95.0	5.0	100.0	0.0	5.0
18	27	4232F	MWAT045R1	2	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0
19	65	4232F	MWAT045R1	3	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0
20	38	4232F	MWAT045R1	4	20	19	19	1	0	1	95.0	5.0	100.0	0.0	5.0
21	49	4232F	MWAT045R1	5	20	18	18	2	0	2	90.0	10.0	100.0	0.0	10.0
22	22	4232F	MWAT045R1	6	20	water quality beaker									
23	88	4232F	MWAT045R1	7	20	day 5 sacrificial beaker									
24	79	4232F	MWAT045R1	8		day 0 sacrificial beaker									
25	58	4233F	MWAT044R1	1	20	18	18	2	0	2	90.0	10.0	100.0	0.0	10.0
26	40	4233F	MWAT044R1	2	20	19	19	1	0	1	95.0	5.0	100.0	0.0	5.0
27	60	4233F	MWAT044R1	3	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0
28	67	4233F	MWAT044R1	4	20	17	16	3	1	4	85.0	15.0	94.1	5.9	20.0
29	9	4233F	MWAT044R1	5	20	18	14	2	4	6	90.0	10.0	77.8	22.2	30.0
30	90	4233F	MWAT044R1	6	20	water quality beaker									
31	28	4233F	MWAT044R1	7	20	day 5 sacrificial beaker									
32	10	4233F	MWAT044R1	8		day 0 sacrificial beaker									

	SURV	MORT	NOBURY	PSURV	PMORT	PBURY	PNOBURY	PTEM
Mean	20.0	0.0	0.0	100.0	0.0	100.0	0.0	0.0
SD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
n	5	5	5	5	5	5	5	5
Mean	18.2	1.8	0.4	91.0	9.0	97.6	2.4	11.0
SD	1.3	1.3	0.5	6.5	6.5	3.2	3.2	8.9
n	5	5	5	5	5	5	5	5
Mean	19.2	0.8	0.0	96.0	4.0	100.0	0.0	4.0
SD	0.8	0.8	0.0	4.2	4.2	0.0	0.0	4.2
n	5	5	5	5	5	5	5	5
Mean	18.4	1.6	1.0	92.0	8.0	94.4	5.6	13.0
SD	1.1	1.1	1.7	5.7	5.7	9.6	9.6	12.0
n	5	5	5	5	5	5	5	5

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL	INIT	SURV	REBUR	MORT	NOBURY	TEM	PSURV	PMORT	PBURY	PNOBURY	PTEM									
33	77	4234F	MWAT047R1	1	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0									
34	17	4234F	MWAT047R1	2	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0	Mean	20.4	0.0	1.8	100.0	0.0	91.5	8.5	8.5
35	87	4234F	MWAT047R1	3	20	20	19	0	1	1	100.0	0.0	95.0	5.0	5.0	SD	0.9	0.0	2.5	0.0	0.0	11.3	11.3	11.3
36	35	4234F	MWAT047R1	4	20	20	18	0	2	2	100.0	0.0	90.0	10.0	10.0	n	5	5	5	5	5	5	5	5
37	15	4234F	MWAT047R1	5	22	22	16	0	6	6	100.0	0.0	72.7	27.3	27.3									
38	93	4234F	MWAT047R1	6	20	water quality beaker																		
39	43	4234F	MWAT047R1	7	20	day 5 sacrificial beaker																		
40	37	4234F	MWAT047R1	8		day 0 sacrificial beaker																		
41	72	4235F	MWAT153R1	1	20	18	18	2	0	2	90.0	10.0	100.0	0.0	10.0									
42	33	4235F	MWAT153R1	2	20	20	19	0	1	1	100.0	0.0	95.0	5.0	5.0	Mean	19.2	0.8	0.4	96.0	4.0	97.9	2.1	6.0
43	61	4235F	MWAT153R1	3	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0	SD	1.1	1.1	0.5	5.5	5.5	2.9	2.9	6.5
44	39	4235F	MWAT153R1	4	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0	n	5	5	5	5	5	5	5	5
45	31	4235F	MWAT153R1	5	20	18	17	2	1	3	90.0	10.0	94.4	5.6	15.0									
46	23	4235F	MWAT153R1	6	20	water quality beaker																		
47	69	4235F	MWAT153R1	7	20	day 5 sacrificial beaker																		
48	94	4235F	MWAT153R1	8		day 0 sacrificial beaker																		
49	19	4245F	MWAT041R1	1	20	19	19	1	0	1	95.0	5.0	100.0	0.0	5.0									
50	25	4245F	MWAT041R1	2	20	19	19	1	0	1	95.0	5.0	100.0	0.0	5.0	Mean	18.4	1.6	0.6	92.0	8.0	96.6	3.4	11.0
51	30	4245F	MWAT041R1	3	20	18	16	2	2	4	90.0	10.0	88.9	11.1	20.0	SD	0.9	0.9	0.9	4.5	4.5	5.0	5.0	8.2
52	11	4245F	MWAT041R1	4	20	19	19	1	0	1	95.0	5.0	100.0	0.0	5.0	n	5	5	5	5	5	5	5	5
53	57	4245F	MWAT041R1	5	20	17	16	3	1	4	85.0	15.0	94.1	5.9	20.0									
54	13	4245F	MWAT041R1	6	20	water quality beaker																		
55	52	4245F	MWAT041R1	7	20	day 5 sacrificial beaker																		
56	4	4245F	MWAT041R1	8		day 0 sacrificial beaker																		
57	83	4246F	MWAT046R1	1	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0									
58	73	4246F	MWAT046R1	2	20	18	18	2	0	2	90.0	10.0	100.0	0.0	10.0	Mean	19.4	0.6	0.4	97.0	3.0	97.9	2.1	5.0
59	21	4246F	MWAT046R1	3	20	19	17	1	2	3	95.0	5.0	89.5	10.5	15.0	SD	0.9	0.9	0.9	4.5	4.5	4.7	4.7	7.1
60	92	4246F	MWAT046R1	4	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0	n	5	5	5	5	5	5	5	5
61	89	4246F	MWAT046R1	5	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0									
62	7	4246F	MWAT046R1	6	20	water quality beaker																		
63	76	4246F	MWAT046R1	7	20	day 5 sacrificial beaker																		
64	42	4246F	MWAT046R1	8		day 0 sacrificial beaker																		
65	66	4272F	MWAS034R1	1	20	19	17	1	2	3	95.0	5.0	89.5	10.5	15.0									
66	53	4272F	MWAS034R1	2	20	15	15	5	0	5	75.0	25.0	100.0	0.0	25.0	Mean	17.6	2.4	0.8	88.0	12.0	95.7	4.3	16.0
67	2	4272F	MWAS034R1	3	20	18	17	2	1	3	90.0	10.0	94.4	5.6	15.0	SD	1.5	1.5	0.8	7.6	7.6	4.4	4.4	5.5
68	6	4272F	MWAS034R1	4	20	18	17	2	1	3	90.0	10.0	94.4	5.6	15.0	n	5	5	5	5	5	5	5	5
69	12	4272F	MWAS034R1	5	20	18	18	2	0	2	90.0	10.0	100.0	0.0	10.0									
70	75	4272F	MWAS034R1	6	20	water quality beaker																		
71	64	4272F	MWAS034R1	7	20	day 5 sacrificial beaker																		
72	82	4272F	MWAS034R1	8		day 0 sacrificial beaker																		

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INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL	INIT	SURV	REBUR	MORT	NOBURY	TEM	PSURV	PMORT	PBURY	PNOBURY	PTEM			SURV	MORT	NOBURY	PSURV	PMORT	PBURY	PNOBURY	PTEM
73	8	4273F	MWAS037R1	1	20	20	19	0	1	1	100.0	0.0	95.0	5.0	5.0										
74	41	4273F	MWAS037R1	2	20	18	18	2	0	2	90.0	10.0	100.0	0.0	10.0		Mean	19.0	1.0	0.2	95.0	5.0	99.0	1.0	6.0
75	34	4273F	MWAS037R1	3	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0		SD	1.0	1.0	0.4	5.0	5.0	2.2	2.2	4.2
76	14	4273F	MWAS037R1	4	20	19	19	1	0	1	95.0	5.0	100.0	0.0	5.0		n	5	5	5	5	5	5	5	5
77	32	4273F	MWAS037R1	5	20	18	18	2	0	2	90.0	10.0	100.0	0.0	10.0										
78	78	4273F	MWAS037R1	6	20	water quality beaker																			
79	45	4273F	MWAS037R1	7	20	day 5 sacrificial beaker																			
80	91	4273F	MWAS037R1	8		day 0 sacrificial beaker																			
81	70	4274F	MWRC213R1	1	20	19	19	1	0	1	95.0	5.0	100.0	0.0	5.0										
82	63	4274F	MWRC213R1	2	20	20	18	0	2	2	100.0	0.0	90.0	10.0	10.0		Mean	18.4	1.6	0.8	92.0	8.0	95.3	4.7	12.0
83	46	4274F	MWRC213R1	3	20	18	18	2	0	2	90.0	10.0	100.0	0.0	10.0		SD	2.1	2.1	1.1	10.4	10.4	6.5	6.5	13.5
84	56	4274F	MWRC213R1	4	20	15	13	5	2	7	75.0	25.0	86.7	13.3	35.0		n	5	5	5	5	5	5	5	5
85	16	4274F	MWRC213R1	5	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0										
86	48	4274F	MWRC213R1	6	20	water quality beaker																			
87	20	4274F	MWRC213R1	7	20	day 5 sacrificial beaker																			
88	71	4274F	MWRC213R1	8		day 0 sacrificial beaker																			
89	80	4275F	MWRC214R1	1	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0										
90	44	4275F	MWRC214R1	2	20	19	19	1	0	1	95.0	5.0	100.0	0.0	5.0		Mean	19.2	0.8	0.0	96.0	4.0	100.0	0.0	4.0
91	54	4275F	MWRC214R1	3	20	18	18	2	0	2	90.0	10.0	100.0	0.0	10.0		SD	0.8	0.8	0.0	4.2	4.2	0.0	0.0	4.2
92	3	4275F	MWRC214R1	4	20	20	20	0	0	0	100.0	0.0	100.0	0.0	0.0		n	5	5	5	5	5	5	5	5
93	81	4275F	MWRC214R1	5	20	19	19	1	0	1	95.0	5.0	100.0	0.0	5.0										
94	24	4275F	MWRC214R1	6	20	water quality beaker																			
95	95	4275F	MWRC214R1	7	20	day 5 sacrificial beaker																			
96	59	4275F	MWRC214R1	8		day 0 sacrificial beaker																			

Project Name: P590-5 Rhepoxynius, % mortality

12/ 3/99

Sample ID: MWAT042R1		**Replicates:**	5
Alias: NAS #4231F - X1			
Mean:	9.000	**Transform Mean:**	15.385
SD:	6.519	**Transform SD:**	9.508

Reference ID: MWRC213R1		**Replicates:**	5
Alias: NAS #4274F - X2			
Mean:	8.000	**Transform Mean:**	12.271
SD:	10.368	**Transform SD:**	12.785

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	7.3108
SS:	1,015.5205
K:	5.0000
b:	30.8420
Alpha Level:	0.05
Calculated Value:	0.9366
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	7.1402
Test Residual SD:	5.1652
Reference Residual Mean:	9.8169
Reference Residual SD:	6.5579
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.7169
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	0.4370
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	10.0000	18.4349	5.0000	12.9209	3.0491	0.6497			-15.3857
2	5.0000	12.9209	0.0000	0.0000	2.4648	12.2711			-12.2711
3	15.0000	22.7864	10.0000	18.4349	7.4006	6.1637			-12.2711
4	15.0000	22.7864	25.0000	29.9999	7.4006	17.7287			-2.4648
5	0.0000	0.0000	0.0000	0.0000	15.3857	12.2711			0.6497
6									3.0491
7									6.1637
8									7.4006
9									7.4006
10									17.7287
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5 Rhepoxynius, % mortality 12/ 3/99

Sample ID: MWAT045R1		**Replicates:**	5
Alias: NAS #4232F - X1			
Mean:	4.000	**Transform Mean:**	8.855
SD:	4.183	**Transform SD:**	8.391

Reference ID: MWRC213R1		**Replicates:**	5
Alias: NAS #4274F - X2			
Mean:	8.000	**Transform Mean:**	12.271
SD:	10.368	**Transform SD:**	12.785

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	7.0170
SS:	935.5463
K:	5.0000
b:	29.3414
Alpha Level:	0.05
Calculated Value:	0.9202
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	7.0842
Test Residual SD:	2.7715
Reference Residual Mean:	9.8169
Reference Residual SD:	6.5579
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.8582
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-0.4994
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	5.0000	12.9209	5.0000	12.9209	4.0655	0.6497			-12.2711
2	0.0000	0.0000	0.0000	0.0000	8.8553	12.2711			-12.2711
3	0.0000	0.0000	10.0000	18.4349	8.8553	6.1637			-8.8553
4	5.0000	12.9209	25.0000	29.9999	4.0655	17.7287			-8.8553
5	10.0000	18.4349	0.0000	0.0000	9.5795	12.2711			0.6497
6									4.0655
7									4.0655
8									6.1637
9									9.5795
10									17.7287
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5 Rhepoxynius, % mortality 12/ 3/99

Sample ID: MWAT044R1		**Replicates:** 5	**Reference ID:** MWRC213R1		**Replicates:** 5
Alias: NAS #4233F - X1			**Alias:** NAS #4274F - X2		
Mean:	8.000	**Transform Mean:** 14.515	**Mean:**	8.000	**Transform Mean:** 12.27
SD:	5.700	**Transform SD:** 8.837	**SD:**	10.368	**Transform SD:** 12.785

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	7.1313
SS:	966.2603
K:	5.0000
b:	30.0176
Alpha Level:	0.05
Calculated Value:	0.9325
Critical Value:	*<= 0.842*
Normally Distributed:	Yes
Override Option:	N/A

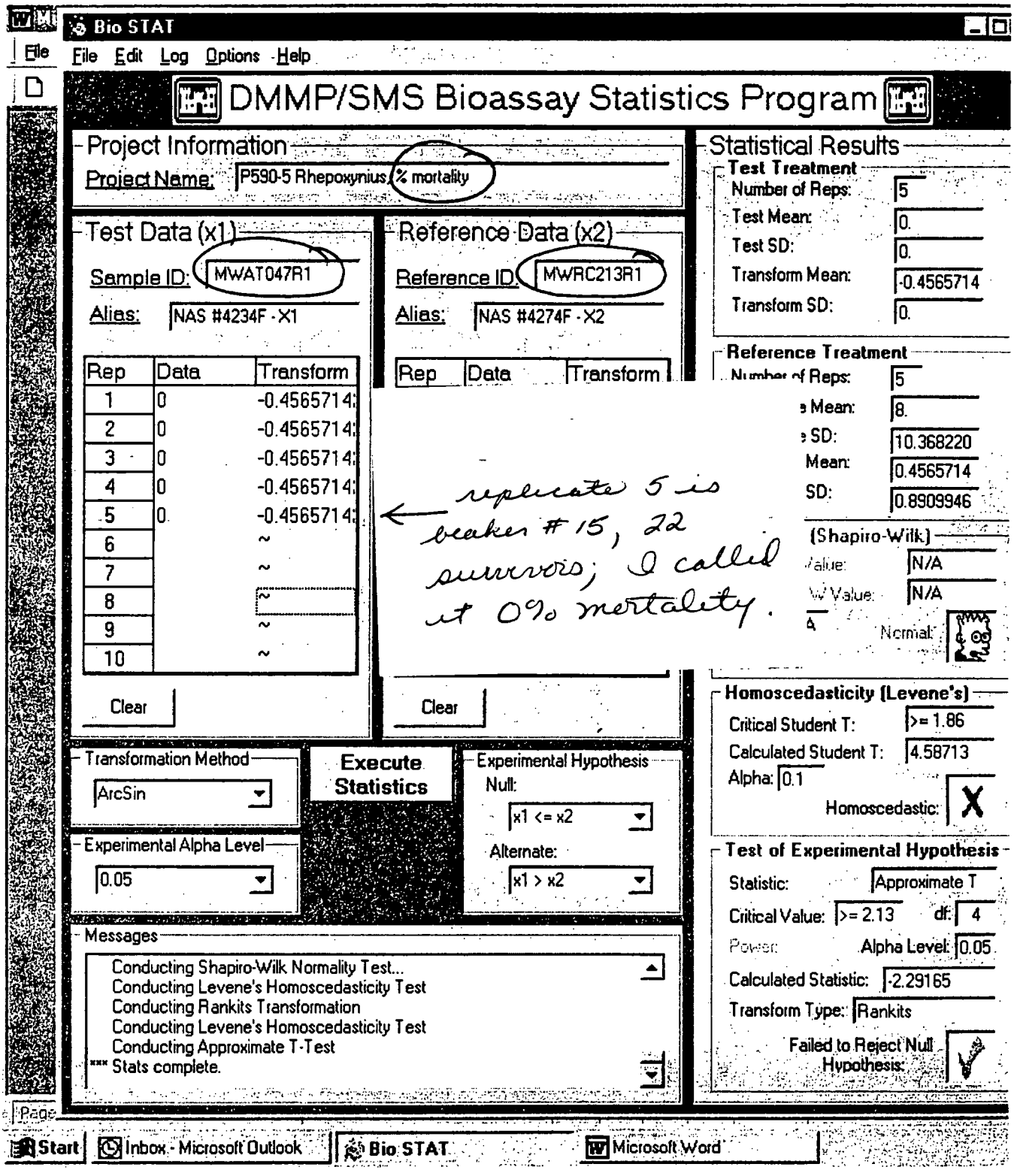
Levene's Results:

Test Residual Mean:	6.4439
Test Residual SD:	5.1173
Reference Residual Mean:	9.8169
Reference Residual SD:	6.5579
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	*0.9066*
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	0.3228
Critical Value:	*>= 1.86*
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	10.0000	18.4349	5.0000	12.9209	3.9194	0.6497			-14.5154
2	5.0000	12.9209	0.0000	0.0000	1.5945	12.2711			-12.2711
3	0.0000	0.0000	10.0000	18.4349	14.5154	6.1637			-12.2711
4	15.0000	22.7864	25.0000	29.9999	8.2710	17.7287			-1.5945
5	10.0000	18.4349	0.0000	0.0000	3.9194	12.2711			0.6497
6									3.9194
7									3.9194
8									6.1637
9									8.2710
10									17.7287
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									


Bio STAT
File Edit Log Options Help
DMMP/SMS Bioassay Statistics Program
Project Information
Project Name: P590-5 Rhepoxynius % mortality
Test Data (x1)
Sample ID: MWAT047R1
Alias: NAS #4234F - X1
Rep Data Transform
1 0 -0.4565714
2 0 -0.4565714
3 0 -0.4565714
4 0 -0.4565714
5 0 -0.4565714
6 ~
7 ~
8 ~
9 ~
10 ~
Clear
Reference Data (x2)
Reference ID: MWRC213R1
Alias: NAS #4274F - X2
Rep Data Transform
Clear
replicate 5 is beaker #15, 22 survivors; I called it 0% mortality.
Statistical Results
Test Treatment
Number of Reps: 5
Test Mean: 0.
Test SD: 0.
Transform Mean: -0.4565714
Transform SD: 0.
Reference Treatment
Number of Reps: 5
Mean: 8.
SD: 10.368220
Mean: 0.4565714
SD: 0.8909946
(Shapiro-Wilk)
Value: N/A
W Value: N/A
Normal:
Homoscedasticity (Levene's)
Critical Student T: >= 1.86
Calculated Student T: 4.58713
Alpha: 0.1
Homoscedastic: X
Test of Experimental Hypothesis
Statistic: Approximate T
Critical Value: >= 2.13 df: 4
Power: Alpha Level: 0.05
Calculated Statistic: -2.29165
Transform Type: Rankits
Failed to Reject Null Hypothesis:
Transformation Method
ArcSin
Execute Statistics
Experimental Hypothesis
Null: x1 <= x2
Alternate: x1 > x2
Experimental Alpha Level
0.05
Messages
Conducting Shapiro-Wilk Normality Test...
Conducting Levene's Homoscedasticity Test
Conducting Rankits Transformation
Conducting Levene's Homoscedasticity Test
Conducting Approximate T-Test
*** Stats complete.
Start
Inbox - Microsoft Outlook
Bio STAT
Microsoft Word

Project Name: P590-5 Rhepoxynius % mortality 12/ 3/99

Sample ID: MWAT153R1		**Replicates:** 5	**Reference ID:** MWRC213R1		**Replicates:** 5
Alias: NAS #4235F - X1			**Alias:** NAS #4274F - X2		
Mean:	4.000	**Transform Mean:** 7.373	**Mean:**	8.000	**Transform Mean:** 12.27
SD:	5.477	**Transform SD:** 10.097	**SD:**	10.368	**Transform SD:** 12.785

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	7.4752
SS:	1,061.7008
K:	5.0000
b:	30.8196
Alpha Level:	0.05
Calculated Value:	0.8946
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	8.8487
Test Residual SD:	2.0194
Reference Residual Mean:	9.8169
Reference Residual SD:	6.5579
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.3154
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-0.6721
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	10.0000	18.4349	5.0000	12.9209	11.0609	0.6497			-12.2711
2	0.0000	0.0000	0.0000	0.0000	7.3739	12.2711			-12.2711
3	0.0000	0.0000	10.0000	18.4349	7.3739	6.1637			-7.3739
4	0.0000	0.0000	25.0000	29.9999	7.3739	17.7287			-7.3739
5	10.0000	18.4349	0.0000	0.0000	11.0609	12.2711			-7.3739
6									0.6497
7									6.1637
8									11.0609
9									11.0609
10									17.7287
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5 Rhepoxynius % mortality 12/ 3/99

Sample ID: MWAT041R1		**Replicates:**	5
Alias: NAS #4245F - X1			
Mean:	8.000	**Transform Mean:**	15.996
SD:	4.472	**Transform SD:**	4.484

Reference ID: MWRC213R1		**Replicates:**	5
Alias: NAS #4274F - X2			
Mean:	8.000	**Transform Mean:**	12.271
SD:	10.368	**Transform SD:**	12.785

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	6.2167
SS:	734.3124
K:	5.0000
b:	26.2916
Alpha Level:	0.05
Calculated Value:	0.9413
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	3.6910
Test Residual SD:	1.7540
Reference Residual Mean:	9.8169
Reference Residual SD:	6.5579
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	2.0178
Critical Value:	>= 1.86
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	5
Experimental Alpha Level:	0.05
Calculated Value:	0.6148
Critical Value:	>= 2.015
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	5.0000	12.9209	5.0000	12.9209	3.0758	0.6497			-12.2711
2	5.0000	12.9209	0.0000	0.0000	3.0758	12.2711			-12.2711
3	10.0000	18.4349	10.0000	18.4349	2.4380	6.1637			-3.0758
4	5.0000	12.9209	25.0000	29.9999	3.0758	17.7287			-3.0758
5	15.0000	22.7864	0.0000	0.0000	6.7896	12.2711			-3.0758
6									0.6497
7									2.4380
8									6.1637
9									6.7896
10									17.7287
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5 Rhepoxynius % mortality 12/ 3/99

Sample ID:	MWAT046R1	**Replicates:**	5	**Reference ID:**	MWRC213R1	**Replicates:**	5
Alias:	NAS #4246F - X1			**Alias:**	NAS #4274F - X2		
Mean:	3.000	**Transform Mean:**	6.271	**Mean:**	8.000	**Transform Mean:**	12.[illegible]
SD:	4.472	**Transform SD:**	8.805	**SD:**	10.368	**Transform SD:**	12.785

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	7.1231
SS:	964.0445
K:	5.0000
b:	29.8230
Alpha Level:	0.05
Calculated Value:	0.9225
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	7.5254
Test Residual SD:	2.5980
Reference Residual Mean:	9.8169
Reference Residual SD:	6.5579
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.7264
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-0.8642
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.0000	0.0000	5.0000	12.9209	6.2711	0.6497			-12.2711
2	10.0000	18.4349	0.0000	0.0000	12.1637	12.2711			-12.2711
3	5.0000	12.9209	10.0000	18.4349	6.6497	6.1637			-6.2711
4	0.0000	0.0000	25.0000	29.9999	6.2711	17.7287			-6.2711
5	0.0000	0.0000	0.0000	0.0000	6.2711	12.2711			-6.2711
6									0.6497
7									6.1637
8									6.6497
9									12.1637
10									17.7287
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: ~~P590-5 Rhepoxynius~~ % mortality 12/ 3/99

Sample ID: MWAS0346R1	**Replicates:** 5	**Reference ID:** MWRC213R1	**Replicates:** 5
Alias: NAS #4272F - X1		**Alias:** NAS #4274F - X2	
Mean: 12.000	**Transform Mean:** 19.645	**Mean:** 8.000	**Transform Mean:** 12.271
SD: 7.582	**Transform SD:** 6.261	**SD:** 10.368	**Transform SD:** 12.785

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	6.5321
SS:	810.7165
K:	5.0000
b:	27.6501
Alpha Level:	0.05
Calculated Value:	0.9430
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	4.1419
Test Residual SD:	4.2146
Reference Residual Mean:	9.8169
Reference Residual SD:	6.5579
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.6278
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: ArcSin

Experimental Hypothesis
Null: x1 <= x2
Alternate: x1 > x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	1.1581
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	5.0000	12.9209	5.0000	12.9209	6.7241	0.6497			-12.2711
2	25.0000	29.9999	0.0000	0.0000	10.3548	12.2711			-12.2711
3	10.0000	18.4349	10.0000	18.4349	1.2102	6.1637			-6.7241
4	10.0000	18.4349	25.0000	29.9999	1.2102	17.7287			-1.2102
5	10.0000	18.4349	0.0000	0.0000	1.2102	12.2711			-1.2102
6									-1.2102
7									0.6497
8									6.1637
9									10.3548
10									17.7287
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5 Rhepoxynius, % mortality 12/ 3/99

Sample ID: MWAS037R1		**Replicates:** 5	**Reference ID:** MWRC213R1		**Replicates:** 5
Alias: NAS #4273F - X1			**Alias:** NAS #4274F - X2		
Mean:	5.000	**Transform Mean:** 9.958	**Mean:**	8.000	**Transform Mean:** 12.71
SD:	5.000	**Transform SD:** 9.365	**SD:**	10.368	**Transform SD:** 12.785

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	7.2718
SS:	1,004.7043
K:	5.0000
b:	30.0576
Alpha Level:	0.05
Calculated Value:	0.8992
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	7.9665
Test Residual SD:	2.8935
Reference Residual Mean:	9.8169
Reference Residual SD:	6.5579
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.5772
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-0.3263
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.0000	0.0000	5.0000	12.9209	9.9581	0.6497			-12.2711
2	10.0000	18.4349	0.0000	0.0000	8.4767	12.2711			-12.2711
3	0.0000	0.0000	10.0000	18.4349	9.9581	6.1637			-9.9581
4	5.0000	12.9209	25.0000	29.9999	2.9627	17.7287			-9.9581
5	10.0000	18.4349	0.0000	0.0000	8.4767	12.2711			0.6497
6									2.9627
7									6.1637
8									8.4767
9									8.4767
10									17.7287
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius % total effective mortality 12/ 3/99

Sample ID: MWAT042R1		**Replicates:**	5
Alias: NAS #4231F - X1			
Mean:	11.000	**Transform Mean:**	16.897
SD:	8.944	**Transform SD:**	11.075

Reference ID: MWRC213R1		**Replicates:**	5
Alias: NAS #4274F - X2			
Mean:	12.000	**Transform Mean:**	17.212
SD:	13.509	**Transform SD:**	13.047

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	7.8523
SS:	1,171.5298
K:	5.0000
b:	33.2221
Alpha Level:	0.05
Calculated Value:	0.9421
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	8.3493
Test Residual SD:	5.9595
Reference Residual Mean:	8.6015
Reference Residual SD:	8.8172
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.0529
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-0.0411
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	10.0000	18.4349	5.0000	12.9209	1.5377	4.2914			-17.2123
2	5.0000	12.9209	10.0000	18.4349	3.9762	1.2225			-16.8971
3	20.0000	26.5649	10.0000	18.4349	9.6678	1.2225			-4.2914
4	20.0000	26.5649	35.0000	36.2711	9.6678	19.0587			-3.9762
5	0.0000	0.0000	0.0000	0.0000	16.8971	17.2123			1.2225
6									1.2225
7									1.5377
8									9.6678
9									9.6678
10									19.0587
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius, % total effective mortality 12/ 3/99

Sample ID: MWAT045R1		**Replicates:**	5	**Reference ID:** MWRC213R1		**Replicates:**	5
Alias: NAS #4232F - X1				**Alias:** NAS #4274F - X2			
Mean:	4.000	**Transform Mean:**	8.855	**Mean:**	12.000	**Transform Mean:**	17.21
SD:	4.183	**Transform SD:**	8.391	**SD:**	13.509	**Transform SD:**	13.047

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	7.1176
SS:	962.5672
K:	5.0000
b:	30.6721
Alpha Level:	0.05
Calculated Value:	0.9773
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	7.0842
Test Residual SD:	2.7715
Reference Residual Mean:	8.6015
Reference Residual SD:	8.8172
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.3670
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-1.2046
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	5.0000	12.9209	5.0000	12.9209	4.0655	4.2914			-17.2123
2	0.0000	0.0000	10.0000	18.4349	8.8553	1.2225			-8.8553
3	0.0000	0.0000	10.0000	18.4349	8.8553	1.2225			-8.8553
4	5.0000	12.9209	35.0000	36.2711	4.0655	19.0587			-4.2914
5	10.0000	18.4349	0.0000	0.0000	9.5795	17.2123			1.2225
6									1.2225
7									4.0655
8									4.0655
9									9.5795
10									19.0587
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius, % total effective mortality 12/ 3/99

Sample ID: MWAT044R1		**Replicates:**	5
Alias: NAS #4233F - X1			
Mean:	13.000	**Transform Mean:**	18.226
SD:	12.041	**Transform SD:**	12.791

Reference ID: MWRC213R1		**Replicates:**	5
Alias: NAS #4274F - X2			
Mean:	12.000	**Transform Mean:**	17.212
SD:	13.509	**Transform SD:**	13.047

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	8.3834
SS:	1,335.3653
K:	5.0000
b:	35.6304
Alpha Level:	0.05
Calculated Value:	0.9507
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	9.4126
Test Residual SD:	7.2709
Reference Residual Mean:	8.6015
Reference Residual SD:	8.8172
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.1587
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: ArcSin

Experimental Hypothesis
Null: x1 <= x2
Alternate: x1 > x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	0.1240
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	10.0000	18.4349	5.0000	12.9209	0.2085	4.2914			-18.2263
2	5.0000	12.9209	10.0000	18.4349	5.3053	1.2225			-17.2123
3	0.0000	0.0000	10.0000	18.4349	18.2263	1.2225			-5.3053
4	20.0000	26.5649	35.0000	36.2711	8.3386	19.0587			-4.2914
5	30.0000	33.2108	0.0000	0.0000	14.9845	17.2123			0.2085
6									1.2225
7									1.2225
8									8.3386
9									14.9845
10									19.0587
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius, % total effective mortality 12/ 3/99

Sample ID: MWAT047R1		**Replicates:** 5	**Reference ID:** MWRC213R1		**Replicates:** 5
Alias: NAS #4234F - X1			**Alias:** NAS #4274F - X2		
Mean:	8.460	**Transform Mean:** 12.571	**Mean:**	12.000	**Transform Mean:** 1...12
SD:	11.318	**Transform SD:** 13.312	**SD:**	13.509	**Transform SD:** 13.047

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	8.5525
SS:	1,389.7675
K:	5.0000
b:	35.8391
Alpha Level:	0.05
Calculated Value:	0.9242
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	10.0568
Test Residual SD:	7.1266
Reference Residual Mean:	8.6015
Reference Residual SD:	8.8172
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.2870
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-0.5567
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.0000	0.0000	5.0000	12.9209	12.5710	4.2914			-17.2123
2	0.0000	0.0000	10.0000	18.4349	12.5710	1.2225			-12.5710
3	5.0000	12.9209	10.0000	18.4349	0.3498	1.2225			-12.5710
4	10.0000	18.4349	35.0000	36.2711	5.8638	19.0587			-4.2914
5	27.3000	31.4996	0.0000	0.0000	18.9285	17.2123			0.3498
6									1.2225
7									1.2225
8									5.8638
9									18.9285
10									19.0587
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius, % total effective mortality 12/ 3/99

Sample ID: MWAT153R1		**Replicates:**	5
Alias: NAS #4235F - X1			
Mean:	6.000	**Transform Mean:**	10.828
SD:	6.519	**Transform SD:**	10.485

Reference ID: MWRC213R1		**Replicates:**	5
Alias: NAS #4274F - X2			
Mean:	12.000	**Transform Mean:**	17.212
SD:	13.509	**Transform SD:**	13.047

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	7.6799
SS:	1,120.6479
K:	5.0000
b:	33.0433
Alpha Level:	0.05
Calculated Value:	0.9743
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	8.6627
Test Residual SD:	4.0163
Reference Residual Mean:	8.6015
Reference Residual SD:	8.8172
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.0141
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-0.8528
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	10.0000	18.4349	5.0000	12.9209	7.6064	4.2914			-17.2123
2	5.0000	12.9209	10.0000	18.4349	2.0924	1.2225			-10.8284
3	0.0000	0.0000	10.0000	18.4349	10.8284	1.2225			-10.8284
4	0.0000	0.0000	35.0000	36.2711	10.8284	19.0587			-4.2914
5	15.0000	22.7864	0.0000	0.0000	11.9579	17.2123			1.2225
6									1.2225
7									2.0924
8									7.6064
9									11.9579
10									19.0587
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius, % total effective mortality 12/ 3/99

Sample ID: MWAT041R1		**Replicates:** 5	**Reference ID:** MWRC213R1		**Replicates:** 5
Alias: NAS #4245F - X1			**Alias:** NAS #4274F - X2		
Mean:	11.000	**Transform Mean:** 18.378	**Mean:**	12.000	**Transform Mean:** 17.212
SD:	8.215	**Transform SD:** 7.473	**SD:**	13.509	**Transform SD:** 13.047

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	6.8988
SS:	904.2991
K:	5.0000
b:	29.2651
Alpha Level:	0.05
Calculated Value:	0.9470
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	6.5491
Test Residual SD:	1.4946
Reference Residual Mean:	8.6015
Reference Residual SD:	8.8172
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.5131
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: ArcSin

Experimental Hypothesis
Null: x1 <= x2
Alternate: x1 > x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	0.1734
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	5.0000	12.9209	5.0000	12.9209	5.4576	4.2914			-17.2123
2	5.0000	12.9209	10.0000	18.4349	5.4576	1.2225			-5.4576
3	20.0000	26.5649	10.0000	18.4349	8.1864	1.2225			-5.4576
4	5.0000	12.9209	35.0000	36.2711	5.4576	19.0587			-5.4576
5	20.0000	26.5649	0.0000	0.0000	8.1864	17.2123			-4.2914
6									1.2225
7									1.2225
8									8.1864
9									8.1864
10									19.0587
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius, % total effective mortality 12/ 3/99

Sample ID: MWAT046R1		**Replicates:**	5
Alias: NAS #4246F - X1			
Mean:	5.000	**Transform Mean:**	8.244
SD:	7.071	**Transform SD:**	11.393

Reference ID: MWRC213R1		**Replicates:**	5
Alias: NAS #4274F - X2			
Mean:	12.000	**Transform Mean:**	17.212
SD:	13.509	**Transform SD:**	13.047

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	7.9476
SS:	1,200.1348
K:	5.0000
b:	33.6406
Alpha Level:	0.05
Calculated Value:	0.9429
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	9.8931
Test Residual SD:	2.7321
Reference Residual Mean:	8.6015
Reference Residual SD:	8.8172
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.3128
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-1.1577
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.0000	0.0000	5.0000	12.9209	8.2442	4.2914			-17.2123
2	10.0000	18.4349	10.0000	18.4349	10.1906	1.2225			-8.2442
3	15.0000	22.7864	10.0000	18.4349	14.5421	1.2225			-8.2442
4	0.0000	0.0000	35.0000	36.2711	8.2442	19.0587			-8.2442
5	0.0000	0.0000	0.0000	0.0000	8.2442	17.2123			-4.2914
6									1.2225
7									1.2225
8									10.1906
9									14.5421
10									19.0587
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius, % total effective mortality 12/ 3/99

Sample ID: MWAS034R1		**Replicates:**	5
Alias: NAS #4272F - X1			
Mean:	16.000	**Transform Mean:**	23.358
SD:	5.477	**Transform SD:**	4.163

Reference ID: MWRC213R1		**Replicates:**	5
Alias: NAS #4274F - X2			
Mean:	12.000	**Transform Mean:**	17.212
SD:	13.509	**Transform SD:**	13.047

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	6.2838
SS:	750.2390
K:	5.0000
b:	26.0222
Alpha Level:	0.05
Calculated Value:	0.9025
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	2.6564
Test Residual SD:	2.9175
Reference Residual Mean:	8.6015
Reference Residual SD:	8.8172
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.4313
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	1.0035
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	15.0000	22.7864	5.0000	12.9209	0.5723	4.2914			-17.2123
2	25.0000	29.9999	10.0000	18.4349	6.6410	1.2225			-4.9239
3	15.0000	22.7864	10.0000	18.4349	0.5723	1.2225			-4.2914
4	15.0000	22.7864	35.0000	36.2711	0.5723	19.0587			-0.5723
5	10.0000	18.4349	0.0000	0.0000	4.9239	17.2123			-0.5723
6									-0.5723
7									1.2225
8									1.2225
9									6.6410
10									19.0587
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius, % total effective mortality 12/ 3/99

Sample ID: MWAS037R1		**Replicates:**	5
Alias: NAS #4273F - X1			
Mean:	6.000	**Transform Mean:**	12.542
SD:	4.183	**Transform SD:**	7.533

Reference ID: MWRC213R1		**Replicates:**	5
Alias: NAS #4274F - X2			
Mean:	12.000	**Transform Mean:**	17.212
SD:	13.509	**Transform SD:**	13.047

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	6.9127
SS:	907.9486
K:	5.0000
b:	29.2002
Alpha Level:	0.05
Calculated Value:	0.9391
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	5.0169
Test Residual SD:	5.0297
Reference Residual Mean:	8.6015
Reference Residual SD:	8.8172
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.7896
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-0.6931
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	5.0000	12.9209	5.0000	12.9209	0.3785	4.2914			-17.2123
2	10.0000	18.4349	10.0000	18.4349	5.8925	1.2225			-12.5423
3	0.0000	0.0000	10.0000	18.4349	12.5423	1.2225			-4.2914
4	5.0000	12.9209	35.0000	36.2711	0.3785	19.0587			0.3785
5	10.0000	18.4349	0.0000	0.0000	5.8925	17.2123			0.3785
6									1.2225
7									1.2225
8									5.8925
9									5.8925
10									19.0587
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5 Rhepoxynius % mortality 12/ 3/99

Sample ID: MWAT042R1		**Replicates:**	5	**Reference ID:** MWRC214R1		**Replicates:**	5
Alias: NAS #4231F - X1				**Alias:** NAS #4275F - X2			
Mean:	9.000	**Transform Mean:**	15.385	**Mean:**	4.000	**Transform Mean:**	8.85
SD:	6.519	**Transform SD:**	9.508	**SD:**	4.183	**Transform SD:**	8.391

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	5.8187
SS:	643.2948
K:	5.0000
b:	23.9977
Alpha Level:	0.05
Calculated Value:	0.8952
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	7.1402
Test Residual SD:	5.1652
Reference Residual Mean:	7.0842
Reference Residual SD:	2.7715
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.0213
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	1.1514
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	10.0000	18.4349	0.0000	0.0000	3.0491	8.8553			-15.3857
2	5.0000	12.9209	5.0000	12.9209	2.4648	4.0655			-8.8553
3	15.0000	22.7864	10.0000	18.4349	7.4006	9.5795			-8.8553
4	15.0000	22.7864	0.0000	0.0000	7.4006	8.8553			-2.4648
5	0.0000	0.0000	5.0000	12.9209	15.3857	4.0655			3.0491
6									4.0655
7									4.0655
8									7.4006
9									7.4006
10									9.5795
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5 Rhepoxynius, % mortality 12/ 3/99

Sample ID: MWAT045R1		**Replicates:**	5
Alias: NAS #4232F - X1			
Mean:	4.000	**Transform Mean:**	8.855
SD:	4.183	**Transform SD:**	8.391

Reference ID: MWRC214R1		**Replicates:**	5
Alias: NAS #4275F - X2			
Mean:	4.000	**Transform Mean:**	8.855
SD:	4.183	**Transform SD:**	8.391

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	5.4450
SS:	563.3206
K:	5.0000
b:	20.9946
Alpha Level:	0.05
Calculated Value:	0.7824
Critical Value:	<= 0.842
Normally Distributed:	No
Override Option:	

Levene's Results:

Test Residual Mean:	7.0842
Test Residual SD:	2.7715
Reference Residual Mean:	7.0842
Reference Residual SD:	2.7715
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.0000
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	5,5
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	12.5000
Critical Value:	>= 21.0
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	5.0000	6.5000	0.0000	2.5000	4.0655	8.8553	2.5000		-8.8553
2	0.0000	2.5000	5.0000	6.5000	8.8553	4.0655	2.5000		-8.8553
3	0.0000	2.5000	10.0000	9.5000	8.8553	9.5795	2.5000		-8.8553
4	5.0000	6.5000	0.0000	2.5000	4.0655	8.8553	2.5000		-8.8553
5	10.0000	9.5000	5.0000	6.5000	9.5795	4.0655	6.5000		4.0655
6							6.5000		4.0655
7							6.5000		4.0655
8							6.5000		4.0655
9							9.5000		9.5795
10							9.5000		9.5795
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Data for % total effective mortality comparison are identical to these

YMR
12-3-99

Project Name: P590-5 Rhepoxynius % mortality 12/ 3/99

Sample ID: MWAT044R1		**Replicates:**	5
Alias: NAS #4233F - X1			
Mean:	8.000	**Transform Mean:**	14.515
SD:	5.700	**Transform SD:**	8.837

Reference ID: MWRC214R1		**Replicates:**	5
Alias: NAS #4275F - X2			
Mean:	4.000	**Transform Mean:**	8.85
SD:	4.183	**Transform SD:**	8.391

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	5.5915
SS:	594.0347
K:	5.0000
b:	22.9235
Alpha Level:	0.05
Calculated Value:	0.8846
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

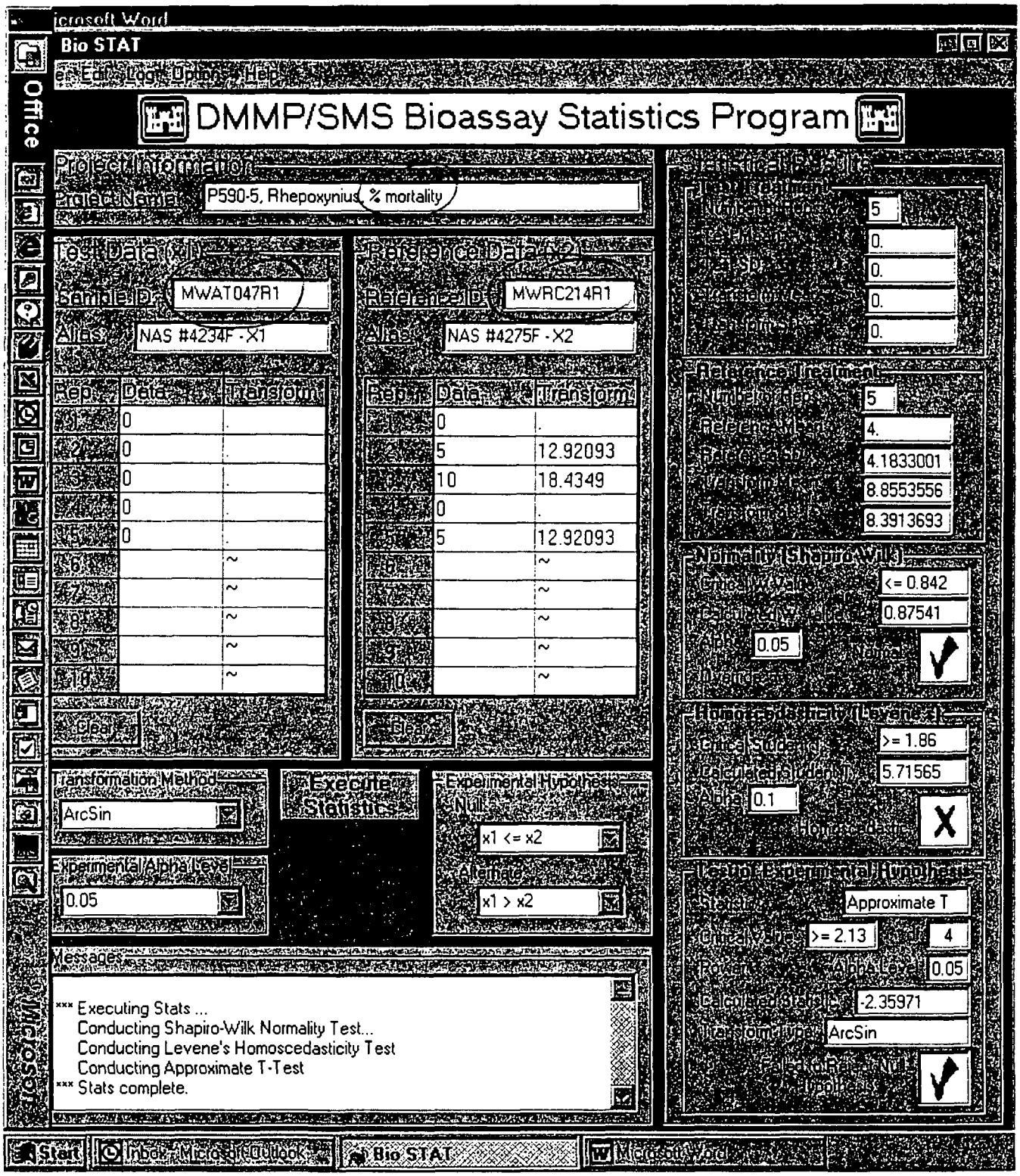
Levene's Results:

Test Residual Mean:	6.4439
Test Residual SD:	5.1173
Reference Residual Mean:	7.0842
Reference Residual SD:	2.7715
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.2460
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	1.0385
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	10.0000	18.4349	0.0000	0.0000	3.9194	8.8553			-14.5154
2	5.0000	12.9209	5.0000	12.9209	1.5945	4.0655			-8.8553
3	0.0000	0.0000	10.0000	18.4349	14.5154	9.5795			-8.8553
4	15.0000	22.7864	0.0000	0.0000	8.2710	8.8553			-1.5945
5	10.0000	18.4349	5.0000	12.9209	3.9194	4.0655			3.9194
6									3.9194
7									4.0655
8									4.0655
9									8.2710
10									9.5795
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									


Bio STAT
DMMP/SMS Bioassay Statistics Program
Project Information
Project Name: P590-5, Rhepoxynius % mortality
Test Data (x1)
Sample ID: MWAT047R1
Alias: NAS #4234F - X1
Rep | Data | Transform
1 | 0 | .
2 | 0 | .
3 | 0 | .
4 | 0 | .
5 | 0 | .
Reference Data (x2)
Reference ID: MWRC214R1
Alias: NAS #4275F - X2
Rep | Data | Transform
1 | 0 | .
2 | 5 | 12.92093
3 | 10 | 18.4349
4 | 0 | .
5 | 5 | 12.92093
Clear
Transformation Method
ArcSin
Execute Statistics
Experimental Hypothesis
Null
x1 <= x2
Alternate
x1 > x2
Experimental Alpha Level
0.05
Messages
*** Executing Stats ...
Conducting Shapiro-Wilk Normality Test...
Conducting Levene's Homoscedasticity Test
Conducting Approximate T-Test
*** Stats complete.
Statistical Results
Test Treatment
Number Rep: 5
Reference Treatment
Number Rep: 5
Reference Mean: 4.
Reference SD: 4.1833001
Variance Mean: 8.8553556
Variance SD: 8.3913693
Normality (Shapiro-Wilk)
Critical W Value: <= 0.842
Calculated W: 0.87541
Alpha: 0.05
Normal
Homogeneity (Levene's)
Critical Statistic: >= 1.86
Calculated Statistic: 5.71565
Alpha: 0.1
Homogeneous
Test for Experimental Hypothesis
Statistic: Approximate T
Critical Value: >= 2.13
Power: Alpha Level: 0.05
Calculated Statistic: -2.35971
Transformation Type: ArcSin
Reject Null Hypothesis
Start
Inbox - Microsoft Outlook
Bio STAT
Microsoft Word

Project Name: P590-5, Rhepoxynius % mortality

12/ 3/99

Sample ID: MWAT153R1		**Replicates:** 5	**Reference ID:** MWRC214R1		**Replicates:** 5
Alias: NAS #4235F - X1			**Alias:** NAS #4275F - X2		
Mean:	4.000	**Transform Mean:** 7.373	**Mean:**	4.000	**Transform Mean:** 8.85
SD:	5.477	**Transform SD:** 10.097	**SD:**	4.183	**Transform SD:** 8.391

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	6.0239
SS:	689.4752
K:	5.0000
b:	23.4708
Alpha Level:	0.05
Calculated Value:	0.7989
Critical Value:	<= 0.842
Normally Distributed:	No
Override Option:	

Levene's Results:

Test Residual Mean:	8.8487
Test Residual SD:	2.0194
Reference Residual Mean:	7.0842
Reference Residual SD:	2.7715
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.1505
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	5,5
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	12.0000
Critical Value:	>= 21.0
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	10.0000	9.0000	0.0000	3.0000	11.0609	8.8553	3.0000		-8.8553
2	0.0000	3.0000	5.0000	6.5000	7.3739	4.0655	3.0000		-8.8553
3	0.0000	3.0000	10.0000	9.0000	7.3739	9.5795	3.0000		-7.3739
4	0.0000	3.0000	0.0000	3.0000	7.3739	8.8553	3.0000		-7.3739
5	10.0000	9.0000	5.0000	6.5000	11.0609	4.0655	3.0000		-7.3739
6							6.5000		4.0655
7							6.5000		4.0655
8							9.0000		9.5795
9							9.0000		11.0609
10							9.0000		11.0609
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius % mortality 12/ 3/99

Sample ID: MWAT041R1		**Replicates:**	5
Alias: NAS #4245F - X1			
Mean:	8.000	**Transform Mean:**	15.996
SD:	4.472	**Transform SD:**	4.484

Reference ID: MWRC214R1		**Replicates:**	5
Alias: NAS #4275F - X2			
Mean:	4.000	**Transform Mean:**	8.855
SD:	4.183	**Transform SD:**	8.391

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	4.3654
SS:	362.0867
K:	5.0000
b:	18.3516
Alpha Level:	0.05
Calculated Value:	0.9301
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	3.6910
Test Residual SD:	1.7540
Reference Residual Mean:	7.0842
Reference Residual SD:	2.7715
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	2.3133
Critical Value:	>= 1.86
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	6
Experimental Alpha Level:	0.05
Calculated Value:	1.6783
Critical Value:	>= 1.943
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

cate ber	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	5.0000	12.9209	0.0000	0.0000	3.0758	8.8553			-8.8553
2	5.0000	12.9209	5.0000	12.9209	3.0758	4.0655			-8.8553
3	10.0000	18.4349	10.0000	18.4349	2.4380	9.5795			-3.0758
4	5.0000	12.9209	0.0000	0.0000	3.0758	8.8553			-3.0758
5	15.0000	22.7864	5.0000	12.9209	6.7896	4.0655			-3.0758
6									2.4380
7									4.0655
8									4.0655
9									6.7896
10									9.5795
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius, % mortality 12/ 3/99

Sample ID:	MWAT046R1	**Replicates:**	5	**Reference ID:**	MWRC214R1	**Replicates:**	5
Alias:	NAS #4246F - X1			**Alias:**	NAS #4275F - X2		
Mean:	3.000	**Transform Mean:**	6.271	**Mean:**	4.000	**Transform Mean:**	8.85
SD:	4.472	**Transform SD:**	8.805	**SD:**	4.183	**Transform SD:**	8.391

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	5.5810
SS:	591.8188
K:	5.0000
b:	22.5738
Alpha Level:	0.05
Calculated Value:	0.8610
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	7.5254
Test Residual SD:	2.5980
Reference Residual Mean:	7.0842
Reference Residual SD:	2.7715
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.2596
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-0.4750
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.0000	0.0000	0.0000	0.0000	6.2711	8.8553			-8.8553
2	10.0000	18.4349	5.0000	12.9209	12.1637	4.0655			-8.8553
3	5.0000	12.9209	10.0000	18.4349	6.6497	9.5795			-6.2711
4	0.0000	0.0000	0.0000	0.0000	6.2711	8.8553			-6.2711
5	0.0000	0.0000	5.0000	12.9209	6.2711	4.0655			-6.2711
6									4.0655
7									4.0655
8									6.6497
9									9.5795
10									12.1637
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5 Rhepoxynius, % mortality 12/ 3/99

Sample ID: MWAS034R1		**Replicates:**	5
Alias: NAS #4272F - X1			
Mean:	12.000	**Transform Mean:**	19.645
SD:	7.582	**Transform SD:**	6.261

Reference ID: MWRC214R1		**Replicates:**	5
Alias: NAS #4275F - X2			
Mean:	4.000	**Transform Mean:**	8.855
SD:	4.183	**Transform SD:**	8.391

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	4.8040
SS:	438.4909
K:	5.0000
b:	20.0474
Alpha Level:	0.05
Calculated Value:	0.9165
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	4.1419
Test Residual SD:	4.2146
Reference Residual Mean:	7.0842
Reference Residual SD:	2.7715
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.3043
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	2.3043
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	No
Power:	
Significant Diff for Power:	significantly different

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	5.0000	12.9209	0.0000	0.0000	6.7241	8.8553			-8.8553
2	25.0000	29.9999	5.0000	12.9209	10.3548	4.0655			-8.8553
3	10.0000	18.4349	10.0000	18.4349	1.2102	9.5795			-6.7241
4	10.0000	18.4349	0.0000	0.0000	1.2102	8.8553			-1.2102
5	10.0000	18.4349	5.0000	12.9209	1.2102	4.0655			-1.2102
6									-1.2102
7									4.0655
8									4.0655
9									9.5795
10									10.3548
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5 Rhepoxynius % mortality 12/ 3/99

Sample ID: MWAS037R1		**Replicates:**	5	**Reference ID:** MWRC214R1		**Replicates:**	5
Alias: NAS #4273F - X1				**Alias:** NAS #4275F - X2			
Mean:	5.000	**Transform Mean:**	9.958	**Mean:**	4.000	**Transform Mean:**	8.85
SD:	5.000	**Transform SD:**	9.365	**SD:**	4.183	**Transform SD:**	8.391

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	5.7696
SS:	632.4786
K:	5.0000
b:	22.6159
Alpha Level:	0.05
Calculated Value:	0.8086
Critical Value:	<= 0.842
Normally Distributed:	No
Override Option:	

Levene's Results:

Test Residual Mean:	7.9665
Test Residual SD:	2.8935
Reference Residual Mean:	7.0842
Reference Residual SD:	2.7715
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.4923
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	5,5
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	14.0000
Critical Value:	>= 21.0
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.0000	2.5000	0.0000	2.5000	9.9581	8.8553	2.5000		-9.9581
2	10.0000	9.0000	5.0000	6.0000	8.4767	4.0655	2.5000		-9.9581
3	0.0000	2.5000	10.0000	9.0000	9.9581	9.5795	2.5000		-8.8553
4	5.0000	6.0000	0.0000	2.5000	2.9627	8.8553	2.5000		-8.8553
5	10.0000	9.0000	5.0000	6.0000	8.4767	4.0655	6.0000		2.9627
6							6.0000		4.0655
7							6.0000		4.0655
8							9.0000		8.4767
9							9.0000		8.4767
10							9.0000		9.5795
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius, % total effective mortality 12/ 3/99

Sample ID: MWAT042R1		**Replicates:** 5	**Reference ID:** MWRC214R1		**Replicates:** 5
Alias: NAS #4231F - X1			**Alias:** NAS #4275F - X2		
Mean:	11.000	**Transform Mean:** 16.897	**Mean:**	4.000	**Transform Mean:** 8.855
SD:	8.944	**Transform SD:** 11.075	**SD:**	4.183	**Transform SD:** 8.391

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	6.3754
SS:	772.2831
K:	5.0000
b:	26.3737
Alpha Level:	0.05
Calculated Value:	0.9006
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	8.3493
Test Residual SD:	5.9595
Reference Residual Mean:	7.0842
Reference Residual SD:	2.7715
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.4304
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	1.2941
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	10.0000	18.4349	0.0000	0.0000	1.5377	8.8553			-16.8971
2	5.0000	12.9209	5.0000	12.9209	3.9762	4.0655			-8.8553
3	20.0000	26.5649	10.0000	18.4349	9.6678	9.5795			-8.8553
4	20.0000	26.5649	0.0000	0.0000	9.6678	8.8553			-3.9762
5	0.0000	0.0000	5.0000	12.9209	16.8971	4.0655			1.5377
6									4.0655
7									4.0655
8									9.5795
9									9.6678
10									9.6678
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius, % total effective mortality 12/ 6/99

Sample ID: MWAT045R1		**Replicates:**	5	**Reference ID:** MWRC214R1		**Replicates:**	5
Alias: NAS #4232F - X1				**Alias:** NAS #4275F - X2			
Mean:	4.000	**Transform Mean:**	8.855	**Mean:**	12.000	**Transform Mean:**	17.212
SD:	4.183	**Transform SD:**	8.391	**SD:**	13.509	**Transform SD:**	13.047

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	7.1176
SS:	962.5672
K:	5.0000
b:	30.6721
Alpha Level:	0.05
Calculated Value:	0.9773
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	7.0842
Test Residual SD:	2.7715
Reference Residual Mean:	8.6015
Reference Residual SD:	8.8172
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.3670
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-1.2046
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	5.0000	12.9209	5.0000	12.9209	4.0655	4.2914			-17.2123
2	0.0000	0.0000	10.0000	18.4349	8.8553	1.2225			-8.8553
3	0.0000	0.0000	10.0000	18.4349	8.8553	1.2225			-8.8553
4	5.0000	12.9209	35.0000	36.2711	4.0655	19.0587			-4.2914
5	10.0000	18.4349	0.0000	0.0000	9.5795	17.2123			1.2225
6									1.2225
7									4.0655
8									4.0655
9									9.5795
10									19.0587
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius, % total effective mortality 12/ 3/99

Sample ID: MWAT044R1		**Replicates:**	5
Alias: NAS #4233F - X1			
Mean:	13.000	**Transform Mean:**	18.226
SD:	12.041	**Transform SD:**	12.791

Reference ID: MWRC214R1		**Replicates:**	5
Alias: NAS #4275F - X2			
Mean:	4.000	**Transform Mean:**	8.855
SD:	4.183	**Transform SD:**	8.391

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	7.0192
SS:	936.1186
K:	5.0000
b:	30.1087
Alpha Level:	0.05
Calculated Value:	0.9684
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	9.4126
Test Residual SD:	7.2709
Reference Residual Mean:	7.0842
Reference Residual SD:	2.7715
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.6691
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	1.3697
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	10.0000	18.4349	0.0000	0.0000	0.2085	8.8553			-18.2263
2	5.0000	12.9209	5.0000	12.9209	5.3053	4.0655			-8.8553
3	0.0000	0.0000	10.0000	18.4349	18.2263	9.5795			-8.8553
4	20.0000	26.5649	0.0000	0.0000	8.3386	8.8553			-5.3053
5	30.0000	33.2108	5.0000	12.9209	14.9845	4.0655			0.2085
6									4.0655
7									4.0655
8									8.3386
9									9.5795
10									14.9845
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius, % total effective mortality 12/ 6/99

Sample ID: MWAT047R1		**Replicates:** 5	**Reference ID:** MWRC214R1		**Replicates:** 5
Alias: NAS #4234F - X1			**Alias:** NAS #4275F - X2		
Mean:	8.460	**Transform Mean:** 12.571	**Mean:**	12.000	**Transform Mean:** 17.212
SD:	11.318	**Transform SD:** 13.312	**SD:**	13.509	**Transform SD:** 13.047

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	8.5525
SS:	1,389.7675
K:	5.0000
b:	35.8391
Alpha Level:	0.05
Calculated Value:	0.9242
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	10.0568
Test Residual SD:	7.1266
Reference Residual Mean:	8.6015
Reference Residual SD:	8.8172
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.2870
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-0.5567
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.0000	0.0000	5.0000	12.9209	12.5710	4.2914			-17.2123
2	0.0000	0.0000	10.0000	18.4349	12.5710	1.2225			-12.5710
3	5.0000	12.9209	10.0000	18.4349	0.3498	1.2225			-12.5710
4	10.0000	18.4349	35.0000	36.2711	5.8638	19.0587			-4.2914
5	27.3000	31.4996	0.0000	0.0000	18.9285	17.2123			0.3498
6									1.2225
7									1.2225
8									5.8638
9									18.9285
10									19.0587
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius, % total effective mortality 12/ 3/99

Sample ID: MWAT153R1		**Replicates:**	5
Alias: NAS #4235F - X1			
Mean:	6.000	**Transform Mean:**	10.828
SD:	6.519	**Transform SD:**	10.485

Reference ID: MWRC214R1		**Replicates:**	5
Alias: NAS #4275F - X2			
Mean:	4.000	**Transform Mean:**	8.855
SD:	4.183	**Transform SD:**	8.391

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	6.1618
SS:	721.4012
K:	5.0000
b:	24.9781
Alpha Level:	0.05
Calculated Value:	0.8648
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	8.6627
Test Residual SD:	4.0163
Reference Residual Mean:	7.0842
Reference Residual SD:	2.7715
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.7233
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	0.3285
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	10.0000	18.4349	0.0000	0.0000	7.6064	8.8553			-10.8284
2	5.0000	12.9209	5.0000	12.9209	2.0924	4.0655			-10.8284
3	0.0000	0.0000	10.0000	18.4349	10.8284	9.5795			-8.8553
4	0.0000	0.0000	0.0000	0.0000	10.8284	8.8553			-8.8553
5	15.0000	22.7864	5.0000	12.9209	11.9579	4.0655			2.0924
6									4.0655
7									4.0655
8									7.6064
9									9.5795
10									11.9579
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius, % total effective mortality 12/ 3/99

Sample ID:	MWAT041R1	**Replicates:**	5	**Reference ID:**	MWRC214R1	**Replicates:**	5
Alias:	NAS #4245F - X1			**Alias:**	NAS #4275F - X2		
Mean:	11.000	**Transform Mean:**	18.378	**Mean:**	4.000	**Transform Mean:**	8.85
SD:	8.215	**Transform SD:**	7.473	**SD:**	4.183	**Transform SD:**	8.391

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	5.1557
SS:	505.0525
K:	5.0000
b:	20.6550
Alpha Level:	0.05
Calculated Value:	0.8447
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	6.5491
Test Residual SD:	1.4946
Reference Residual Mean:	7.0842
Reference Residual SD:	2.7715
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.3800
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: ArcSin

Experimental Hypothesis
Null: x1 <= x2
Alternate: x1 > x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	1.8950
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	No
Power:	
Significant Diff for Power:	significantly different

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	5.0000	12.9209	0.0000	0.0000	5.4576	8.8553			-8.8553
2	5.0000	12.9209	5.0000	12.9209	5.4576	4.0655			-8.8553
3	20.0000	26.5649	10.0000	18.4349	8.1864	9.5795			-5.4576
4	5.0000	12.9209	0.0000	0.0000	5.4576	8.8553			-5.4576
5	20.0000	26.5649	5.0000	12.9209	8.1864	4.0655			-5.4576
6									4.0655
7									4.0655
8									8.1864
9									8.1864
10									9.5795
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius, % total effective mortality 12/ 3/99

Sample ID: MWAT046R1		**Replicates:** 5	**Reference ID:** MWRC214R1		**Replicates:** 5
Alias: NAS #4246F - X1			**Alias:** NAS #4275F - X2		
Mean:	5.000	**Transform Mean:** 8.244	**Mean:**	4.000	**Transform Mean:** 8.855
SD:	7.071	**Transform SD:** 11.393	**SD:**	4.183	**Transform SD:** 8.391

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	6.4924
SS:	800.8881
K:	5.0000
b:	25.5098
Alpha Level:	0.05
Calculated Value:	0.8125
Critical Value:	<= 0.842
Normally Distributed:	No
Override Option:	

Levene's Results:

Test Residual Mean:	9.8931
Test Residual SD:	2.7321
Reference Residual Mean:	7.0842
Reference Residual SD:	2.7715
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.6138
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	5,5
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	12.5000
Critical Value:	>= 21.0
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.0000	3.0000	0.0000	3.0000	8.2442	8.8553	3.0000		-8.8553
2	10.0000	8.5000	5.0000	6.5000	10.1906	4.0655	3.0000		-8.8553
3	15.0000	10.0000	10.0000	8.5000	14.5421	9.5795	3.0000		-8.2442
4	0.0000	3.0000	0.0000	3.0000	8.2442	8.8553	3.0000		-8.2442
5	0.0000	3.0000	5.0000	6.5000	8.2442	4.0655	3.0000		-8.2442
6							6.5000		4.0655
7							6.5000		4.0655
8							8.5000		9.5795
9							8.5000		10.1906
10							10.0000		14.5421
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius, % total effective mortality 12/ 3/99

Sample ID: MWAS034R1		**Replicates:** 5	**Reference ID:** MWRC214R1		**Replicates:** 5
Alias: NAS #4272F - X1			**Alias:** NAS #4275F - X2		
Mean:	16.000	**Transform Mean:** 23.358	**Mean:**	4.000	**Transform Mean:** 8.85
SD:	5.477	**Transform SD:** 4.163	**SD:**	4.183	**Transform SD:** 8.391

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	4.2980
SS:	350.9924
K:	5.0000
b:	18.1720
Alpha Level:	0.05
Calculated Value:	0.9408
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	2.6564
Test Residual SD:	2.9175
Reference Residual Mean:	7.0842
Reference Residual SD:	2.7715
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	2.4604
Critical Value:	>= 1.86
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	6
Experimental Alpha Level:	0.05
Calculated Value:	3.4620
Critical Value:	>= 1.943
Failed to Reject Null Hypo:	No
Power:	significantly
Significant Diff for Power:	different

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	15.0000	22.7864	0.0000	0.0000	0.5723	8.8553			-8.8553
2	25.0000	29.9999	5.0000	12.9209	6.6410	4.0655			-8.8553
3	15.0000	22.7864	10.0000	18.4349	0.5723	9.5795			-4.9239
4	15.0000	22.7864	0.0000	0.0000	0.5723	8.8553			-0.5723
5	10.0000	18.4349	5.0000	12.9209	4.9239	4.0655			-0.5723
6									-0.5723
7									4.0655
8									4.0655
9									6.6410
10									9.5795
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-5, Rhepoxynius, % total effective mortality 12/ 3/99

Sample ID: MWAS037R1		**Replicates:**	5
Alias: NAS #4273F - X1			
Mean:	6.000	**Transform Mean:**	12.542
SD:	4.183	**Transform SD:**	7.533

Reference ID: MWRC214R1		**Replicates:**	5
Alias: NAS #4275F - X2			
Mean:	4.000	**Transform Mean:**	8.855
SD:	4.183	**Transform SD:**	8.391

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	5.1743
SS:	508.7019
K:	5.0000
b:	21.3052
Alpha Level:	0.05
Calculated Value:	0.8923
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	5.0169
Test Residual SD:	5.0297
Reference Residual Mean:	7.0842
Reference Residual SD:	2.7715
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.8049
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	0.7310
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	5.0000	12.9209	0.0000	0.0000	0.3785	8.8553			-12.5423
2	10.0000	18.4349	5.0000	12.9209	5.8925	4.0655			-8.8553
3	0.0000	0.0000	10.0000	18.4349	12.5423	9.5795			-8.8553
4	5.0000	12.9209	0.0000	0.0000	0.3785	8.8553			0.3785
5	10.0000	18.4349	5.0000	12.9209	5.8925	4.0655			0.3785
6									4.0655
7									4.0655
8									5.8925
9									5.8925
10									9.5795
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Emergence Data

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	EMERG	TOTAL EMERG		
1	68	4286F	control	1	1	0			
1	68	4286F	control	1	2	0			Data entry verified
1	68	4286F	control	1	3	0			10-26-99 by LKN
1	68	4286F	control	1	4	0			
1	68	4286F	control	1	5	0			
1	68	4286F	control	1	6	0			
1	68	4286F	control	1	7	0			
1	68	4286F	control	1	8	0			
1	68	4286F	control	1	9	0			
1	68	4286F	control	1	10	0	0		
2	50	4286F	control	2	1	0			
2	50	4286F	control	2	2	0			
2	50	4286F	control	2	3	0			
2	50	4286F	control	2	4	0			
2	50	4286F	control	2	5	0			
2	50	4286F	control	2	6	0			
2	50	4286F	control	2	7	0			
2	50	4286F	control	2	8	0			
2	50	4286F	control	2	9	0			
2	50	4286F	control	2	10	0	0		
3	85	4286F	control	3	1	0			
3	85	4286F	control	3	2	0			
3	85	4286F	control	3	3	0			
3	85	4286F	control	3	4	0			
3	85	4286F	control	3	5	0			
3	85	4286F	control	3	6	0			
3	85	4286F	control	3	7	0			
3	85	4286F	control	3	8	0			
3	85	4286F	control	3	9	0			
3	85	4286F	control	3	10	0	0		
4	55	4286F	control	4	1	0			
4	55	4286F	control	4	2	0			
4	55	4286F	control	4	3	0			
4	55	4286F	control	4	4	0			
4	55	4286F	control	4	5	0			
4	55	4286F	control	4	6	0			
4	55	4286F	control	4	7	0			
4	55	4286F	control	4	8	0			
4	55	4286F	control	4	9	0			
4	55	4286F	control	4	10	0	0		
5	29	4286F	control	5	1	0			
5	29	4286F	control	5	2	0			
5	29	4286F	control	5	3	0			
5	29	4286F	control	5	4	0			
5	29	4286F	control	5	5	0			
5	29	4286F	control	5	6	0			
5	29	4286F	control	5	7	0			
5	29	4286F	control	5	8	0		Mean	0.0
5	29	4286F	control	5	9	0		SD	0.0
5	29	4286F	control	5	10	0	0	n	5
9	18	4231F	MWAT042R1	1	1	0			
9	18	4231F	MWAT042R1	1	2	0			
9	18	4231F	MWAT042R1	1	3	0			
9	18	4231F	MWAT042R1	1	4	0			
9	18	4231F	MWAT042R1	1	5	0			
9	18	4231F	MWAT042R1	1	6	0			
9	18	4231F	MWAT042R1	1	7	0			
9	18	4231F	MWAT042R1	1	8	1			
9	18	4231F	MWAT042R1	1	9	2			
9	18	4231F	MWAT042R1	1	10	1	4		
10	36	4231F	MWAT042R1	2	1	0			
10	36	4231F	MWAT042R1	2	2	0			
10	36	4231F	MWAT042R1	2	3	0			
10	36	4231F	MWAT042R1	2	4	0			
10	36	4231F	MWAT042R1	2	5	0			
10	36	4231F	MWAT042R1	2	6	0			
10	36	4231F	MWAT042R1	2	7	0			
10	36	4231F	MWAT042R1	2	8	0			

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	EMERG	TOTAL EMERG		
10	36	4231F	MWAT042R1	2	9	0			
10	36	4231F	MWAT042R1	2	10	0	0		
11	86	4231F	MWAT042R1	3	1	0			
11	86	4231F	MWAT042R1	3	2	1			
11	86	4231F	MWAT042R1	3	3	0			
11	86	4231F	MWAT042R1	3	4	3			
11	86	4231F	MWAT042R1	3	5	3			
11	86	4231F	MWAT042R1	3	6	2			
11	86	4231F	MWAT042R1	3	7	1			
11	86	4231F	MWAT042R1	3	8	3			
11	86	4231F	MWAT042R1	3	9	2			
11	86	4231F	MWAT042R1	3	10	3	18		
12	74	4231F	MWAT042R1	4	1	0			
12	74	4231F	MWAT042R1	4	2	1			
12	74	4231F	MWAT042R1	4	3	1			
12	74	4231F	MWAT042R1	4	4	0			
12	74	4231F	MWAT042R1	4	5	0			
12	74	4231F	MWAT042R1	4	6	1			
12	74	4231F	MWAT042R1	4	7	0			
12	74	4231F	MWAT042R1	4	8	1			
12	74	4231F	MWAT042R1	4	9	2			
12	74	4231F	MWAT042R1	4	10	0	6		
13	51	4231F	MWAT042R1	5	1	0			
13	51	4231F	MWAT042R1	5	2	0			
13	51	4231F	MWAT042R1	5	3	0			
13	51	4231F	MWAT042R1	5	4	0			
13	51	4231F	MWAT042R1	5	5	0			
13	51	4231F	MWAT042R1	5	6	0			
13	51	4231F	MWAT042R1	5	7	0			
13	51	4231F	MWAT042R1	5	8	0		Mean	5.6
13	51	4231F	MWAT042R1	5	9	0		SD	7.4
13	51	4231F	MWAT042R1	5	10	0	0	n	5.0
17	5	4232F	MWAT045R1	1	1	0			
17	5	4232F	MWAT045R1	1	2	1			
17	5	4232F	MWAT045R1	1	3	0			
17	5	4232F	MWAT045R1	1	4	0			
17	5	4232F	MWAT045R1	1	5	0			
17	5	4232F	MWAT045R1	1	6	1			
17	5	4232F	MWAT045R1	1	7	1			
17	5	4232F	MWAT045R1	1	8	3			
17	5	4232F	MWAT045R1	1	9	0			
17	5	4232F	MWAT045R1	1	10	1	7		
18	27	4232F	MWAT045R1	2	1	0			
18	27	4232F	MWAT045R1	2	2	0			
18	27	4232F	MWAT045R1	2	3	0			
18	27	4232F	MWAT045R1	2	4	0			
18	27	4232F	MWAT045R1	2	5	0			
18	27	4232F	MWAT045R1	2	6	1			
18	27	4232F	MWAT045R1	2	7	0			
18	27	4232F	MWAT045R1	2	8	1			
18	27	4232F	MWAT045R1	2	9	0			
18	27	4232F	MWAT045R1	2	10	0	2		
19	65	4232F	MWAT045R1	3	1	0			
19	65	4232F	MWAT045R1	3	2	0			
19	65	4232F	MWAT045R1	3	3	0			
19	65	4232F	MWAT045R1	3	4	0			
19	65	4232F	MWAT045R1	3	5	0			
19	65	4232F	MWAT045R1	3	6	0			
19	65	4232F	MWAT045R1	3	7	0			
19	65	4232F	MWAT045R1	3	8	0			
19	65	4232F	MWAT045R1	3	9	0			
19	65	4232F	MWAT045R1	3	10	1	1		
20	38	4232F	MWAT045R1	4	1	0			
20	38	4232F	MWAT045R1	4	2	0			
20	38	4232F	MWAT045R1	4	3	0			
20	38	4232F	MWAT045R1	4	4	0			
20	38	4232F	MWAT045R1	4	5	0			
20	38	4232F	MWAT045R1	4	6	0			

Emergence Data

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	EMERG	TOTAL EMERG		
20	38	4232F	MWAT045R1	4	7	0			
20	38	4232F	MWAT045R1	4	8	0			
20	38	4232F	MWAT045R1	4	9	0			
20	38	4232F	MWAT045R1	4	10	0	0		
21	49	4232F	MWAT045R1	5	1	1			
21	49	4232F	MWAT045R1	5	2	1			
21	49	4232F	MWAT045R1	5	3	0			
21	49	4232F	MWAT045R1	5	4	0			
21	49	4232F	MWAT045R1	5	5	1			
21	49	4232F	MWAT045R1	5	6	1			
21	49	4232F	MWAT045R1	5	7	1			
21	49	4232F	MWAT045R1	5	8	2		Mean	3.4
21	49	4232F	MWAT045R1	5	9	0		SD	3.4
21	49	4232F	MWAT045R1	5	10	0	7	n	5.0
25	58	4233F	MWAT044R1	1	1	0			
25	58	4233F	MWAT044R1	1	2	1			
25	58	4233F	MWAT044R1	1	3	2			
25	58	4233F	MWAT044R1	1	4	0			
25	58	4233F	MWAT044R1	1	5	0			
25	58	4233F	MWAT044R1	1	6	1			
25	58	4233F	MWAT044R1	1	7	2			
25	58	4233F	MWAT044R1	1	8	4			
25	58	4233F	MWAT044R1	1	9	3			
25	58	4233F	MWAT044R1	1	10	3	16		
26	40	4233F	MWAT044R1	2	1	0			
26	40	4233F	MWAT044R1	2	2	0			
26	40	4233F	MWAT044R1	2	3	0			
26	40	4233F	MWAT044R1	2	4	0			
26	40	4233F	MWAT044R1	2	5	0			
26	40	4233F	MWAT044R1	2	6	1			
26	40	4233F	MWAT044R1	2	7	0			
26	40	4233F	MWAT044R1	2	8	2			
26	40	4233F	MWAT044R1	2	9	1			
26	40	4233F	MWAT044R1	2	10	1	5		
27	60	4233F	MWAT044R1	3	1	0			
27	60	4233F	MWAT044R1	3	2	0			
27	60	4233F	MWAT044R1	3	3	0			
27	60	4233F	MWAT044R1	3	4	2			
27	60	4233F	MWAT044R1	3	5	0			
27	60	4233F	MWAT044R1	3	6	2			
27	60	4233F	MWAT044R1	3	7	1			
27	60	4233F	MWAT044R1	3	8	1			
27	60	4233F	MWAT044R1	3	9	1			
27	60	4233F	MWAT044R1	3	10	2	9		
28	67	4233F	MWAT044R1	4	1	0			
28	67	4233F	MWAT044R1	4	2	0			
28	67	4233F	MWAT044R1	4	3	1			
28	67	4233F	MWAT044R1	4	4	2			
28	67	4233F	MWAT044R1	4	5	3			
28	67	4233F	MWAT044R1	4	6	4			
28	67	4233F	MWAT044R1	4	7	2			
28	67	4233F	MWAT044R1	4	8	3			
28	67	4233F	MWAT044R1	4	9	1			
28	67	4233F	MWAT044R1	4	10	2	18		
29	9	4233F	MWAT044R1	5	1	0			
29	9	4233F	MWAT044R1	5	2	0			
29	9	4233F	MWAT044R1	5	3	0			
29	9	4233F	MWAT044R1	5	4	0			
29	9	4233F	MWAT044R1	5	5	2			
29	9	4233F	MWAT044R1	5	6	3			
29	9	4233F	MWAT044R1	5	7	0			
29	9	4233F	MWAT044R1	5	8	2		Mean	11.6
29	9	4233F	MWAT044R1	5	9	3		SD	5.3
29	9	4233F	MWAT044R1	5	10	0	10	n	5.0
33	77	4234F	MWAT047R1	1	1	0			
33	77	4234F	MWAT047R1	1	2	0			
33	77	4234F	MWAT047R1	1	3	0			
33	77	4234F	MWAT047R1	1	4	0			

Emergence Data

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	EMERG	TOTAL EMERG		
33	77	4234F	MWAT047R1	1	5	1			
33	77	4234F	MWAT047R1	1	6	1			
33	77	4234F	MWAT047R1	1	7	1			
33	77	4234F	MWAT047R1	1	8	2			
33	77	4234F	MWAT047R1	1	9	1			
33	77	4234F	MWAT047R1	1	10	2	8		
34	17	4234F	MWAT047R1	2	1	0			
34	17	4234F	MWAT047R1	2	2	2			
34	17	4234F	MWAT047R1	2	3	0			
34	17	4234F	MWAT047R1	2	4	0			
34	17	4234F	MWAT047R1	2	5	0			
34	17	4234F	MWAT047R1	2	6	1			
34	17	4234F	MWAT047R1	2	7	1			
34	17	4234F	MWAT047R1	2	8	3			
34	17	4234F	MWAT047R1	2	9	1			
34	17	4234F	MWAT047R1	2	10	0	8		
35	87	4234F	MWAT047R1	3	1	0			
35	87	4234F	MWAT047R1	3	2	0			
35	87	4234F	MWAT047R1	3	3	1			
35	87	4234F	MWAT047R1	3	4	4			
35	87	4234F	MWAT047R1	3	5	2			
35	87	4234F	MWAT047R1	3	6	0			
35	87	4234F	MWAT047R1	3	7	1			
35	87	4234F	MWAT047R1	3	8	0			
35	87	4234F	MWAT047R1	3	9	0			
35	87	4234F	MWAT047R1	3	10	0	8		
36	35	4234F	MWAT047R1	4	1	0			
36	35	4234F	MWAT047R1	4	2	0			
36	35	4234F	MWAT047R1	4	3	1			
36	35	4234F	MWAT047R1	4	4	0			
36	35	4234F	MWAT047R1	4	5	0			
36	35	4234F	MWAT047R1	4	6	0			
36	35	4234F	MWAT047R1	4	7	0			
36	35	4234F	MWAT047R1	4	8	1			
36	35	4234F	MWAT047R1	4	9	1			
36	35	4234F	MWAT047R1	4	10	0	3		
37	15	4234F	MWAT047R1	5	1	0			
37	15	4234F	MWAT047R1	5	2	0			
37	15	4234F	MWAT047R1	5	3	0			
37	15	4234F	MWAT047R1	5	4	0			
37	15	4234F	MWAT047R1	5	5	1			
37	15	4234F	MWAT047R1	5	6	3			
37	15	4234F	MWAT047R1	5	7	1			
37	15	4234F	MWAT047R1	5	8	2		Mean	7.4
37	15	4234F	MWAT047R1	5	9	1		SD	2.6
37	15	4234F	MWAT047R1	5	10	2	10	n	5.0
41	72	4235F	MWAT153R1	1	1	0			
41	72	4235F	MWAT153R1	1	2	0			
41	72	4235F	MWAT153R1	1	3	0			
41	72	4235F	MWAT153R1	1	4	1			
41	72	4235F	MWAT153R1	1	5	1			
41	72	4235F	MWAT153R1	1	6	3			
41	72	4235F	MWAT153R1	1	7	0			
41	72	4235F	MWAT153R1	1	8	1			
41	72	4235F	MWAT153R1	1	9	2			
41	72	4235F	MWAT153R1	1	10	2	10		
42	33	4235F	MWAT153R1	2	1	0			
42	33	4235F	MWAT153R1	2	2	0			
42	33	4235F	MWAT153R1	2	3	0			
42	33	4235F	MWAT153R1	2	4	0			
42	33	4235F	MWAT153R1	2	5	1			
42	33	4235F	MWAT153R1	2	6	0			
42	33	4235F	MWAT153R1	2	7	0			
42	33	4235F	MWAT153R1	2	8	0			
42	33	4235F	MWAT153R1	2	9	0			
42	33	4235F	MWAT153R1	2	10	0	1		
43	61	4235F	MWAT153R1	3	1	0			
43	61	4235F	MWAT153R1	3	2	0			

Emergence Data

		NAS	CLIENT				TOTAL		
INDEX	BKR	SMPL	DESCRIP	REPL	DAY	EMERG	EMERG		
43	61	4235F	MWAT153R1	3	3	0			
43	61	4235F	MWAT153R1	3	4	0			
43	61	4235F	MWAT153R1	3	5	0			
43	61	4235F	MWAT153R1	3	6	0			
43	61	4235F	MWAT153R1	3	7	0			
43	61	4235F	MWAT153R1	3	8	0			
43	61	4235F	MWAT153R1	3	9	0			
43	61	4235F	MWAT153R1	3	10	1	1		
44	39	4235F	MWAT153R1	4	1	0			
44	39	4235F	MWAT153R1	4	2	0			
44	39	4235F	MWAT153R1	4	3	0			
44	39	4235F	MWAT153R1	4	4	1			
44	39	4235F	MWAT153R1	4	5	0			
44	39	4235F	MWAT153R1	4	6	0			
44	39	4235F	MWAT153R1	4	7	0			
44	39	4235F	MWAT153R1	4	8	0			
44	39	4235F	MWAT153R1	4	9	0			
44	39	4235F	MWAT153R1	4	10	0	1		
45	31	4235F	MWAT153R1	5	1	0			
45	31	4235F	MWAT153R1	5	2	0			
45	31	4235F	MWAT153R1	5	3	0			
45	31	4235F	MWAT153R1	5	4	0			
45	31	4235F	MWAT153R1	5	5	1			
45	31	4235F	MWAT153R1	5	6	1			
45	31	4235F	MWAT153R1	5	7	1			
45	31	4235F	MWAT153R1	5	8	1		Mean	3.4
45	31	4235F	MWAT153R1	5	9	0		SD	3.9
45	31	4235F	MWAT153R1	5	10	0	4	n	5.0
49	19	4245F	MWAT041R1	1	1	0			
49	19	4245F	MWAT041R1	1	2	2			
49	19	4245F	MWAT041R1	1	3	1			
49	19	4245F	MWAT041R1	1	4	1			
49	19	4245F	MWAT041R1	1	5	1			
49	19	4245F	MWAT041R1	1	6	2			
49	19	4245F	MWAT041R1	1	7	3			
49	19	4245F	MWAT041R1	1	8	1			
49	19	4245F	MWAT041R1	1	9	3			
49	19	4245F	MWAT041R1	1	10	7	21		
50	25	4245F	MWAT041R1	2	1	1			
50	25	4245F	MWAT041R1	2	2	1			
50	25	4245F	MWAT041R1	2	3	0			
50	25	4245F	MWAT041R1	2	4	1			
50	25	4245F	MWAT041R1	2	5	1			
50	25	4245F	MWAT041R1	2	6	1			
50	25	4245F	MWAT041R1	2	7	4			
50	25	4245F	MWAT041R1	2	8	3			
50	25	4245F	MWAT041R1	2	9	2			
50	25	4245F	MWAT041R1	2	10	1	15		
51	30	4245F	MWAT041R1	3	1	0			
51	30	4245F	MWAT041R1	3	2	0			
51	30	4245F	MWAT041R1	3	3	0			
51	30	4245F	MWAT041R1	3	4	0			
51	30	4245F	MWAT041R1	3	5	0			
51	30	4245F	MWAT041R1	3	6	0			
51	30	4245F	MWAT041R1	3	7	0			
51	30	4245F	MWAT041R1	3	8	0			
51	30	4245F	MWAT041R1	3	9	0			
51	30	4245F	MWAT041R1	3	10	1	1		
52	11	4245F	MWAT041R1	4	1	3			
52	11	4245F	MWAT041R1	4	2	0			
52	11	4245F	MWAT041R1	4	3	1			
52	11	4245F	MWAT041R1	4	4	1			
52	11	4245F	MWAT041R1	4	5	0			
52	11	4245F	MWAT041R1	4	6	0			
52	11	4245F	MWAT041R1	4	7	0			
52	11	4245F	MWAT041R1	4	8	3			
52	11	4245F	MWAT041R1	4	9	2			
52	11	4245F	MWAT041R1	4	10	1	11		

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	EMERG	TOTAL EMERG		
53	57	4245F	MWAT041R1	5	1	0			
53	57	4245F	MWAT041R1	5	2	0			
53	57	4245F	MWAT041R1	5	3	1			
53	57	4245F	MWAT041R1	5	4	0			
53	57	4245F	MWAT041R1	5	5	0			
53	57	4245F	MWAT041R1	5	6	0			
53	57	4245F	MWAT041R1	5	7	0			
53	57	4245F	MWAT041R1	5	8	3		Mean	11.4
53	57	4245F	MWAT041R1	5	9	1		SD	7.4
53	57	4245F	MWAT041R1	5	10	4	9	n	5.0
57	83	4246F	MWAT046R1	1	1	0			
57	83	4246F	MWAT046R1	1	2	1			
57	83	4246F	MWAT046R1	1	3	0			
57	83	4246F	MWAT046R1	1	4	0			
57	83	4246F	MWAT046R1	1	5	2			
57	83	4246F	MWAT046R1	1	6	2			
57	83	4246F	MWAT046R1	1	7	2			
57	83	4246F	MWAT046R1	1	8	2			
57	83	4246F	MWAT046R1	1	9	3			
57	83	4246F	MWAT046R1	1	10	2	14		
58	73	4246F	MWAT046R1	2	1	0			
58	73	4246F	MWAT046R1	2	2	0			
58	73	4246F	MWAT046R1	2	3	0			
58	73	4246F	MWAT046R1	2	4	2			
58	73	4246F	MWAT046R1	2	5	0			
58	73	4246F	MWAT046R1	2	6	0			
58	73	4246F	MWAT046R1	2	7	0			
58	73	4246F	MWAT046R1	2	8	0			
58	73	4246F	MWAT046R1	2	9	1			
58	73	4246F	MWAT046R1	2	10	1	4		
59	21	4246F	MWAT046R1	3	1	0			
59	21	4246F	MWAT046R1	3	2	0			
59	21	4246F	MWAT046R1	3	3	0			
59	21	4246F	MWAT046R1	3	4	0			
59	21	4246F	MWAT046R1	3	5	0			
59	21	4246F	MWAT046R1	3	6	1			
59	21	4246F	MWAT046R1	3	7	1			
59	21	4246F	MWAT046R1	3	8	1			
59	21	4246F	MWAT046R1	3	9	2			
59	21	4246F	MWAT046R1	3	10	5	10		
60	92	4246F	MWAT046R1	4	1	0			
60	92	4246F	MWAT046R1	4	2	0			
60	92	4246F	MWAT046R1	4	3	1			
60	92	4246F	MWAT046R1	4	4	1			
60	92	4246F	MWAT046R1	4	5	1			
60	92	4246F	MWAT046R1	4	6	1			
60	92	4246F	MWAT046R1	4	7	1			
60	92	4246F	MWAT046R1	4	8	1			
60	92	4246F	MWAT046R1	4	9	1			
60	92	4246F	MWAT046R1	4	10	1	8		
61	89	4246F	MWAT046R1	5	1	1			
61	89	4246F	MWAT046R1	5	2	0			
61	89	4246F	MWAT046R1	5	3	1			
61	89	4246F	MWAT046R1	5	4	0			
61	89	4246F	MWAT046R1	5	5	0			
61	89	4246F	MWAT046R1	5	6	0			
61	89	4246F	MWAT046R1	5	7	1			
61	89	4246F	MWAT046R1	5	8	1		Mean	8.6
61	89	4246F	MWAT046R1	5	9	2		SD	3.7
61	89	4246F	MWAT046R1	5	10	1	7	n	5.0
65	66	4272F	MWAS034R1	1	1	0			
65	66	4272F	MWAS034R1	1	2	1			
65	66	4272F	MWAS034R1	1	3	2			
65	66	4272F	MWAS034R1	1	4	1			
65	66	4272F	MWAS034R1	1	5	0			
65	66	4272F	MWAS034R1	1	6	2			
65	66	4272F	MWAS034R1	1	7	1			
65	66	4272F	MWAS034R1	1	8	0			

Emergence Data

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	EMERG	TOTAL EMERG		
65	66	4272F	MWAS034R1	1	9	3			
65	66	4272F	MWAS034R1	1	10	6	16		
66	53	4272F	MWAS034R1	2	1	0			
66	53	4272F	MWAS034R1	2	2	0			
66	53	4272F	MWAS034R1	2	3	0			
66	53	4272F	MWAS034R1	2	4	1			
66	53	4272F	MWAS034R1	2	5	2			
66	53	4272F	MWAS034R1	2	6	4			
66	53	4272F	MWAS034R1	2	7	0			
66	53	4272F	MWAS034R1	2	8	0			
66	53	4272F	MWAS034R1	2	9	2			
66	53	4272F	MWAS034R1	2	10	3	12		
67	2	4272F	MWAS034R1	3	1	0			
67	2	4272F	MWAS034R1	3	2	0			
67	2	4272F	MWAS034R1	3	3	0			
67	2	4272F	MWAS034R1	3	4	0			
67	2	4272F	MWAS034R1	3	5	0			
67	2	4272F	MWAS034R1	3	6	0			
67	2	4272F	MWAS034R1	3	7	0			
67	2	4272F	MWAS034R1	3	8	1			
67	2	4272F	MWAS034R1	3	9	0			
67	2	4272F	MWAS034R1	3	10	0	1		
68	6	4272F	MWAS034R1	4	1	0			
68	6	4272F	MWAS034R1	4	2	0			
68	6	4272F	MWAS034R1	4	3	0			
68	6	4272F	MWAS034R1	4	4	0			
68	6	4272F	MWAS034R1	4	5	0			
68	6	4272F	MWAS034R1	4	6	1			
68	6	4272F	MWAS034R1	4	7	0			
68	6	4272F	MWAS034R1	4	8	2			
68	6	4272F	MWAS034R1	4	9	3			
68	6	4272F	MWAS034R1	4	10	1	7		
69	12	4272F	MWAS034R1	5	1	0			
69	12	4272F	MWAS034R1	5	2	0			
69	12	4272F	MWAS034R1	5	3	1			
69	12	4272F	MWAS034R1	5	4	0			
69	12	4272F	MWAS034R1	5	5	0			
69	12	4272F	MWAS034R1	5	6	1			
69	12	4272F	MWAS034R1	5	7	0			
69	12	4272F	MWAS034R1	5	8	2		Mean	8.4
69	12	4272F	MWAS034R1	5	9	1		SD	5.8
69	12	4272F	MWAS034R1	5	10	1	6	n	5.0
73	8	4273F	MWAS037R1	1	1	0			
73	8	4273F	MWAS037R1	1	2	2			
73	8	4273F	MWAS037R1	1	3	1			
73	8	4273F	MWAS037R1	1	4	3			
73	8	4273F	MWAS037R1	1	5	1			
73	8	4273F	MWAS037R1	1	6	2			
73	8	4273F	MWAS037R1	1	7	0			
73	8	4273F	MWAS037R1	1	8	1			
73	8	4273F	MWAS037R1	1	9	1			
73	8	4273F	MWAS037R1	1	10	3	14		
74	41	4273F	MWAS037R1	2	1	1			
74	41	4273F	MWAS037R1	2	2	1			
74	41	4273F	MWAS037R1	2	3	1			
74	41	4273F	MWAS037R1	2	4	1			
74	41	4273F	MWAS037R1	2	5	1			
74	41	4273F	MWAS037R1	2	6	2			
74	41	4273F	MWAS037R1	2	7	3			
74	41	4273F	MWAS037R1	2	8	5			
74	41	4273F	MWAS037R1	2	9	2			
74	41	4273F	MWAS037R1	2	10	0	17		
75	34	4273F	MWAS037R1	3	1	0			
75	34	4273F	MWAS037R1	3	2	2			
75	34	4273F	MWAS037R1	3	3	1			
75	34	4273F	MWAS037R1	3	4	0			
75	34	4273F	MWAS037R1	3	5	1			
75	34	4273F	MWAS037R1	3	6	2			

Emergence Data

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	EMERG	TOTAL EMERG		
75	34	4273F	MWAS037R1	3	7	2			
75	34	4273F	MWAS037R1	3	8	1			
75	34	4273F	MWAS037R1	3	9	1			
75	34	4273F	MWAS037R1	3	10	0	10		
76	14	4273F	MWAS037R1	4	1	0			
76	14	4273F	MWAS037R1	4	2	1			
76	14	4273F	MWAS037R1	4	3	0			
76	14	4273F	MWAS037R1	4	4	0			
76	14	4273F	MWAS037R1	4	5	0			
76	14	4273F	MWAS037R1	4	6	1			
76	14	4273F	MWAS037R1	4	7	1			
76	14	4273F	MWAS037R1	4	8	1			
76	14	4273F	MWAS037R1	4	9	0			
76	14	4273F	MWAS037R1	4	10	3	7		
77	32	4273F	MWAS037R1	5	1	0			
77	32	4273F	MWAS037R1	5	2	3			
77	32	4273F	MWAS037R1	5	3	0			
77	32	4273F	MWAS037R1	5	4	1			
77	32	4273F	MWAS037R1	5	5	2			
77	32	4273F	MWAS037R1	5	6	3			
77	32	4273F	MWAS037R1	5	7	3			
77	32	4273F	MWAS037R1	5	8	4		Mean	13.8
77	32	4273F	MWAS037R1	5	9	2		SD	5.5
77	32	4273F	MWAS037R1	5	10	3	21	n	5.0
81	70	4274F	MWRC213R1	1	1	1			
81	70	4274F	MWRC213R1	1	2	0			
81	70	4274F	MWRC213R1	1	3	1			
81	70	4274F	MWRC213R1	1	4	4			
81	70	4274F	MWRC213R1	1	5	2			
81	70	4274F	MWRC213R1	1	6	2			
81	70	4274F	MWRC213R1	1	7	2			
81	70	4274F	MWRC213R1	1	8	4			
81	70	4274F	MWRC213R1	1	9	4			
81	70	4274F	MWRC213R1	1	10	2	22		
82	63	4274F	MWRC213R1	2	1	2			
82	63	4274F	MWRC213R1	2	2	2			
82	63	4274F	MWRC213R1	2	3	2			
82	63	4274F	MWRC213R1	2	4	0			
82	63	4274F	MWRC213R1	2	5	2			
82	63	4274F	MWRC213R1	2	6	1			
82	63	4274F	MWRC213R1	2	7	1			
82	63	4274F	MWRC213R1	2	8	3			
82	63	4274F	MWRC213R1	2	9	3			
82	63	4274F	MWRC213R1	2	10	5	21		
83	46	4274F	MWRC213R1	3	1	1			
83	46	4274F	MWRC213R1	3	2	3			
83	46	4274F	MWRC213R1	3	3	3			
83	46	4274F	MWRC213R1	3	4	3			
83	46	4274F	MWRC213R1	3	5	3			
83	46	4274F	MWRC213R1	3	6	3			
83	46	4274F	MWRC213R1	3	7	2			
83	46	4274F	MWRC213R1	3	8	3			
83	46	4274F	MWRC213R1	3	9	1			
83	46	4274F	MWRC213R1	3	10	2	24		
84	56	4274F	MWRC213R1	4	1	1			
84	56	4274F	MWRC213R1	4	2	1			
84	56	4274F	MWRC213R1	4	3	1			
84	56	4274F	MWRC213R1	4	4	0			
84	56	4274F	MWRC213R1	4	5	0			
84	56	4274F	MWRC213R1	4	6	2			
84	56	4274F	MWRC213R1	4	7	0			
84	56	4274F	MWRC213R1	4	8	2			
84	56	4274F	MWRC213R1	4	9	4			
84	56	4274F	MWRC213R1	4	10	4	15		
85	16	4274F	MWRC213R1	5	1	1			
85	16	4274F	MWRC213R1	5	2	1			
85	16	4274F	MWRC213R1	5	3	0			
85	16	4274F	MWRC213R1	5	4	0			

Emergence Data

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	EMERG	TOTAL EMERG		
85	16	4274F	MWRC213R1	5	5	0			
85	16	4274F	MWRC213R1	5	6	0			
85	16	4274F	MWRC213R1	5	7				
85	16	4274F	MWRC213R1	5	8	0		Mean	17.4
85	16	4274F	MWRC213R1	5	9	1		SD	7.7
85	16	4274F	MWRC213R1	5	10	2	5	n	5.0
89	80	4275F	MWRC214R1	1	1	0			
89	80	4275F	MWRC214R1	1	2	0			
89	80	4275F	MWRC214R1	1	3	0			
89	80	4275F	MWRC214R1	1	4	0			
89	80	4275F	MWRC214R1	1	5	0			
89	80	4275F	MWRC214R1	1	6	0			
89	80	4275F	MWRC214R1	1	7	0			
89	80	4275F	MWRC214R1	1	8	0			
89	80	4275F	MWRC214R1	1	9	1			
89	80	4275F	MWRC214R1	1	10	0	1		
90	44	4275F	MWRC214R1	2	1	0			
90	44	4275F	MWRC214R1	2	2	0			
90	44	4275F	MWRC214R1	2	3	0			
90	44	4275F	MWRC214R1	2	4	0			
90	44	4275F	MWRC214R1	2	5	0			
90	44	4275F	MWRC214R1	2	6	0			
90	44	4275F	MWRC214R1	2	7	0			
90	44	4275F	MWRC214R1	2	8	0			
90	44	4275F	MWRC214R1	2	9	1			
90	44	4275F	MWRC214R1	2	10	0	1		
91	54	4275F	MWRC214R1	3	1	0			
91	54	4275F	MWRC214R1	3	2	0			
91	54	4275F	MWRC214R1	3	3	0			
91	54	4275F	MWRC214R1	3	4	0			
91	54	4275F	MWRC214R1	3	5	0			
91	54	4275F	MWRC214R1	3	6	0			
91	54	4275F	MWRC214R1	3	7	0			
91	54	4275F	MWRC214R1	3	8	0			
91	54	4275F	MWRC214R1	3	9	2			
91	54	4275F	MWRC214R1	3	10	0	2		
92	3	4275F	MWRC214R1	4	1	0			
92	3	4275F	MWRC214R1	4	2	0			
92	3	4275F	MWRC214R1	4	3	0			
92	3	4275F	MWRC214R1	4	4	0			
92	3	4275F	MWRC214R1	4	5	0			
92	3	4275F	MWRC214R1	4	6	0			
92	3	4275F	MWRC214R1	4	7	0			
92	3	4275F	MWRC214R1	4	8	0			
92	3	4275F	MWRC214R1	4	9	0			
92	3	4275F	MWRC214R1	4	10	0	0		
93	81	4275F	MWRC214R1	5	1	0			
93	81	4275F	MWRC214R1	5	2	0			
93	81	4275F	MWRC214R1	5	3	0			
93	81	4275F	MWRC214R1	5	4	0			
93	81	4275F	MWRC214R1	5	5	0			
93	81	4275F	MWRC214R1	5	6	0			
93	81	4275F	MWRC214R1	5	7	0			
93	81	4275F	MWRC214R1	5	8	1		Mean	1.0
93	81	4275F	MWRC214R1	5	9	0		SD	0.7
93	81	4275F	MWRC214R1	5	10	0	1	n	5.0

APPENDIX III

RAW DATA – REFERENCE TOXICANT TEST

Water Quality Data

					Overlying Water Quality						Interstitial Water Quality			
BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	TEMP	DO	SAL	pH	S	NH3	SAL	pH	S	NH3
7	4246F	MWAT046R1	6	0	16.1	8.0	28.0	7.8	<0.02	1.0				
42	4246F	MWAT046R1	8	0									<1.0	7.5
13	4245F	MWAT041R1	6	0	16.2	8.0	28.0	7.8	<0.02	0.5				
4	4245F	MWAT041R1	8	0									<1.0	2.5
22	4232F	MWAT045R1	6	0	16.1	8.0	28.0	7.8	<0.02	1.0				
79	4232F	MWAT045R1	8	0									<1.0	7.5
23	4235F	MWAT153R1	6	0	16.0	8.0	28.0	7.6	<0.02	1.0				
94	4235F	MWAT153R1	8	0									<1.0	5.0
24	4275F	MWRC214R1	6	0	16.0	8.0	28.0	7.9	<0.02	1.5				
59	4275F	MWRC214R1	8	0									<1.0	12.5
47	4231F	MWAT042R1	6	0	15.7	8.0	28.0	7.8	<0.02	2.0				
84	4231F	MWAT042R1	8	0									<1.0	12.5
48	4274F	MWRC213R1	6	0	15.7	8.0	28.5	7.9	<0.02	0.5				
71	4274F	MWRC213R1	8	0									1.75	5.0
62	4286F	control	6	0	15.6	8.0	28.0	7.9	<0.02	<0.5				
96	4286F	control	8	0									<1.0	<2.5
75	4272F	MWAS034R1	6	0	15.5	8.0	28.0	7.8	<0.02	0.5				
82	4272F	MWAS034R1	8	0									<1.0	5.0
78	4273F	MWAS037R1	6	0	15.5	7.9	28.0	7.9	<0.02	<0.5				
91	4273F	MWAS037R1	8	0									<1.0	<2.5
90	4233F	MWAT044R1	6	0	15.5	8.0	28.0	7.8	<0.02	0.5				
10	4233F	MWAT044R1	8	0									<1.0	2.5
93	4234F	MWAT047R1	6	0	15.6	8.1	28.0	8.0	<0.02	1.0				
37	4234F	MWAT047R1	8	0									<1.0	2.5
7	4246F	MWAT046R1	6	1	15.9	8.0	28.0	8.2						
13	4245F	MWAT041R1	6	1	16.1	8.1	28.0	8.1						
22	4232F	MWAT045R1	6	1	15.9	8.0	28.0	8.1						
23	4235F	MWAT153R1	6	1	16.0	8.1	28.0	8.1						
24	4275F	MWRC214R1	6	1	15.9	8.0	28.5	8.1						
47	4231F	MWAT042R1	6	1	15.8	8.1	29.0	8.1						
48	4274F	MWRC213R1	6	1	15.9	8.1	29.0	8.1						
62	4286F	control	6	1	15.8	8.0	28.0	8.1						
75	4272F	MWAS034R1	6	1	15.7	8.1	28.5	8.0						
78	4273F	MWAS037R1	6	1	15.8	8.1	28.5	8.1						
90	4233F	MWAT044R1	6	1	15.7	8.2	27.5	8.1						
93	4234F	MWAT047R1	6	1	15.8	8.2	28.0	8.2						
7	4246F	MWAT046R1	6	2	16.1	8.3	28.0	8.3						
13	4245F	MWAT041R1	6	2	16.2	8.4	28.0	8.3						
22	4232F	MWAT045R1	6	2	16.1	8.3	28.5	8.3						
23	4235F	MWAT153R1	6	2	16.1	8.3	29.0	8.3						
24	4275F	MWRC214R1	6	2	16.1	8.4	29.0	8.3						
47	4231F	MWAT042R1	6	2	15.9	8.3	28.5	8.4						
48	4274F	MWRC213R1	6	2	16.0	8.3	29.0	8.2						
62	4286F	control	6	2	15.8	8.3	29.0	8.3						
75	4272F	MWAS034R1	6	2	15.7	8.4	29.0	8.2						
78	4273F	MWAS037R1	6	2	15.7	8.3	28.5	8.2						
90	4233F	MWAT044R1	6	2	15.8	8.4	28.0	8.2						
93	4234F	MWAT047R1	6	2	15.8	8.3	28.0	8.3						
7	4246F	MWAT046R1	6	3	16.2	7.9	29.5	8.1						
8				3			29.5							
13	4245F	MWAT041R1	6	3	16.3	8.0	29.0	8.1						
14				3			29.0							
21				3			29.5							
22	4232F	MWAT045R1	6	3	16.3	8.0	28.5	8.1						
23	4235F	MWAT153R1	6	3	16.1	8.0	28.5	8.1						

Data Entries Verified RSe 11/24/99

Water Quality Data

					Overlying Water Quality				Interstitial Water Quality		
24	4275F	MWRC214R1	6	3	16.1	8.0	28.5	8.1			
29				3			30.0				
32				3			29.5				
34				3			29.5				
41				3			29.5				
47	4231F	MWAT042R1	6	3	16.0	8.0	28.5	8.1			
48	4274F	MWRC213R1	6	3	15.9	8.0	29.0	8.1			
50				3			30.0				
55				3			30.0				
62	4286F	control	6	3	15.8	8.0	29.5	8.1			
68				3			30.5				
73				3			29.5				
75	4272F	MWAS034R1	6	3	15.9	8.0	29.0	8.0			
78	4273F	MWAS037R1	6	3	15.8	8.0	29.5	8.1			
83				3			29.5				
85				3			30.0				
89				3			29.5				
90	4233F	MWAT044R1	6	3	15.8	8.1	29.0	8.1			
93	4234F	MWAT047R1	6	3	15.8	8.1	28.5	8.2			
7	4246F	MWAT046R1	6	4	16.0	8.1	28.0	8.0			
13	4245F	MWAT041R1	6	4	16.0	8.1	29.0	8.0			
22	4232F	MWAT045R1	6	4	16.1	8.0	28.5	8.0			
23	4235F	MWAT153R1	6	4	15.9	8.0	29.0	8.0			
24	4275F	MWRC214R1	6	4	15.9	8.0	28.5	8.0			
47	4231F	MWAT042R1	6	4	15.6	8.1	28.0	8.0			
48	4274F	MWRC213R1	6	4	15.7	8.1	28.0	8.0			
62	4286F	control	6	4	15.7	8.1	28.0	8.0			
75	4272F	MWAS034R1	6	4	15.7	8.0	28.0	7.9			
78	4273F	MWAS037R1	6	4	15.6	8.0	27.5	7.9			
90	4233F	MWAT044R1	6	4	15.6	8.1	28.0	7.9			
93	4234F	MWAT047R1	6	4	15.6	8.0	28.0	8.1			
7	4246F	MWAT046R1	6	5	15.8	8.1	28.5	7.4			
76	4246F	MWAT046R1	7	5					29.0	7.4	5.0
13	4245F	MWAT041R1	6	5	15.8	8.1	28.0	7.7			
52	4245F	MWAT041R1	7	5					27.0	7.1	2.5
22	4232F	MWAT045R1	6	5	15.9	8.1	28.5	7.8			
88	4232F	MWAT045R1	7	5					28.0	7.5	7.5
23	4235F	MWAT153R1	6	5	15.8	8.1	28.5	7.8			
69	4235F	MWAT153R1	7	5					29.0	7.6	2.5
24	4275F	MWRC214R1	6	5	15.7	8.2	29.0	7.9			
95	4275F	MWRC214R1	7	5					29.0	7.8	7.5
47	4231F	MWAT042R1	6	5	15.7	8.1	28.0	7.9			
26	4231F	MWAT042R1	7	5					28.0	7.7	12.5
48	4274F	MWRC213R1	6	5	15.7	8.2	28.5	8.0			
20	4274F	MWRC213R1	7	5					28.5	7.7	2.5
62	4286F	control	6	5	15.5	8.1	27.5	7.9			
1	4286F	control	7	5					29.0	7.6	<2.5
68				5			29.0				
75	4272F	MWAS034R1	6	5	15.6	8.2	28.0	7.9			
64	4272F	MWAS034R1	7	5					28.5	7.4	2.5
78	4273F	MWAS037R1	6	5	15.6	8.2	28.0	7.9			
45	4273F	MWAS037R1	7	5					28.0	7.0	<2.5
90	4233F	MWAT044R1	6	5	15.5	8.1	28.0	8.0			
28	4233F	MWAT044R1	7	5					28.0	7.4	2.5
93	4234F	MWAT047R1	6	5	15.5	8.1	28.0	8.0			
43	4234F	MWAT047R1	7	5					27.0	7.4	5.0
7	4246F	MWAT046R1	6	6	16.0	7.8	29.0	8.3			

Water Quality Data

					Overlying Water Quality				Interstitial Water Quality			
13	4245F	MWAT041R1	6	6	16.1	7.8	28.5	8.3				
22	4232F	MWAT045R1	6	6	16.1	7.8	29.0	8.3				
23	4235F	MWAT153R1	6	6	16.1	7.9	29.0	8.2				
24	4275F	MWRC214R1	6	6	16.0	7.8	29.0	8.3				
47	4231F	MWAT042R1	6	6	16.0	8.0	29.0	8.3				
48	4274F	MWRC213R1	6	6	16.0	7.8	29.0	8.4				
62	4286F	control	6	6	16.0	7.8	28.5	8.2				
75	4272F	MWAS034R1	6	6	15.9	7.8	29.0	8.2				
78	4273F	MWAS037R1	6	6	15.9	7.8	28.0	8.1				
90	4233F	MWAT044R1	6	6	15.9	7.9	28.0	8.1				
93	4234F	MWAT047R1	6	6	15.9	7.8	28.5	8.3				
7	4246F	MWAT046R1	6	7	15.7	8.1	29.0	8.1				
13	4245F	MWAT041R1	6	7	15.8	8.2	29.0	8.1				
22	4232F	MWAT045R1	6	7	15.9	8.2	28.5	8.1				
23	4235F	MWAT153R1	6	7	15.9	8.2	28.5	8.1				
24	4275F	MWRC214R1	6	7	15.9	8.2	28.0	8.2				
47	4231F	MWAT042R1	6	7	15.8	8.1	28.0	8.2				
48	4274F	MWRC213R1	6	7	15.8	8.1	28.5	8.4				
62	4286F	control	6	7	15.7	8.0	27.5	8.1				
75	4272F	MWAS034R1	6	7	16.7	8.1	28.0	8.1				
78	4273F	MWAS037R1	6	7	15.6	8.0	27.5	8.0				
90	4233F	MWAT044R1	6	7	15.7	8.2	28.0	8.1				
93	4234F	MWAT047R1	6	7	15.6	8.2	28.0	8.2				
2				8			32.0					
3				8			30.0					
5				8			30.5					
6				8			31.0					
7	4246F	MWAT046R1	6	8	16.1	7.8	29.5	8.3				
8				8			30.0					
9				8			30.5					
11				8			29.0					
12				8			30.0					
13	4245F	MWAT041R1	6	8	16.3	8.0	29.5	8.3				
14				8			29.5					
15				8			30.0					
16				8			31.0					
17				8			30.0					
18				8			30.0					
19				8			29.0					
21				8			29.0					
22	4232F	MWAT045R1	6	8	16.2	8.1	30.0	8.3				
23	4235F	MWAT153R1	6	8	16.2	8.1	30.0	8.2				
24	4275F	MWRC214R1	6	8	16.2	8.1	30.0	8.5				
25				8			30.0					
27				8			30.0					
29				8			29.0					
30				8			29.0					
31				8			31.0					
32				8			30.0					
33				8			30.0					
34				8			30.0					
35				8			30.0					
36				8			31.0					
38				8			30.5					
39				8			30.5					
40				8			31.0					
41				8			29.5					

Water Quality Data

					Overlying Water Quality				Interstitial Water Quality			
44				8			30.5					
46				8			30.5					
47	4231F	MWAT042R1	6	8	16.1	8.1	29.5	8.3				
48	4274F	MWRC213R1	6	8	16.1	8.1	30.0	8.6				
49				8			29.5					
50				8			29.0					
51				8			29.0					
53				8			30.5					
54				8			30.0					
55				8			30.0					
56				8			30.0					
57				8			30.0					
58				8			30.5					
60				8			30.0					
61				8			31.0					
62	4286F	control	6	8	15.9	8.1	30.0	8.2				
63				8			30.5					
65				8			30.0					
66				8			30.5					
67				8			30.0					
68				8			29.5					
70				8			30.5					
72				8			30.0					
73				8			29.0					
74				8			29.0					
75	4272F	MWAS034R1	6	8	15.9	8.2	30.0	8.2				
77				8			30.0					
78	4273F	MWAS037R1	6	8	15.8	8.1	29.0	8.1				
80				8			31.0					
81				8			30.0					
83				8			28.5					
85				8			28.0					
86				8			28.0					
87				8			29.5					
89				8			28.5					
90	4233F	MWAT044R1	6	8	15.9	8.2	29.5	8.2				
92				8			28.0					
93	4234F	MWAT047R1	6	8	15.8	8.2	29.5	8.3				
7	4246F	MWAT046R1	6	9	15.5	8.0	28.0	8.3				
13	4245F	MWAT041R1	6	9	15.7	8.1	28.0	8.3				
22	4232F	MWAT045R1	6	9	15.8	8.0	28.0	8.3				
23	4235F	MWAT153R1	6	9	15.7	8.0	28.5	8.2				
24	4275F	MWRC214R1	6	9	15.7	8.0	28.5	8.5				
47	4231F	MWAT042R1	6	9	15.6	8.0	28.5	8.3				
48	4274F	MWRC213R1	6	9	15.7	8.0	28.5	8.6				
62	4286F	control	6	9	15.6	8.0	28.0	8.2				
75	4272F	MWAS034R1	6	9	15.6	8.0	28.0	8.2				
78	4273F	MWAS037R1	6	9	15.6	7.9	28.0	8.1				
90	4233F	MWAT044R1	6	9	15.6	8.0	28.0	8.1				
93	4234F	MWAT047R1	6	9	15.6	8.0	28.0	8.2				
7	4246F	MWAT046R1	6	10	15.3	8.1	29.0	8.3	<0.02	<0.5		<0.5 2.5
13	4245F	MWAT041R1	6	10	15.5	8.1	28.5	8.3	<0.02	<0.5		2.5
22	4232F	MWAT045R1	6	10	15.5	8.1	29.0	8.2	<0.02	<0.5		2.5
23	4235F	MWAT153R1	6	10	15.7	8.2	29.0	8.1	<0.02	<0.5		2.5
24	4275F	MWRC214R1	6	10	15.6	8.0	29.0	8.5	<0.02	<0.5		2.5
47	4231F	MWAT042R1	6	10	15.5	8.0	29.0	8.2	<0.02	<0.5		5.0
48	4274F	MWRC213R1	6	10	15.5	8.1	29.0	8.5	<0.02	0.5		2.5

Water Quality Data

					Overlying Water Quality						Interstitial Water Quality
62	4286F	control	6	10	15.4	8.1	29.0	8.1	<0.02	<0.5	2.5
75	4272F	MWAS034R1	6	10	15.4	8.1	29.0	8.2	<0.02	3.5	5.0
78	4273F	MWAS037R1	6	10	15.4	8.1	29.0	8.1	<0.02	<0.5	2.5
90	4233F	MWAT044R1	6	10	15.3	8.1	28.5	8.2	<0.02	<0.5	2.5
93	4234F	MWAT047R1	6	10	15.3	8.1	29.0	8.2	<0.02	<0.5	2.5

	Overlying Water						Interstitial Water			
	TEMP	DO	SAL	pH	S	NH3	SAL	pH	S	NH3
Mean	15.8	8.1	29.0	8.1	—	—	28.3	7.5	—	—
SD	0.2	0.1	0.9	0.2	—	—	0.7	0.2	—	—
n	132	132	207	132	24	24.0	12.0	12.0	12	36.0
Max	16.3	8.4	32.0	8.6	<0.02	3.5	29.0	7.8	1.8	12.5
Min	15.3	7.8	27.5	7.4	<0.02	<0.5	27.0	7.0	<1.0	<2.5

Chain of Custody Record & Laboratory Analysis Request

Date: 9/21/99

Page 1 of 1

Number of coolers: 1

ANALYTICAL RESOURCES INCORPORATED
333 Ninth Ave. North
Seattle, WA 98109-5187
(206) 621-6490
(206) 621-7523 (FAX)

ARI Client: Foster Wheeler Phone #: 425 688 3700

Client Contact: Gary Braun

Client Project ID: Middle Waterway 1B

Samplers: GB, BJ, PS, KL, BMcD

	Sample ID	Date	Time	Matx	No Cont	Lab ID	Analysis Required: BIOASSAYS Amphipod	Larval	Neanthes							Notes/Comments
1	MWAT042R1	9/21	1225	Sed	5		2	2	1			NAS # 4231F				Cool to 4°C
2	MWAT045R1	9/21	1240	Sed	5		2	2	1			NAS # 4232F				" " "
3																
4																
5																
6																
	all intact; 4.0°C MR 9-23-99															

Comments/Special Instructions:

Relinquished by: (Signature)	Printed Name	Company	Date	Time
Bruce McDonald	Bruce McDonald	Anchor	9/21/99	1400
Gary M Braun	GARY M BRAUN	FWENC	9/22/99	5:00
Michele S. Redmond	Michele S. Redmond	NAS	9-23-99	13:30

Received by: (Signature)	Printed Name	Company	Date	Time
Gary M Braun	GARY M BRAUN	FWENC	9/22/99	5100

FedEx. USA Airbill Tracking Number 4185416675

FedEx Retrieval Copy

1161148 00155/00500

1 From

Date 9/22/99 Sender's FedEx Account Number 1776-5771-9

Sender's Name Gary Braun Phone (~~206~~ 425) 688-3700

Dept./Floor/Suite/Room

Company FOSTER WHEELER ENVIRONMENTAL

Address 10900 NE 8TH ST STE 1300

City BELLEVUE State WA Zip 98004

2 Your Internal Billing Reference Information

3 To

Recipient's Name Dick Caldwell Phone (541) 265-7225

Dept./Floor/Suite/Room

Company Northwest Aquatics

Address 3514 Yaquina Bay

(To "HOLD" at FedEx location, print FedEx address here)

City Newport State OR Zip 97365

For HOLD at FedEx Location check here

1 [ ] Hold Weekday (Not available with FedEx First Overnight)

31 [ ] Hold Saturday (Not available at all locations) (Not available with FedEx First Overnight or FedEx Standard Overnight)

For Saturday Delivery check here

3 [ ] (Extra Charge. Not available to all locations) (Not available with FedEx First Overnight or FedEx Standard Overnight)

4 1 8 5 4 1 6 6 7 5

4a Express Package Service *Packages under 150 lbs.* Delivery commitment may be later in some areas.

1 [ ] FedEx Priority Overnight (Next business morning)

2 [X] FedEx Standard Overnight (Next business afternoon)

3 [ ] FedEx 2Day* (Second business day)

5 [ ] NEW FedEx First Overnight (Next business day, delivery to selected locations)

* FedEx Letter Rate not available. Minimum charge. Use pound FedEx 2Day rate

4b Express Freight Service *Packages over 150 lbs.* Delivery commitment may be later in some areas.

7 [ ] FedEx Overnight Freight (Next business day)

8 [ ] FedEx 2Day Freight (Second business day)

83 [ ] FedEx Express Saver Freight (Third business day service)

(Please check for details on terms of freight products.)

5 Packaging 6 [ ] FedEx Letter 2 [ ] FedEx Pak 3 [ ] FedEx Box 4 [ ] FedEx Tube 1 [X] Other or Pkg

6 Special Handling

Does this shipment contain dangerous goods? 4 [ ] Yes (Shipper's Declaration required) [ ] Yes

5 [ ] Dry Ice

CA [ ] Cargo Aircraft Only

7 Payment [ ] Obtain Recipient FedEx Account No.

Bill to: 1 [X] Sender [ ] Recipient 2 [ ] Third Party 4 [ ] Credit Card 5 [ ] Cash/Check

FedEx Account No.

Credit Card No. Exp. Date

Total Packages 1 Total Weight 72 Total Charges $

Credit Card Auth.

Shipment declaring a value higher than $100 per shipment, you pay an additional charge. See SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY section for further information.

8 Release Signature

[ ] Check here if package was dropped off

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MultiChem ANALYTICAL SERVICES

560 Naches Ave. SW Suite 1[illegible] Renton, WA 98055
(800) 609-0580 • (425) 228-8335 • FAX (425) 228-8336

[redacted]

DATE: [illegible]/22/99
PAGE: 1 of 1

COMPANY: Foster Wheeler
ADDRESS: 10900 NE 8th St, Ste 1300
Bellevue WA 98004

PHONE: (425) 688-3700 FAX (425) 688-3952
PROJ. MGR / CONTACT: Gary Braun
PROJECT NUMBER: 1699.0014.0000
PROJECT NAME: Middle WW 1B
DISPOSAL: ☐ MAS ☐ HOLD ☐ RETURN

	DATE	TIME	MATRIX	LAB ID	FUELS: TPH-HCID	BETX / TPH-G BETX / AK101	BETX (by 8021)	TPH-G	TPH-D TPHD-extended	8015 modified	418.1	413.2	AK-GRO AK101	AK-DRO AK102 / 103	ORGANIC COMPOUNDS: 8240 / 8260 GCMS Volatiles	8270 GCMS Semivolatiles	8081 Pesticides / PCBs	PCB only (by 8081) STD / LL	8021 Halogenated VOCs	8021 Aromatic VOCs	8310 HPLC PAHs	8041 Phenols	8151 OC Herbicides	METALS: Metals indicate below	Total / Dissolved Lead	RCRA Metals (8)	PP Metals (13)	TAL Metals (23)	TCLP: TCLP 8240 (ZHE)	TCLP 8270 Semivolatiles	TCLP 8081 Pesticides	TCLP 8151 Herbicides	TCLP Metals	OTHER: BIOASSAY Amphipod	Larval	~~Neanthes~~	Neanthes		Total # of Containers
MWAT153R1	9/22	1035	Sed			NAS # 4233F																												2	2				4
MWAT047R1	9/22	1150	Sed			NAS # 4234F																												2	2		1		5
MWAT044R1	9/22	0910	Sed			NAS # 4233F																												2	2				4

All intact; 4.0°C MSR 9-23-99

SAMPLE RECEIPT	TAT:	RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:
[illegible] OF CONTAINERS ☐ YES ☐ NO	☐ 24 HOURS	SIGNATURE: Gary M Braun	SIGNATURE:	SIGNATURE:
[illegible] ☐ YES ☐ NO	☐ 48 HOURS	PRINT NAME: GARY M BRAUN	PRINT NAME:	PRINT NAME:
[illegible] ☐ YES ☐ NO	☐ 72 HOURS	DATE: 9/22/99 TIME: 5:00 pm	DATE: TIME:	DATE: TIME:
[illegible] ☐ YES ☐ NO	☐ 7 DAYS	COMPANY: FWENC	COMPANY:	COMPANY:
[illegible] ☐ YES ☐ NO	☐ SP			
[illegible]	☒ STANDARD			

SPECIAL INSTRUCTIONS/COMMENTS:

RECEIVED BY:	RECEIVED BY:	RECEIVED BY:
SIGNATURE: Michele S. Redmond	SIGNATURE:	SIGNATURE:
PRINT NAME: Michele S. Redmond	PRINT NAME:	PRINT NAME:
DATE: 9-23-99 TIME: 13:30	DATE: TIME:	DATE: TIME:
COMPANY: NAS	COMPANY:	COMPANY:

*METALS NEEDED:

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FedEx. USA Airbill

Tracking Number 418541666 4

FedEx Retrieval Copy

1161148 00156/00500

1 From

Date 9/22/99 Sender's FedEx Account Number 1276-5771-9

Sender's Name Gary Braun Phone (425) 688-3700

Dept/Floor/Suite/Room

Company FOSTER WHEELER ENVIRONMENTAL

Address 10900 NE 8TH ST STE 1300

City BELLEVUE State WA Zip 98004

2 Your Internal Billing Reference Information

3 To

Recipient's Name Dick Caldwell Phone (541) 265-7225

Dept/Floor/Suite/Room

Company Northwest Aquatics

Address 3414 Yaquina Bay Rd

(To 'HOLD' at FedEx location, print FedEx address here)

City Newport State OR Zip 97365

For HOLD at FedEx Location check here

1 ☐ Hold Weekday (Not available with FedEx First Overnight)

31 ☐ Hold Saturday (Not available at all locations) (Not available with FedEx First Overnight or FedEx Standard Overnight)

For Saturday Delivery check here

3 ☐ (Extra Charge. Not available to all locations) (Not available with FedEx First Overnight or FedEx Standard Overnight)

4a Express Package Service *Packages under 150 lbs.*

Delivery commitment may be later in some areas

1 ☐ FedEx Priority Overnight

2 ☒ FedEx Standard Overnight

3 ☐ FedEx 2Day* (Second business day)

5 ☐ NEW FedEx First Overnight (Earliest next business morning delivery) (Higher rates apply)

6 ☐ FedEx Letter Rate not available (Minimum charge: One pound FedEx 2Day rate)

4b Express Freight Service *Packages over 150 lbs*

Delivery commitment may be later in some areas

1 ☐ FedEx 1Day Freight (Next business day service)

2 ☐ FedEx 2Day Freight (Second business day service)

3 ☐ FedEx Express Saver Freight (Third business day service)

(Call for Confirmation, Rates and Restrictions for Freight products)

5 Packaging 1 ☐ FedEx Letter 2 ☐ FedEx Pak 3 ☐ FedEx Box 4 ☐ FedEx Tube 5 ☒ Other Pkg.

Declared value limit $100

6 Special Handling

Does this shipment contain dangerous goods? 1 ☐ Yes (Shipper's Declaration not required) ☐ Yes (Shipper's Declaration not required)

6 ☐ Dry Ice (Dry Ice, UN 1845, x kg) CA ☐ Cargo Aircraft Only

7 Payment ☐ Obtain Recipient FedEx Account No.

Bill to: 1 ☒ Sender 2 ☐ Recipient 3 ☐ Third Party 4 ☐ Credit Card 5 ☐ Cash/Check

FedEx Account No.

Credit Card No. Exp Date

Total Packages 1 Total Weight 78 Total Charges $

Credit Card Auth.

For Standard Air, Standard Overnight, Priority Overnight, Express Saver Freight and Overnight Freight services, Declared Value limit $100 unless you declare a higher value. See SERVICE CONDITIONS, DECLARED VALUE AND LIMITATION OF LIABILITY for additional information.

8 Release Signature

By signing you authorize FedEx Express to deliver this shipment without obtaining a signature and agree to indemnify FedEx Express from any resulting loss.

☐ Check here if package was dropped off

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WCBL 0197 Rev. Date 6/98 PART #147856 ©1994-98 FedEx TRK#[0215] USA

4 1 8 5 4 1 6 6 6 4

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Chain of Custody Record
Request for Analysis

FOSTER WHEELER ENVIRONMENTAL CORPORATION
10900 NE 8th Street • Bellevue, WA 98004
(425) 688-3700 • Fax (425) 688-3952

Page ____ of ____ Lab. Ref. No. ____

Project Name: Middle WW 1B
Project Address: Tacoma, WA
FW Project No.: 1699.00144.0000

Sampling Date: 9/23/99
Shipping Date:
Shipping Ref.:

Analysis Laboratory: Northwest Aquatics
Laboratory Contact: Dick Caldwell
P.O. No.:
Reports to be Sent to:
Address/Phone No.: 3814 Yaquina Bay Rd; Newport, OR 97365

Sampler(s): *(printed name)*
Sampler(s): *(signature)*
Special Instructions:

Hazard ID:
- ☐ Nonhazardous
- ☐ Hazardous:
  - ☐ Reactive
  - ☐ Toxic
  - ☐ Flammable
  - ☐ Irritant
  - ☐ Infectious
  - ☐ Radioactive

Sample Disposal Instructions:
- ☐ Lab disposal
- ☐ Return to FWENC
- ☐ Hold for pickup (will call)

ANALYSES REQUEST (circle appropriate method number)

SAMPLE IDENTIFICATION	TIME COLLECTED	NO. OF CONTAINERS, SIZE & TYPE	PRESERVATIVE	MATRIX: Soil	MATRIX: Water	SAMPLE TYPE: Composite	SAMPLE TYPE: Grab	Method Standard (EPA # ____)	TCLP (1311) ____, Other ____	CLP Data Pkg.; Other ____	Halogenated Volatiles 8010B, 8121, 601, 502.1, CLP	Aromatic Volatiles 8020A, 8021B, 602, 502.2, 503.1, CLP	BETX Only 8020A, 602, CLP	GC/MS VOAs 8260B, 624, 524.1, 524.2, CLP	GC/MS SVOAs 8270C, 625, 525, CLP	Pesticides (Organochlorine) 8081A, 608, 505, CLP	PCBs 8082 (Aroclors, Full Congeners)	HPLC PNA/PAHs 8310,610	Organophosphorus Comps. (Pest. & Herbs) 8141A	Chlorinated Herbicides 8151A	Dioxins 8290, CLP, 1613	Nitroaromatics and Nitramines(Ordnance) 8330	TPH-HCID AK, NWHCID	TPH-Gx AK101, NWTPHGx	TPH-Dx AK102,103, NWTPHDx	Lead 6010, 7420, 7421	Priority Poll. Metals (13) 6010B & 7000 Series, 6020 CLP	TCL Metals (23) 6010B & 7000 Series,6020 CLP	TCLP 1311 (metals, VOAs, SVOAs, Pest., Herb.)	Inorganic Anions (Cl, F, No_3, No_2, PO_4, SO_4) 300.__	Total Organic Carbon (TOC) 9060,____	BIOASSAY	REMARKS
[illegible]	[illegible]	32 oz glass		Sediment						Amphipod and larval and [illegible]																						5	NAS 4246F
MW BT 041 R1	1030	32 oz glass		Sediment						Amphipod and larval																						4	NAS 4245F
One of the four jars labelled "MW BT 041 R1", [illegible] "MW BT 041 R1" - [illegible] 9-25-99																																		
[illegible] MW BT 041 R1 for all jars, as per client 9-27-99 MSR																																		

Turnaround Time:
- ☐ Standard
- ☐ 1 Week
- ☐ 4 Work Day
- ☐ 3 Work Day
- ☐ 2 Work Day
- ☐ 24 Hour

Sample Receipt:
Total # Containers Recvd.: ____
COC Seals Present? ____
COC Seals Intact? ____
Received Cold? ____
Received Intact? ____
Received Via: ____

Relinquished by: *(signature)*	Relinquished by: *(signature)*	Relinquished by: *(signature)*	Relinquished by: *(signature)*
Gary M Brown		Total Organic Carbon (TOC 9060,____	
Date: 9/23/99 Time: 6:10	Date: Time:	Date: Time:	Date: Time:
Received by: *(signature)*	**Received by:** *(signature)*	**Received by:** *(signature)*	**Received by:** *(signature)*
			[signature]
Date: Time:	Date: Time:	Date: Time:	Date: 9-25-99 Time: 1000

Rev 7/28/99

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Gary Braun [gbraun@fwenc.com]
Monday, September 27, 1999 8:48 AM
Michele
Re: samples received

[illegible]or trhe note. The correct sample number should be MWAT041R1 for [illegible]rs you received. We will be collecting two more test stations on [illegible] additional reference stations (Carr Inlet) for Middle Waterway [illegible]day. These sample will likely be shipped out Monday night but it [illegible]d slip [illegible]l Tuesday. I'll keep you posted.

[illegible]

"Michele Redmond" <mredmond@nwaquatic.com> on 09/25/99 01:18:46 PM

Please respond to mredmond@nwaquatic.com

To: Gary Braun/Bellevue/FWENC@FWENC
cc:

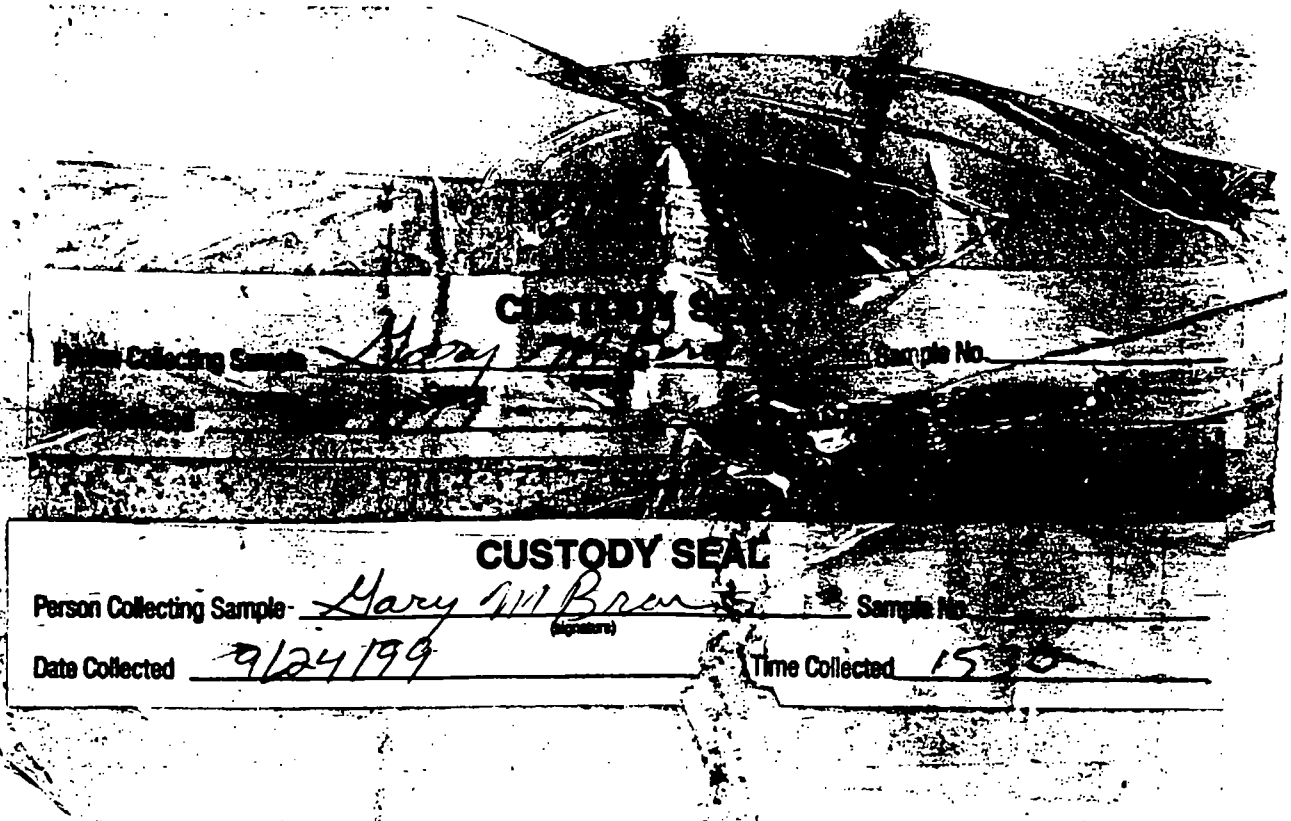
Subject: samples received

Hi Gary,

We received one cooler of samples today (Sat.), with samples MWAT046R1 and
MWBT041R1. Everything was cold and intact.
There was one discrepancy: the chain of custody lists sample MWBT041R1, and
one of the jars was labelled that way, but the other three were labelled
MWAT041R1. When you get a chance, please send documentation as to which is
the correct sample number. And of course, let us know if for some reason we
have the wrong ones!

Hope you have good weather for your field work!

Michele S. Redmond
Northwestern Aquatic Sciences
P.O. Box 1437
Newport, OR 97365
541-265-7225
541-265-2799 fax
e-mail: mredmond@nwaquatic.com



CUSTODY SEAL

Person Collecting Sample: Gary Braun (Signature) Sample No.

Date Collected 9/24/99 Time Collected 15 30

UPS Next Day Air
UPS Worldwide Express
Shipping Document

WEIGHT | WEIGHT 58 | DIMENSIONAL WEIGHT 58 | 403

UPS DRIVER
- RECORD 6-DIGIT UPS SHIPPER NUMBER FROM BOX [1].
- IF BOX [1] IS BLANK OR THE NUMBER IS MORE THAN 6 DIGITS, RECORD THE NUMBER FROM BOX [2].

[X] NEXT DAY AIR [ ] WORLDWIDE EXPRESS (INTERNATIONAL) [ ] DOCUMENTS ONLY [ ] SATURDAY PICKUP [X] SATURDAY DELIVERY

SHIPMENT FROM

UPS SHIPPER NO. [1] 719-08W [2]

REFERENCE NUMBER

GARY BRAUN TELEPHONE 425 668 3840

FWENC

10900 NE 8th St

Bellevue WA 98004

DELIVERY TO

Dick Caldwell TELEPHONE (541) 265-7225

NW Aquatics

3814 Yaquina Bay Rd

Newport, OR 97365

J033 277 407 5 DELIVERY 1

J033 277 407 5 EXPORT 2

J033 277 407 5 EXPORT 1

[ ] BILL RECEIVER

ups **UPS Next Day Air®** EXTREMELY URGENT 1

J033 277 407 5 DELIVERY 2

J033 277 407 5 TRACKING NUMBER

DATE OF SHIPMENT 9/24/99

010191120 1/99 S United Parcel Service, Louisville, KY

The shipper authorizes UPS to act as forwarding agent for export control and customs purposes. The shipper certifies that these commodities, technology or software were exported from the United States in accordance with the Export Administration Regulations. Diversion contrary to U.S. law is prohibited.

MultiChem ANALYTICAL SERVICES

560 Naches Ave. SW Suite 101 Renton, WA 98055
(800) 609-0580 ◆ (425) 228-8335 ◆ FAX (425) 228-8336

[redacted]

DATE: 9/27/99
PAGE: 1 of

COMPANY: Foster [illegible]
ADDRESS: 10900 [illegible] Ste B00
Bellevue [illegible] 98004
PHONE: (425) [illegible] FAX (425) 688 3952
PROJ. MGR. [illegible] Gary Braun
PROJECT NUMBER: [illegible]699.0014.0000
PROJECT NAME: Middle WW 1B
DISPOSAL: ☒ NAS ☐ HOLD ☐ RETURN

				FUELS										ORGANIC COMPOUNDS									METALS					TCLP					OTHER					
				TPH-HCID	BETX / TPH-G BETX / AK101	BETX (by 8021)	TPH-G	TPH-D TPHD-extended	8015 modified	418.1	413.2	AK-GRO AK101	AK-DRO AK102 / 103	8240 / 8260 GCMS Volatiles	8270 GCMS Semivolatiles	8081 Pesticides / PCBs	PCB only (by 8081) STD / LL	8021 Halogenated VOCs	8021 Aromatic VOCs	8310 HPLC PAHs	8041 Phenols	8151 OC Herbicides	Metals indicate below*	Total / Dissolved Lead	RCRA Metals (8)	PP Metals (13)	TAL Metals (23)	TCLP 8240 (ZHE)	TCLP 8270 Semivolatiles	TCLP 8081 Pesticides	TCLP 8151 Herbicides	TCLP Metals	Amphipod	Larval	Neanthes			Total # of Containers
MWA5037R1	9/27	1035	Sed		NAS #4272F																													2	2	1			5
MWA037R1	9/27	1009	Sed		NAS #4273F																													2	2	1			5
MWRC213R1	9/27	1030	Sed		NAS #4274F																													2	2	1			5
MWRC214R1	9/27	0900	Sed		NAS #4275F																													2	2	1			5

- jars labelled MWA5037R1

"MWA5037R1" is correct as per client 9-30-99 MLR

Samples placed under N2 [illegible] receipt
All intact; 9.0°C MLR
9-29-99

TAT:	
☐	24 HOURS
☐	48 HOURS
☐	72 HOURS
☐	7 DAYS
☐	SP
☐	STANDARD

RELINQUISHED BY:	RELINQUISHED BY:	
SIGNATURE: Gary M Braun	SIGNATURE:	SIGNATURE:
PRINT NAME: GARY M BRAUN	PRINT NAME:	PRINT NAME:
DATE: 9/28/99 TIME: 1400	DATE: TIME:	DATE: TIME:
COMPANY: FWENC	COMPANY:	COMPANY:

RECEIVED BY:	RECEIVED BY:	
SIGNATURE: Michele S. Redmond	SIGNATURE:	SIGNATURE:
PRINT NAME: Michele S. Redmond	PRINT NAME:	PRINT NAME:
DATE: 9-29-99 TIME: 14:30	DATE: TIME:	DATE: TIME:
COMPANY: NAS	COMPANY:	COMPANY:

SPECIAL INSTRUCTIONS/COMMENTS:

*METALS NE[illegible]:

-100-

Michele

From: Gary Braun [gbraun@fwenc.com]
Sent: Thursday, September 30, 1999 9:06 AM
To: Michele
Subject: Re: samples

Glad to hear all samples arrived. Sample Nmber discrepency should be resolved
by using the sample number on the bottles; The "S" was inadvertantly left out of
the name. Hope this helps, if you need any other information, call or email me.
I should be out of the field by Monday.
Gary

"Michele Redmond" <mredmond@nwaquatic.com> on 09/29/99 05:06:45 PM

Please respond to mredmond@nwaquatic.com

To: Gary Braun/Bellevue/FWENC@FWENC
cc:

Subject: samples

Last batch of samples received, all intact. Sample number discrepancy: chain-of-custody says "MWA037R1", but jars are labelled "MWAS037R1". Please
advise.

Michele S. Redmond
Northwestern Aquatic Sciences
P.O. Box 1437
Newport, OR 97365
541-265-7225
541-265-2799 fax
e-mail: mredmond@nwaquatic.com

FedEx USA Airbill — Tracking Number 4185416701

Recipient's Copy

1161148 00158/00500

1 From

Date 9/28/99 [redacted]

Sender's Name GARY BRAUN Phone ~~(206)~~ 425 688-3700

Dept/Floor/Suite/Room

Company FOSTER WHEELER ENVIRONMENTAL

Address 10900 NE 8TH ST STE. 1300

City BELLEVUE State WA Zip 98004

2 Your Internal Billing Reference Information 1699.0014.0000.00002

3 To

Recipient's Name Dick Caldwell Phone (541) 265-7225

Dept/Floor/Suite/Room

Company NW Aquatics

Address 3814 Yaquina Bay Rd

(To "HOLD" at FedEx location, print FedEx address here)

City Newport State OR Zip 97365

For HOLD at FedEx Location check here

- [ ] Hold Weekday (Not available with FedEx First Overnight)
- [ ] Hold Saturday (Not available at all locations) (Not available with FedEx First Overnight or FedEx Standard Overnight)

For Saturday Delivery check here

- [ ] (Extra Charge. Not available to all locations) (Not available with FedEx First Overnight or FedEx Standard Overnight)

4 1 8 5 4 1 6 7 0 1

4a Express Package Service *Packages under 150 lbs.* Delivery commitment may be later in some areas.

- [x] FedEx Priority Overnight (Next business morning)
- [x] FedEx Standard Overnight (Next business afternoon)
- [ ] FedEx 2Day* (Second business day)
- [ ] NEW FedEx First Overnight (Earliest next business morning delivery to select locations) (Higher rates apply)

* FedEx Letter Rate not available. Minimum charge: One pound FedEx 2Day rate.

4b Express Freight Service *Packages over 150 lbs.* Delivery commitment may be later in some areas.

- [ ] FedEx Overnight Freight (Next business-day service for any distance)
- [ ] FedEx 2Day Freight (Second business-day service for any distance)
- [ ] FedEx Express Saver Freight (Up to 3 business-day service based upon distance)

(Call for delivery schedule. See back for detailed descriptions of freight products.)

5 Packaging

- [ ] FedEx Letter
- [ ] FedEx Pak
- [ ] FedEx Box
- [ ] FedEx Tube
- [x] Other Pkg.

Declared value limit $500.

6 Special Handling

Does this shipment contain dangerous goods?

- [ ] Yes (As per attached Shipper's Declaration)
- [ ] Yes (Shipper's Declaration not required)
- [ ] Dry Ice. Dry Ice, 9, UN 1845 III _____ x _____ kg. 904 (Dangerous Goods Shipper's Declaration not required)
- CA [ ] Cargo Aircraft Only

7 Payment

- [ ] Obtain Recipient FedEx Account No.

Bill to:

- [x] Sender (Account no. in section 1 will be filled)
- [ ] Recipient
- [ ] Third Party
- [ ] Credit Card
- [ ] Cash/Check

(Enter FedEx account no. or Credit Card no. below)

[redacted]

Total Packages	Total Weight	Total Declared Value*
1	145	$ .00

* When declaring a value higher than $100 per shipment, you pay an additional charge. See SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY section for further information.

8 Release Signature

Your signature authorizes Federal Express to deliver this shipment without obtaining a signature and agrees to indemnify and hold harmless Federal Express from any resulting claims.

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Questions?
Call 1·800·Go·FedEx
(1-800-463-3339)

WCSL 0197 Rev. Date 6/98 PART #14[illegible] ©1994-98 FedEx PRINTED IN U.S.A.

CUSTODY SEAL

Person Collecting Sample Gary Braun (signature) Sample No.

Date Collected 9/28/99 Time Collected 14:00

CUSTODY SEAL

Person Collecting Sample Gary Braun (signature) Sample No.

Date Collected 9/28/99 Time Collected 14:00

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NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-
ACUTE TOXICITY TEST (ALL SPECIES)

received
Test No. 999-1084 Client QC TEST Investigator ppp. 1-7 MSR 12-7-99
Test Type (rangefinding/~~definitive~~) Test Length (hr) 96
Species Rhepoxynius abronius

STUDY MANAGEMENT
Client: QC test
Client's Study Monitor: NA
Testing Laboratory: Northwestern Aquatic Sciences
Test Location: Newport Laboratory
Laboratory's Study Personnel:
Proj. Man./Study Dir. M.S. Redmond MSR
QA Officer L.K. Nemeth
1. Erin Coffey 2.
3. ~~Geoffrey Hayes GH~~ 4.
Study Schedule:
Test Beginning: 10.5.99 1500 Test Ending: 10-9-99 1500

TEST MATERIAL
Description: cadmium as $CdCl_2 \cdot 2\frac{1}{2} H_2O$, Mallinckrodt Lot TNZ,
NAS Sample No.: 1.0 mg/mL stock prepared 7-24-99
Date of Collection:
Date of Receipt:
Temperature (°C):
Dissolved oxygen (mg/L):
Conductivity (umhos/cm):
pH:
Hardness (mg/L):
Alkalinity (mg/L):
:

DILUTION WATER
Description: Yaquina Bay, Oregon, seawater
Date of Preparation/Collection: 10-4-99
Water Quality: Cond.(umhos/cm) — Salinity (ppt) 28.0 pH —
Hardness (mg/L as $CaCO_3$) — Alkalinity (mg/L as $CaCO_3$ —
Treatments: filtered to ≤0.40 µm, salinity-adjusted w/ MilliQ deionized water, aerated.

TEST ORGANISMS
Species: Rhepoxynius abronius Age: adult Size:
Source: West Beach, Whidbey Island, WA; received 10-1-99
Acclimation Data:

Date	Temp (°C)	DO (mg/L)	pH	Sal/~~Cond~~	Comments
10-1-99	13.3	4.8	7.2	30.5	receiving water
10-3-99	15.4	6.2	7.9	30.5	
10-4-99	15.8	7.6	7.9	30.0	
10-5-99	15.9	8.0	7.9	28.5	
Mean	15.1	6.6	7.7		
S.D.	1.2	1.5	0.4		
(N)	4	4	4		

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-

ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-1084 Client QC test Investigator _____

TEST PROCEDURES AND CONDITIONS

Test concentrations: (50% series recommended) _____
10, 3, 1, 0.3, 0.1, and Ø mg/L

Test chambers: 250 mL beakers Test volume: 100 mL

Replicates/treatment: (2) 2 Organisms/treatment: (20) 20 (10/rep.)

Test water changes: none Aeration during test: none

Feeding: None Photoperiod:

Temperature: 15 ± 1°C

Duration: 24-hr, 48-hr, (96-hr) Renewal: none

Beaker placement: ~~Stratified~~ randomization

Randomization chart:

A	3	10	0.1	0.3	Ø	1
B	10	3	0.3	1	Ø	0.1
C						
D						

MISCELLANEOUS NOTES

Test solution preparation:

Test conc. (mg/L)	mL of Cd stock (1.0 mg/mL) per 200 mL
10	2.0
3.0	0.6
1.0	0.2
0.3	0.06
0.1	0.02
Ø	Ø

Solution then brought up to volume in graduated cylinder with dilution water.

10-5-99

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-

ACUTE TOXICITY TEST (ALL SPECIES)

Test No 999-1084 Client QC test Investigator

DAY 0 (10/5/99) N/GOH

	Conc. (mg/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1.	10	15.9	8.3	28.0		8.0			10	10
2.	3.0	15.9	8.3	28.0		8.0			10	10
3.	1.0	15.9	8.3	28.0		8.0			10	10
4.	0.3	16.0	8.2	28.0		8.0			10	10
5.	0.1	16.1	8.3	28.0		8.0			10	10
6.	Ø	15.9	8.2	28.0		8.0			10	10

DAY 1 (10/6/99) N/GOH

	Conc. (mg/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1.	10	16.4	8.0	28.0		8.0			8(1D)	6(4D)
2.	3.0	16.5	7.9	28.0		8.0			10	9(1D)
3.	1.0	16.5	7.8	28.5		8.0			9(1D)	10
4.	0.3	16.4	7.8	28.0		8.0			10	10
5.	0.1	16.4	7.8	28.0		8.0			10	10
6.	Ø	16.5	7.9	28.0		8.0			10	10

DAY 2 (10/7/99) RMS/GOH

	Conc. (mg/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1.	10	16.6	7.9	29.0		8.2			2(6d)	1(5d)
2.	3.0	16.6	8.0	28.5		8.2			3(7d)	4(5d)
3.	1.0	16.5	8.0	28.5		8.2			8(1d)	9(1d)
4.	0.3	16.5	7.4	28.5		8.1			10	10
5.	0.1	16.6	7.9	28.5		8.1			9(1d)	10
6.	Ø	16.6	8.4	28.0		8.1			10	10

DAY 3 (10/8/99) N/RMS

	Conc. (mg/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1.	10	16.6	7.5	29.0		8.0			1(1D)	1
2.	3.0	16.5	7.6	29.0		8.0			3	3(1D)
3.	1.0	16.5	7.5	29.0		8.0			7(1D)	7(2D)
4.	0.3	16.6	7.6	29.0		8.0			10	10
5.	0.1	16.6	7.7	29.0		8.0			9	10
6.	Ø	16.6	8.1	28.5		8.0			10	10

DAY 4 (10/9/99) RMS

	Conc. (mg/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1.	10	16.6	6.7	28.0		7.9			9(1d)	9(1d)
2.	3.0	16.6	6.6	~~28.0~~ 29.0		7.9			3	2(1d)
3.	1.0	16.6	6.8	28.5		7.9			6(1d)	6(1d)
4.	0.3	16.6	6.7	28.0		7.8			10	10
5.	0.1	16.6	6.6	28.0		7.8			9	10
6.	Ø	16.6	8.0	27.5		7.8			10	9(1d)

Remarks:

Rev. 2/97

Amphioid Collection Data Sheet	
Sold to	Northwestern Aquatic Sciences Attn: Michele Redmond 3814 Yaquina Bay Road Newport, OR 97365
Species	Rhepoxynius abronius
Field Collection Notes	
Location	West Beach, Whidbey Island, WA
Date Collected	9/29/99
Number Collected	2,000 +
Interstitial Temperature	12°C
Interstitial Salinity	—
pH (overlying water)	7.9
Notes	
Holding Conditions	
Temperature	15°C
Notes	Included 1 gal 0.5 mm sieved sand NAS # 4286F
Shipping Date	9/30/99

Acute 96-hr Toxicity Test-96 Hr Survival

Start Date:	10/5/99	Test ID:	999-1084	Sample ID:	REF-Ref Toxicant
End Date:	10/9/99 15:00	Lab ID:	ORNAS-Northwestern Aquati	Sample Type:	CDCL-Cadmium chloride
Sample Date:		Protocol:	EPAA 91-EPA Acute	Test Species:	RA-Rhepoxynius abronius
Comments:					

Conc-mg/L	1	2
D-Control	1.0000	0.9000
0.1	0.9000	1.0000
0.3	1.0000	1.0000
1	0.6000	0.6000
3	0.3000	0.2000
10	0.0000	0.0000

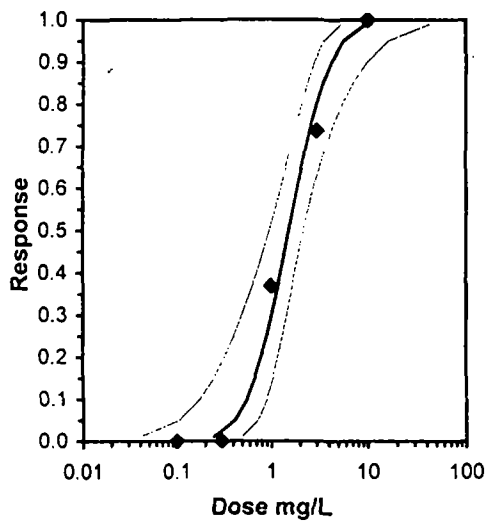
			Transform: Arcsin Square Root					Number	Total
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Resp	Number
D-Control	0.9500	1.0000	1.3305	1.2490	1.4120	8.661	2	1	20
0.1	0.9500	1.0000	1.3305	1.2490	1.4120	8.661	2	1	20
0.3	1.0000	1.0526	1.4120	1.4120	1.4120	0.000	2	0	20
1	0.6000	0.6316	0.8861	0.8861	0.8861	0.000	2	8	20
3	0.2500	0.2632	0.5216	0.4636	0.5796	15.723	2	15	20
10	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	2	20	20

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Normality of the data set cannot be confirmed				
Equality of variance cannot be confirmed				

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	2.9111	0.69001	1.55868	4.26352	0.05	2.48474	7.81472	0.48	0.1867	0.34351	8
Intercept	4.45651	0.28069	3.90635	5.00666							
TSCR	0.03544	0.02717	-0.0178	0.08869							

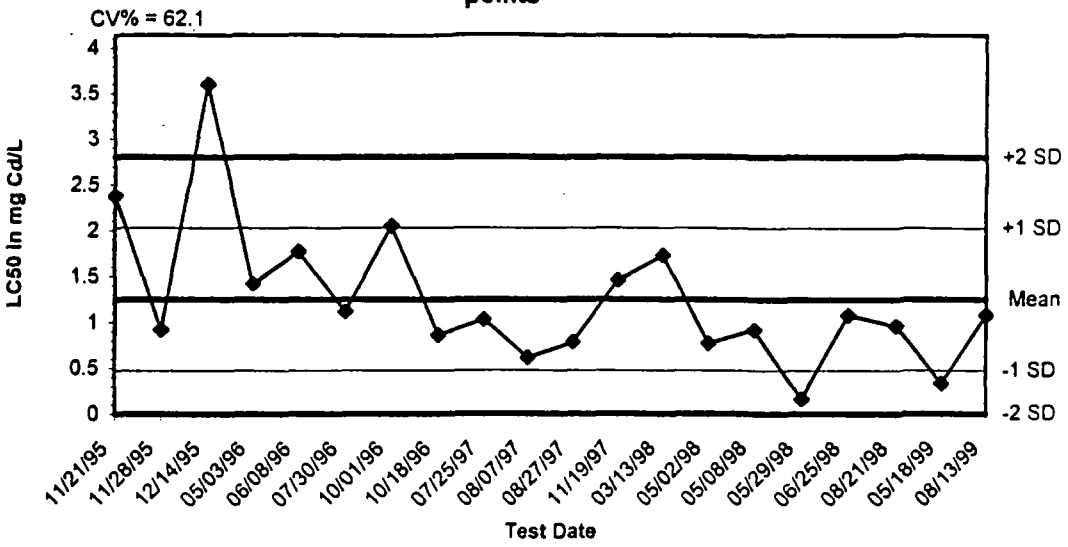
Point	Probits	mg/L	95% Fiducial Limits	
EC01	2.674	0.2441	0.03924	0.49512
EC05	3.355	0.41847	0.10521	0.73021
EC10	3.718	0.55779	0.17687	0.904
EC15	3.964	0.67713	0.24999	1.04868
EC20	4.158	0.78993	0.32787	1.18453
EC25	4.326	0.90157	0.41219	1.32001
EC40	4.747	1.25797	0.71562	1.77813
EC50	5.000	1.53708	0.9697	2.18761
EC60	5.253	1.87813	1.27333	2.77732
EC75	5.674	2.62055	1.85537	4.45766
EC80	5.842	2.99092	2.10814	5.4962
EC85	6.036	3.48919	2.4208	7.09059
EC90	6.282	4.2357	2.84823	9.88139
EC95	6.645	5.64579	3.57155	16.3995
EC99	7.326	9.67891	5.32927	43.4596



Test: AT-Acute 96-hr Toxicity Test							Test ID: 999-1084		
Species: RA-Rhepoxynius abronius							Protocol: EPAA 91-EPA Acute		
Sample ID: REF-Ref Toxicant							Sample Type: CDCL-Cadmium chloride		
Start Date: 10/5/99			End Date: 10/9/99 15:00				Lab ID: ORNAS-Northwestern Aquatic Sciences		
Pos	ID	Rep	Group	Start	24 Hr	48 Hr	72 Hr	96 Hr	Notes
	1	1	D-Control	10				10	
	2	2	D-Control	10				9	
	3	1	0.100	10				9	
	4	2	0.100	10				10	
	5	1	0.300	10				10	
	6	2	0.300	10				10	
	7	1	1.000	10				6	
	8	2	1.000	10				6	
	9	1	3.000	10				3	
	10	2	3.000	10				2	
	11	1	10.000	10				0	
	12	2	10.000	10				0	

Comments:

Reference Toxicant Test Control Chart - Rhepoxynius abronius, last 20 points



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
11/21/95	2.3800	1.2515	0.4740	0.0000	2.0290	2.8065
11/28/95	0.9200	1.2515	0.4740	0.0000	2.0290	2.8065
12/14/95	3.6000	1.2515	0.4740	0.0000	2.0290	2.8065
05/03/96	1.4200	1.2515	0.4740	0.0000	2.0290	2.8065
06/08/96	1.7700	1.2515	0.4740	0.0000	2.0290	2.8065
07/30/96	1.1200	1.2515	0.4740	0.0000	2.0290	2.8065
10/01/96	2.0500	1.2515	0.4740	0.0000	2.0290	2.8065
10/18/96	0.8600	1.2515	0.4740	0.0000	2.0290	2.8065
07/25/97	1.0300	1.2515	0.4740	0.0000	2.0290	2.8065
08/07/97	0.6100	1.2515	0.4740	0.0000	2.0290	2.8065
08/27/97	0.7800	1.2515	0.4740	0.0000	2.0290	2.8065
11/19/97	1.4600	1.2515	0.4740	0.0000	2.0290	2.8065
03/13/98	1.7300	1.2515	0.4740	0.0000	2.0290	2.8065
05/02/98	0.7700	1.2515	0.4740	0.0000	2.0290	2.8065
05/08/98	0.9200	1.2515	0.4740	0.0000	2.0290	2.8065
05/29/98	0.1600	1.2515	0.4740	0.0000	2.0290	2.8065
06/25/98	1.0800	1.2515	0.4740	0.0000	2.0290	2.8065
08/21/98	0.9600	1.2515	0.4740	0.0000	2.0290	2.8065
05/18/99	0.3300	1.2515	0.4740	0.0000	2.0290	2.8065
08/13/99	1.0800	1.2515	0.4740	0.0000	2.0290	2.8065

mrk
8-24-99

TOXICITY TEST NO. 590-6

TOXICITY TEST REPORT

TEST IDENTIFICATION

Test No.: 590-6

Title: Juvenile *Neanthes* 20-day sediment toxicity test.

Protocol: NAS-XXX-NA4, July 23, 1996. Revised October 31, 1997. Complies with: Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments (PSEP 1995), with modifications as specified by the Puget Sound Dredged Disposal Analysis Program (PSDDA, now Dredged Material Management Program or DMMP).

STUDY MANAGEMENT

Study Sponsor: Foster Wheeler Environmental, 10900 N.E. 8th St., Suite 1300, Bellevue, WA 98004

Sponsor's Study Monitor: Mr. Gary Braun

Testing Laboratory: Northwestern Aquatic Sciences, P.O. Box 1437, Newport, Oregon 97365.

Test Location: Newport Laboratory.

Laboratory's Study Personnel: M.S. Redmond, M.S., Proj. Mgr./Study Dir.; L.K. Nemeth, B.A., QA Officer; R.S. Caldwell, Ph.D., Sr. Aq. Toxicol.; G.A. Buhler, B.S., Aq. Toxicol.; R.M. Singleton, M.A., Sr. Tech; E. Coffey, B.S., Sr. Tech.; G. Hayes, B.S., Tech.

Study Schedule:

Test Beginning: 10-5-99, 1600 hrs.

Test Ending: 10-25-99, 1400 hrs.

Disposition of Study Records: All specimens, raw data, reports and other study records are stored according to Good Laboratory Practice regulations at Northwestern Aquatic Sciences, 3814 Yaquina Bay Rd., Newport, OR 97365.

Good Laboratory Practices: The test was conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

Statement of Quality Assurance: The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol and standard operating procedures. This report is an accurate reflection of the raw data.

TEST MATERIAL

Control Sediment: The control sediment (NAS #4287) was collected by NAS, from Yaquina Bay, near the *Rhepoxynius* collection site on 10-3-99. It was sieved through a 1.0 mm screen and homogenized. Stored at 4°C in the dark until used in the test. The control sediment interstitial salinity was 31.5 ppt.

Test Sediments: Unidentified marine sediments. Details are as follows:

NAS Sample No.	4231F	4232F	4234F	4246F
Foster Wheeler No.	MWAT042R1	MWAT045R1	MWAT047R1	MWAT046R1
Collection Date	9-21-99	9-21-99	9-22-99	9-23-99
Receipt Date	9-23-99	9-23-99	9-23-99	9-25-99
Interstitial salinity (ppt)	24.5	24.0	27.0	28.5

NAS Sample No.	4272F	4273F	4274F	4275F
Foster Wheeler No.	MWAS034R1	MWAS037R1	MWRC213R1	MWRC214R1
Collection Date	9-27-99	9-27-99	9-27-99	9-27-99
Receipt Date	9-29-99	9-29-99	9-29-99	9-29-99
Interstitial salinity (ppt)	30.5	29.5	29.5	30.0

Storage: Samples were placed under nitrogen and stored at 4°C in the dark in capped containers until used.

Treatments: Homogenized.

TEST WATER

Source: Yaquina Bay, Oregon seawater
Dates of Collection: 9-29-99 and 10-11-99
Water Quality: Salinity 28.0 ppt and 28.0 ppt; pH 7.9 and 8.0
Pretreatment: Filtered to ≤0.40 µm, salinity adjusted with Milli-Q® deionized water, and aerated.

TEST ORGANISMS

Species: *Neanthes* sp., marine polychaete worm
Age: 2-3 week post-emergence juveniles.
Initial wt.: 0.76 mg
Source: Laboratory cultures at the Department of Biology, California State University, Long Beach, California. Worms were received on 9-29-99.
Acclimation: Conditions during acclimation averaged: temperature, 20.9 ± 1.2°C; salinity 30.8 ± 1.1 ppt; dissolved oxygen 5.5 ± 0.9 mg/L; pH 7.6 ± 0.3; photoperiod 16:8 hr, L:D.

TEST PROCEDURES AND CONDITIONS

The following is an abbreviated statement of the test procedures and a statement of the test conditions actually employed. See the test protocol (Appendix I) for a more detailed description of the test procedures used in this study.

Test Chambers: 1 L covered borosilicate glass beakers.
Test Volumes: 175 ml of test or control sediment; 950 ml total volume.
Replicates/Treatment: 5 (plus one water quality replicate, and two sacrificial replicates for day 0 and day 10 interstitial ammonia and sulfide measurements)
Sediment Salinity Adjustment: None required.
Organisms/Treatment: 25 (5/replicate)
Water Volume Changes: One third of the seawater in each beaker was replaced every third day.
Aeration: Provided using a 1 ml glass pipette with the tip approximately 3-4 cm below the water surface. Air was bubbled at a low rate (150-300 ml/min) so as not to disturb the sediment surface.
Feeding: Animals were fed 40 mg TetraMarin® per beaker every other day.
Acceptance Criteria: DMMP and Sediment Management Standards (SMS) require control sediment mortality of ≤10%, and a target growth rate of >0.72 mg/day. DMMP requires a growth rate of >0.38 mg/day. For both programs, reference sediment mortality should be ≤20% with a growth rate of ≥80% that of the control sediment.
Effects Criteria: 1) survival after 20 days, 2) average individual biomass, and 3) average individual growth rate. Death is defined as no visible appendage movement or response to tactile stimulation. Missing worms are considered dead.
Water Quality and Other Test Conditions: Ammonia-N and sulfide were measured in the pore water of the bulk test sediments upon receipt, and in the interstitial water of one replicate sacrificial beaker on day 0. Ammonia-N and sulfide were measured in the interstitial water of additional replicate sacrificial beakers on days 10 and 20. Pore water was obtained by centrifugation. Ammonia-N and sulfide were measured in the overlying water of one replicate beaker on test days 0 and 20. The temperature, dissolved oxygen, salinity, and pH were measured in the water quality beakers on day 0 3, 6, 9, 12, 15, and 18 prior to test solution renewal. Sulfide and ammonia-N analyses were by the methylene blue (EPA Method 376.2) and salicylate (Clin. Chim. Acta 14:403, 1996) colorimetric methods, respectively; samples were not distilled prior to analysis. The values of individual water quality measurements are to be found in the raw data (Appendix II). The means, and minimum and maximum values for the water quality parameters during the test are listed in Table 1. The photoperiod was constant light.

DATA ANALYSIS METHODS

Percent survival, individual biomass, and individual growth rate at the end of the test were determined from the final observations according to the formulas:

Percent survival = 100 x (no. of surviving worms/initial number of worms)
Individual biomass = total dry wt. of worms/number of surviving worms weighed
Individual growth rate = (individual biomass - the initial dry wt.)/the number of test days

Means and standard deviations for the biological endpoints described above and for water quality data were computed using Microsoft Excel 2000.

Values of the three endpoints (survival, individual biomass, and individual growth rate) for the test sediments were statistically compared against each of the two reference sediments, as appropriate, using BioStat ver. 2.0 (U.S. Army Corps of Engineers, Seattle District). An arcsine transformation was performed on proportional data before analysis. Following transformation and determination of normality and homogeneity of variances, *Student's T-Test or the one-sample T-Test, were conducted at the 0.05 level of significance.*

PROTOCOL DEVIATIONS

The airflow was found to be off in beaker #34 on test day 15. The dissolved oxygen level was checked (7.1 mg/L) and found to be within limits. Airflow was re-established.

REFERENCE TOXICANT TEST

The reference toxicant test is a standard multi-concentration toxicity test using cadmium as $CdCl_2 \bullet 2½H_2O$, to evaluate the performance of the test organisms used in the sediment toxicity test. The performance is evaluated by comparing the results of this test with historical results obtained at the laboratory. The reference toxicant test raw data are found in Appendix III.

Test No.: 999-1083
Reference Toxicant and Source: $CdCl_2 \bullet 2½H_2O$, Mallinckrodt, Lot No. TNZ, 1.0 mg/ml stock prepared 7-24-99.
Test Date: 10-5-99
Dilution Water Used: Yaquina Bay, Oregon, seawater
Result: 96-hr LC50, 7.6 mg/L Cd. This result is within the laboratory's control chart warning limits (3.96 – 11.1 mg/L).

RESULTS AND CONCLUSIONS

Water quality data are summarized in Table 1. A detailed tabulation of the water quality results by sample and test day can be found in Appendix II. The means and standard deviations of percent survival, individual biomass as dry weight, and individual growth rate of *Neanthes* exposed for 20 days to sediments are summarized in Table 2. Detailed data organized by sample and replicate, including the initial observations on survival and worm final and tare weights, and summary statistics for these observations, are given in Appendix II, as well as data on the estimated initial weight of worms at the beginning of the test. Table 3 gives the final interstitial salinities in the sediments of each water quality replicate. Tables 4 and 5 summarize the interstitial ammonia-N and sulfide concentrations in the sediments of each sacrificial beaker on days 0, 10, and 20.

Observations of temperature, dissolved oxygen, salinity, and pH in the overlying water were within the protocol specified ranges. No sulfides were detected in the overlying water at either the beginning or end of the test. Ammonia-N in the overlying water ranged from <0.5 to 2.5 mg/L.

The test met the acceptability criterion (≥90%) for control survival; mean survival in the control was 100.0%. The individual growth rate in the controls averaged 0.93 mg/day. This is greater than the DMMP/SMS recommendation of 0.72 mg/day. The average initial weight of test organisms was 0.76 mg/worm; this is within the recommended range of 0.5 to 1.0 mg/worm. The survival and growth rate in the controls were acceptable, and the reference toxicant (positive control) result was within the control chart limits for this species. Therefore, this test is considered acceptable to use for making management decisions.

control growth rate, 0.83 mg/day (89.3% of the control growth rate) for MWRC213R1 and 0.79 mg/day (85.0% of the control growth rate) for MWRC214R1, respectively.

Survival in test sediments was not significantly different from that in either reference sediment. Average individual worm biomass and individual growth rate were both significantly less in samples MWAT042R1, MWAT045R1, and MWAT046R1 than that in reference sediment MWRC213R1, but were not significantly less than in reference sediment MWRC214R1.

STUDY APPROVAL

Michele S. Redmond 12-9-99
Project Manager/Study Director Date

Julie R. Fiore 12.9.99
Quality Assurance Unit Date

Richard S. Caldwell 12/9/99
Manager, Toxicology Date

Table 1. Summary of water quality conditions prevailing during the *Neanthes* 20-day test.

Water Quality Parameter	Mean ± SD	Minimum	Maximum	N
Temperature (°C)	20.1 ± 0.1	19.7	20.3	72
Dissolved Oxygen (mg/L)	6.9 ± 0.3	5.2	7.4	73
Salinity (ppt)	28.5 ± 0.7	27.0	30.0	72
pH	8.1 ± 0.2	7.4	8.5	72
Total Sulfide (mg/L)	---	<0.02	<0.02	18
Total Ammonia-N (mg/L)	---	<0.5	2.5	18

Table 2. Means and standard deviations (n=5) of percent survival, individual dry weight, and individual growth rate of *Neanthes* exposed for 20 days to marine sediments.

Sample Description	Percent Survival (20-days)	Individual dry wt. (mg)		Individual growth rate (mg/day)	
Control (NAS # 4287F)	100.0 ± 0.0	19.4 ± 4.0		0.93 ± 0.20	
MWAS034R1 (NAS # 4272F)	88.0 ± 17.9	17.8 ± 4.0		0.85 ± 0.20	
MWAS037R1 (NAS # 4273F)	100.0 ± 0.0	15.7 ± 2.5		0.75 ± 0.13	
MWAT042R1 (NAS # 4231F)	96.0 ± 8.9	13.0 ± 2.7	a	0.61 ± 0.14	a
MWAT045R1 (NAS # 4232F)	96.0 ± 8.9	14.5 ± 2.0	a	0.69 ± 0.10	a
MWAT047R1 (NAS # 4234F)	100.0 ± 0.0	16.1 ± 4.5		0.77 ± 0.22	
MWAT046R1 (NAS # 4246F)	100.0 ± 0.0	13.2 ± 1.3	a	0.62 ± 0.06	a
MWRC213R1 (NAS # 4274F)	100.0 ± 0.0	17.4 ± 1.9		0.83 ± 0.10	
MWRC214R1 (NAS # 4275F)	100.0 ± 0.0	16.6 ± 4.8		0.79 ± 0.24	

[a] Significantly different ($p \leq 0.05$) from reference sediment MWRC213R1.
[b] Significantly different ($p \leq 0.05$) from reference sediment MWRC214R1.

Table 3. Final sediment interstitial salinity for sediments tested for 20 days with the polychaete worm *Neanthes*.

Sample Description	Salinity (ppt)
Control (NAS # 4287F)	29.5
MWAS034R1 (NAS # 4272F)	28.5
MWAS037R1 (NAS # 4273F)	27.5
MWAT042R1 (NAS # 4231F)	29.5
MWAT045R1 (NAS # 4232F)	29.0
MWAT047R1 (NAS # 4234F)	29.5
MWAT046R1 (NAS # 4246F)	28.0
MWRC213R1 (NAS # 4274F)	29.5
MWRC214R1 (NAS # 4275F)	29.0

Table 4. Sediment interstitial ammonia-N for sediments tested for 20 days with the polychaete *Neanthes*.

Sample Description	Ammonia-N in mg/L		
	Day 0	Day 10	Day 20
Control (NAS # 4287F)	<2.5	5.0	<2.5
MWAS034R1 (NAS # 4272F)	5.0	2.5	<2.5
MWAS037R1 (NAS # 4273F)	<2.5	<2.5	<2.5
MWAT042R1 (NAS # 4231F)	23	2.5	<2.5
MWAT045R1 (NAS # 4232F)	7.5	2.5	<2.5
MWAT047R1 (NAS # 4234F)	10	5.0	<2.5
MWAT046R1 (NAS # 4246F)	10	2.5	<2.5
MWRC213R1 (NAS # 4274F)	7.5	2.5	<2.5
MWRC214R1 (NAS # 4275F)	13	<2.5	<2.5

Table 5. Sediment interstitial sulfides for sediments tested for 20 days with the polychaete *Neanthes*.

Sample Description	Sulfide in mg/L		
	Day 0	Day 10	Day 20
Control (NAS # 4287F)	4.5	<0.5	<0.5
MWAS034R1 (NAS # 4272F)	<1.0	<0.5	<0.5
MWAS037R1 (NAS # 4273F)	<1.0	<0.5	<0.5
MWAT042R1 (NAS # 4231F)	<1.0	<0.5	<0.5
MWAT045R1 (NAS # 4232F)	<1.0	<0.5	<0.5
MWAT047R1 (NAS # 4234F)	<1.0	<0.5	<0.5
MWAT046R1 (NAS # 4246F)	<1.0	<0.5	<0.5
MWRC213R1 (NAS # 4274F)	6.0	<0.5	<0.5
MWRC214R1 (NAS # 4275F)	<1.0	<0.5	<0.5

TEST PROTOCOL

JUVENILE POLYCHAETE, NEANTHES SP., 20-DAY SOLID PHASE SEDIMENT BIOASSAY

1. INTRODUCTION

1.1 Purpose of Study: The purpose of this study is to characterize the toxicity of marine sediments based on worm survival and growth.

1.2 Summary of Method: The 20-day static renewal test is performed using laboratory-cultured, 2-3 week post-emergence juvenile Neanthes sp. purchased from a supplier. Test sediments are placed in the bottom of 1 liter glass beakers used as test vessels which are then filled with clean seawater. Five replicate containers for each test sediment, a reference site sediment, and a control sediment are employed. Each replicate contains five worms. During test setup, three subsamples of five worms each are randomly selected to provide an estimate of initial biomass. During the exposure period, each chamber is provided with 40 mg of food on an every-other-day basis. Every third day, one-third of the seawater in each chamber is exchanged with fresh seawater. Mortality and growth are the response criteria used. The mean and standard deviation for each treatment and test endpoint are given in the final report. Between-treatment comparisons may be made using Student's t-test, Wilcoxon's Two-Sample test, or Mann-Whitney U test, where each treatment is compared to the control or the reference sediment.

2. STUDY MANAGEMENT

2.1 Sponsor's Name and Address:

_____
_____
_____
_____

2.2 Sponsor's Study Monitor:

_____

2.3 Name of Testing Laboratory:
Northwestern Aquatic Sciences
Yaquina Bay Road P.O. Box 1437
Newport, OR 97365.

2.4 Test Location: _____

2.5 Laboratory's Personnel to be Assigned to the Study:
Study Director: _____
Quality Assurance Officer: _____
Aquatic Biologist: _____
Aquatic Biologist: _____

2.6 Proposed Testing Schedule: Tests are to begin within 14 days of sample collection. Reference toxicant test to be run concurrently. (Test sediments may be held under nitrogen for up to eight weeks for PSDDA and COE work.)

2.7 Good Laboratory Practices: The test is conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

3. TEST MATERIAL

The test materials are marine sediments. The control, reference, and test sediments are placed in solvent cleaned 1 L glass jars fitted with PTFE-lined screw caps. At the laboratory the samples are stored at 4°C in the dark. The original sealed containers may be stored for up to 14 days prior to testing. A negative control sediment is collected from a clean site. In addition, a reference sediment, a clean sediment with physical characteristics similar to the test sediments, may be employed as a control.

4. TEST WATER

Test water is filtered Yaquina Bay seawater adjusted to a salinity of 28 ppt. The water is pumped daily from Yaquina Bay into a 6000 gal seasoned fiberglass reservoir from which it is supplied under pump pressure to the laboratory. Filtration is accomplished using a sand filter followed by a medium porosity (10-25 µm) cartridge filter. A fine (0.45 µm) cartridge filter is then used. An alternative seawater supply of similar quality may be used.

5. TEST ORGANISMS

5.1 Species: Neanthes sp.

5.2. Source: Neanthes are obtained from laboratory cultures. California State University, Long Beach, Dept. of Biology is a source for purchasing these worms.

5.3. Laboratory Handling: Worms are received from the supplier in plastic bags containing seawater and algae (Enteromorpha). Upon receipt, water quality data are taken on 1 or 2 bags and all bags with worms are then placed in holding aquaria containing seawater at 20 ± 1°C, and the salinity is adjusted to 28 ± 2 ppt. The worms are released from the bags after temperature equilibration. Worms are maintained for 1-2 days prior to use in tests. Gentle aeration is supplied to the holding aquaria. During the holding period, organisms are fed TetraMarin_ (8 mg per juvenile worm) on an every-other-day basis. If the food is not being consumed, feeding should be reduced. No water changes are required if holding time is less than 1 week.

5.4 Age at Study Initiation: 2-3 week post-emergence juveniles (0.5-1.0 mg dry weight).

6. DESCRIPTION OF TEST SYSTEM

6.1 Test Chambers and Environmental Control: Test chambers used in the toxicity test are 1000 ml glass beakers. The beakers are covered with lids to minimize contamination and evaporation of seawater or loss of volatile compounds. Test chambers are maintained at constant temperature by partial immersion in a temperature-controlled water bath or by placement in a temperature-controlled room. Minimal aeration is supplied through a glass pipet with the tip placed 3-4 cm below the water surface. The aeration rate should be 150 - 300 mL/minute or approximately 100 bubbles per minute). The test is performed under continuous illumination, using ambient laboratory lighting.

6.2 Cleaning: All laboratory glassware, including test chambers, is cleaned as described in EPA/600/4-90/027. New glassware and test systems are soaked 15 minutes in tap water and scrubbed with detergent (or cleaned in automatic dishwasher); rinsed twice with tap water; carefully rinsed once with fresh, dilute (10%, V:V) hydrochloric or nitric acid to remove scale, metals, and bases; rinsed twice with deionized water; rinsed once with acetone to remove organic compounds (using a fume hood or canopy); and rinsed three times with deionized water. Test systems and chambers are rinsed again with dilution water just before use.

7. EXPERIMENTAL DESIGN AND TEST PROCEDURES

7.1 Experimental Design: The experimental design consists of exposure of test organisms to a number of test sediments, a negative control sediment and a reference sediment. Each treatment consists of five replicate test chambers each containing five animals. Complete randomization of test containers and blind monitoring of response criteria should be used.

7.2 Preparation of Test Sediments: Test sediments are checked to be sure that the interstitial salinities are ≥ 20 ppt. Interstitial salinities should be checked and recorded for control, reference, and test sediments (both

initial and final). If initial interstitial salinities are not ≥20 ppt, the interstitial salinities must be adjusted as specified in the PSEP (1995) protocols. If interstitial salinities are satisfactory, the sediments may be used without further treatment.

On the day before test initiation, each sediment is mixed thoroughly using a non-contaminating implement, then an aliquot (175 ml) sufficient to make a 2-cm-deep layer is added to each of the five replicate test beakers, and the surface is smoothed. Bubbles are removed from the sediment by gently tapping each beaker against the palm of the hand. Seawater at the test temperature and salinity is added to each beaker by carefully pouring the water down the side of the chamber to the 750 mL mark. Filled chambers are then placed into the 20 ± 1 °C water bath and covered with watch glasses. An air line is inserted into the beaker under the watch glass. The chambers are then allowed to equilibrate overnight to bioassay conditions. Photoperiod during the test should be continuous illumination, using ambient laboratory lighting.

7.3 Beginning the Test: On the day of test initiation, worms are collected from the holding aquaria using a small, fine-point paint brush. The worms should be handled as little as possible; damaged or injured worms should be discarded. More worms than are needed for the bioassay are transferred to a shallow glass dish containing seawater of the test salinity and temperature. Individual worms are removed from the dish and randomly placed into plastic cups (5 worms per cup) containing seawater. Enough cups for the test plus three additional cups are prepared. Once the worms are in the cups, worms within a cup are randomly transferred to a test chamber by pouring the contents into the chamber. A squirt bottle containing seawater maintained at the test temperature and salinity can be used to free the worms that stick to the cup. During the transfer process, three of the cups containing worms are randomly selected and set aside. Worms from these cups are used to estimate initial total biomass. To determine initial total biomass, worms from these three cups are quickly rinsed with deionized water, placed on a preweighed aluminum pan, dried at 50°C to a constant weight, and weighed to the nearest 0.1 mg.

Once worms have been placed in all test chambers, each beaker is filled to a total volume of 950 mL and checked to ensure that air is flowing to the chamber and that the worms have begun to burrow into the sediment. TetraMarin_ is then provided to each beaker (40 mg/beaker). The food is preweighed into plastic cups, wetted with bioassay test water, and rinsed into the test beakers. After one hour, any worms that have not burrowed into the sediment should be replaced if they appear damaged.

During the 20-day exposure, one-third of the seawater in each beaker is replaced every third day. Prior to seawater replacement, water quality measurements are determined for each test chamber. Water replacement is achieved by removing aeration lines and siphoning one-third of the volume of test water, then replacing it with fresh 28 ± 2 ppt test water that has been maintained at 20 ± 1 °C. Care should be taken not to disturb the sediments.

7.4 Effect Criteria: Effect criteria are 1) survival after 20 days, 2) total biomass (dry weight), 3) average individual biomass (total biomass divided by the number of surviving worms), and 4) average individual growth rate.

7.5 Test Conditions: The test temperature is 20 ± 1°C. The test salinity is 28 ± 2 ppt. The dissolved oxygen concentration in each test container must be greater than 60% saturation (PSEP 1995) or 4.0 mg/L (PSDDA) throughout the 20-day test. Each beaker is supplied with oil-free compressed air provided at a rate of 150-300 mL per minute through disposable glass pipettes positioned with their tips approximately 3-4 cm below the water surface. Beakers are covered with lids to minimize evaporation and the possibility of cross contamination between beakers. The test is conducted under constant illumination of medium to low intensity.

7.6 Feeding: Animals are fed 40 mg TetraMarin® per beaker on an every-other-day basis during the test.

7.7 Test Duration, Type and Frequency of Observations, and Methods: The duration of the sediment toxicity test is 20 days. The test chambers are observed daily to ensure that adequate aeration is provided and to note the

general status of each chamber. The temperature of the environmental chamber should also be monitored daily. The type and frequency of observations to be made are summarized as follows:

TYPE OF OBSERVATION	TIMES OF OBSERVATION
Biological Data	
Survival	end of test
Biomass	end of test
Physical and Chemical Data	
Sediment interstitial salinity	beginning & end of test
Salinity, dissolved oxygen, pH, and temperature (in all beakers on days 0 & 20; in one replicate every third day)	day 0, day 20 and prior to partial replacement of test water every third day
Ammonia-N and sulfide in overlying water (optional, PSEP; required, PSDDA)	beginning & end of test*

*Further ammonia-N and sulfide monitoring is recommended prior to the first and second water renewals when initial monitoring reveals >0.7 mg/L unionized ammonia or >5.0 mg/L sulfides.

Following the exposure period, worms from each chamber are removed from the test sediment, either by gently sieving the sediment through a 0.5 mm screen or by placing the sediment in a white enamel pan of seawater, and searching for surviving worms. Worms often are in their tubes and can be removed by gently prodding either end of the tube with a fine-point paint brush. Survival is noted on a data sheet. Surviving worms are placed in a vial of clean seawater until all chambers have been sieved. Then worms from each chamber are quickly rinsed with deionized water, placed on a pre-weighed aluminum pan, dried at 50°C to a constant weight, and weighed to the nearest 0.1 mg. Prior to rinsing the worms, observations should be made to determine if food or sediment is present in the digestive tract.

Dissolved oxygen is measured directly in test bakers using a polarographic oxygen probe calibrated according to the manufacturer's recommendations. The pH is measured using a properly calibrated pH meter with scale divisions of 0.1 pH units. Temperature is measured using a calibrated mercury thermometer or a telethermometer. Salinity is measured using a refractometer. Ammonia-nitrogen is measured using the HACH Model FF-3 test kit (ammonia-N detection limit 0.1 mg/L). Sulfide is measured using the HACH Hydrogen Sulfide Test Kit Model HS-WR (sulfide detection limit 0.01 mg/L). Any observed changes in sediment color or the formation of a sediment discontinuity layer is also recorded.

7.8 Criteria of Test Acceptance: For the test to be considered acceptable, the minimum survival of organisms in the control treatment at the end of the test should be 80%.
PSDDA Performance Guidelines: Control sediment: mortality ≤10% and growth rate >0.72 mg/day. Reference sediment: mortality ≤20% and growth rate of ≥80% of that of the control sediment.
Sediment Management Standards Performance Standards: Control sediment: mortality <10% and mean individual growth rate of at least 0.72 mg/day. Reference sediment: mean individual growth rate of at least 80% of that of the control sediment.

8. DATA ANALYSIS

The mean and standard deviation are calculated for each endpoint employed (e.g. 20-day survival, 20-day total biomass, 20-day average individual biomass, and average individual growth rate) and for each treatment (i.e. test sediment). Between treatment comparisons may be made using a Student's t-test, Wilcoxon's Two-Sample test, or Mann-Whitney U test, where each treatment is compared to the control or the reference sediment. An arcsine-square root transformation of proportional data, and tests for normality and heterogeneity of variances, are performed prior to statistical comparisons.

9. REPORTING

A report of the test results must include the following information: name and identification of the test; the investigator and laboratory; information on the test, reference, and control sediments including the initial and final interstitial salinities; information on the source of seawater used; detailed information about the test organisms including acclimation conditions; a description of the experimental design and test chambers and other test conditions including water quality; information about any aeration that may have been required; definition of the effect criteria and other observations; unusual responses, if any, in the control treatment; 20-day survival in each exposure chamber and the mean and standard deviation for each treatment; initial total biomass (dry weight) for three groups of five worms; 20-day total biomass (dry weight) in each exposure chamber and the mean and standard deviation for each treatment; 20-day average individual biomass (dry weight) in each exposure chamber and the mean and standard deviation for each treatment; average individual growth rate in each exposure chamber and the mean and standard deviation for each treatment; interstitial salinity values, both initial and final, for each sediment; 96-hour LC50 with reference toxicant; a description of data analysis methods employed and documentation of statistical test results: any unusual information about the test or deviations from procedures.

10. STUDY DESIGN ALTERATION

Amendments made to the protocol must be approved by the sponsor and study director and should include a description of the change, the reason for the change, the date the change took effect, and the dated signatures of the study director and sponsor. Any deviations in the protocol must be described and recorded in the study raw data.

11. REFERENCE TOXICANT

Reference toxicant testing should be included with each study or at regular intervals as defined in the Quality Assurance Program of the laboratory.

12. REFERENCED PROCEDURES

Johns, D.M., T.C. Ginn, and D.R. Reish. 1990. Protocol for juvenile Neanthes sediment bioassay. Prepared for U.S. Env. Prot. Agency, Region 10 -Office of Puget Sound, Seattle, WA, 17 pp.

Puget Sound Dredged Disposal Analysis (PSDDA). 1989. Management plan report - unconfined open-water disposal of dredged material, Phase II - (north and south Puget Sound). Puget Sound Dredged Disposal Analysis, Army Corps of Engineers, Seattle, WA.

Puget Sound Estuary Program. 1995. Recommended guidelines for conducting laboratory bioassays on Puget Sound sediments. Prepared for U.S. Env. Prot. Agency, Region 10, Office of Puget Sound, Seattle, WA, and Puget Sound Water Quality Authority, Olympia, WA.

Snedecor, G.W. and W.G. Cochran. 1967. Statistical methods. Sixth Ed., The Iowa State Univ. Press. Ames, Iowa., 593 pp.

Weber, C.I. (Ed.) 1991. Methods for measuring the acute toxicity of effluents to freshwater and marine organisms (fourth edition). EPA/600/4-90/027.

13. APPROVALS

_____ for _____

Name Date

_____ for **NORTHWESTERN AQUATIC SCIENCES**

Name Date

APPENDIX II

RAW DATA

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-NA4
NEANTHES SP. 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-6 Client Foster Wheeler Investigator pgs. 1-76 MSR reviewed 12-10-99

STUDY MANAGEMENT

Client: Foster Wheeler Environmental, 10900 NE 8th St, Suite 1300, Bellevue, WA 98004
Client's Study Monitor: Mr. Gary Braun
Testing Laboratory: Northwestern Aquatic Sciences
Test Location: Newport Laboratory
Laboratory's Study Personnel:
Proj. Man./Study Dir. M.S. Redmond MSR
QA Officer L.K. Nemeth
1. Erin Coffey 2. Robert Shelton RS. Caldwell RSC
3. Colleen Hayes CH 4. [illegible] (AR)
Study Schedule:
Test Beginning: 10-5-99 1600 Test Ending: 10-25-99 1400

TEST MATERIAL

General description (see sample logbook/chain-of-custody for details):

NAS Sample No.:	4231F	4232F	4234F	4246F	4272F
Description:	MWAT042R1	MWAT045R1	MWAT047R1	MWAT046R1	MWA S034R1
Collection Date:	9-21-99	9-21-99	9-22-99	9-23-99	9-27-99
Receipt Date:	9-23-99	9-23-99	9-23-99	9-25-99	9-29-99
Inters.Salinity (ppm):	24.5	24.0	27.0	28.5	30.5

NAS Sample No.:	4273F	4274F	4275F	4287F	
Description:	MWA S037R1	MWRC213R1	MWRC214R1	control	
Collection Date:	9-27-99	9-27-99	9-27-99	10-3-99	
Receipt Date:	9-29-99	9-29-99	9-29-99	10-3-99	
Inters.Salinity (ppm):	29.5	29.5	30.0	31.5	

TEST WATER

Source: Yaquina Bay, Oregon sea water
Date of Collection: 9-29-99 MSR Salinity (ppt) 28.0/28.0 pH 7.9/8.0
Treatments: Filtered to ≤0.40µm, salinity-adjusted w/ Milli-Q deionized water, aerated.

TEST ORGANISMS

Species: Neanthes Date ~~Purchased~~ Received: 9-29-99
Source: Dept. of Biology, California State University, Long Beach, CA MSR 10-4-99
Acclimation Data:

Date	Temp (°C)	DO (mg/L)	pH	Sal (ppt)	Comments
9-29-99	23.2	6.1	7.3	33.0	receiving water; fed
9-30-99	20.6	5.2	7.6	30.5	
10-1-99	20.5	4.0	7.6	30.5	fed
10-3-99	20.8	5.0	7.8	30.5	fed
10-4-99	20.0	6.2	7.4	30.0	
10-5-99	20.1	6.3	8.0	30.0	
Mean	20.9	5.5	7.6	30.8	
S.D.	1.2	0.9	0.3	1.1	
(N)	6	6	6	6	

NORTHWESTERN AQUATIC SCIENCES - MSR 10-6-99 PROTOCOL NO. NAS-XXX-~~RA+~~ NAH MSR 10-6-99

~~MARINE AMPHIPOD 10~~ NEANTHES 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-~~5~~ 6 Client Foster - Wheeler Investigator

MSR 10-6-99

SEDIMENT DESCRIPTIONS--SUPLEMENTAL NOTES

Sample No.	Description
~~4286F~~	~~Gray, course sand~~ not used in this test - MSR 10-6-99
4287F	Gray, course sand; sieved through 1.0 mm screen.
4232F	dark brown sandy mud
4231F	DARK GRAY, FINE, WOOD PIECES AND PLANT DEBIS
4233F	Dark brown sandy mud
4245F	Dark brown sandy mud
4235F	dark brown sandy mud
4234F	DARK GRAY GREEN FINE MUD + FINE SAND
4272F	Dark gray/light black, fine mud
4246F	dark brown mud
4273F	DARK GRAY, FINE MUD
4274F	Dark brown sandy mud
4275F	light brown sandy mud

Samples 4272F, 4273F, 4274F, 4275F were placed under nitrogen upon receipt. Samples 4232F, 4231F, 4233F, 4245F, 4235F, 4234F and 4246F were placed under nitrogen on 9-29-99 MSR

NEANTHES SP. 20-DAY SOLID PHASE SEDIMENT TEST

TEST PROCEDURES AND CONDITIONS

Test chambers: 1 L glass beakers covered w/ watchglasses
Test volumes: 175 ml of test sediment; ~~1000~~ 950 ml total volume mw 10-5-99
Replicates/treatment: (5) 5 * Organisms/treatment: (25) 25
Test water changes: Every third day beginning with day 3
Aeration: Yes, 3 cm below water surface
Feeding: every other day beginning with day 0 Photoperiod: constant light
Beaker placement: Total randomization
Controls: Negative (clean sediment)
Positive (96-hr acute test with reference toxicant)

constant temperature room #2, north side

Randomization chart: NORTH WALL

1											
2											
3			QC test								
4											
5											

upper shelf

Randomization chart: NORTH WALL

1	3	6								69	72
2	2	5	→	→	→	→	→	→	→	68	71
3	1	4								67	70
4											
5											

lower shelf

TEST SCHEDULE SUMMARY

Date	10-5-99	10-6-99	10-7-99	10-8-99	10-9-99	10-10-99	10-11-99	10-12-99	10-13-99	10-14-99	10-15-99	10-16-99	10-17-99	10-18-99	10-19-99	10-20-99	10-21-99	10-22-99	10-23-99	10-24-99	10-25-99
Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Feed	X		X		X		X		X		X		X		X		X		X		
Record WQ	X			X			X			X			X			X			X		X
Change H2O				X			X			X			X			X			X		
IS/NH4/S=	X																				X
Initials																					

MISCELLANEOUS NOTES

* Three additional replicates were included for water quality purposes as follows: 1) a replicate w/o animals, sacrificed on day 0 for interstitial ammonia and sulfide measurements, 2) a replicate w/ animals, sacrificed on day 10 for ammonia and sulfide measurements, and 3) a replicate w/ animals, used for daily overlying water quality measurements and sacrificed at test termination for interstitial ammonia and sulfide measurements.

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-NA4

NEANTHES SP. 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-6 Client Foster Wheeler Investigator

DAILY RECORD SHEET

Day 0 (10/5/99) Temperature beaker 20.0 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water changed*	Fed*	Air*	Comments
4	20.0	7.0	27.5	7.4	<0.02			Yes	OK	
11	20.1	6.9	27.5	7.5	<0.02					
25	20.1	7.2	27.5	7.7	<0.02					
30	19.9	7.2	27.5	7.6	<0.02					
38	20.0	7.1	27.0	7.6	<0.02					
41	20.1	7.2	27.5	7.7	<0.02					
46	20.2	7.3	27.5	7.8	<0.02					
51	20.1	7.3	27.5	7.8	<0.02					
59	20.2	7.4	27.0	7.8	<0.02			↓	↓	

Day 1 (10/6/99) Temperature beaker 20.1 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water changed*	Fed*	Air*	Comments
4									OK	
11									↓	
25										
30										
38										
41										
46										
51										
59										

*These columns refer to all beakers in the test; MSL 10-5-99

NORTHWESTERN AQUATIC SCIENCES — PROTOCOL NO. NAS-XXX-NA4

NEANTHES SP. 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-6 Client Foster Wheeler Investigator _____

DAILY RECORD SHEET

Day 2 (10/7/99) RMS/L — Temperature beaker 20.5 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water changed*	Fed*	Air*	Comments
4								yes	OK	
11										
25										
30										
38										
41										
46										
51										
59										

Day 3 (10/8/99) RMS/L — Temperature beaker 20.5 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water changed*	Fed*	Air*	Comments
4	20.2	6.2	28.5	7.9			yes		OK	
11	20.1	6.4	28.5	8.1						
25	20.1	6.8	29.0	8.2						
30	19.8	6.8	28.5	8.2						
38	20.1	6.6	28.0	8.1						
41	20.1	6.8	28.5	8.2						
46	20.2	6.8	29.0	8.3						
51	20.0	7.0	29.0	8.3						
59	20.2	6.8	28.5	8.3						

*These columns refer to all beakers in the test; YMR 10-5-99

NORTHWESTERN AQUATIC SCIENCES — PROTOCOL NO. NAS-XXX-NA4

NEANTHES SP. 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-6 Client Foster Wheeler Investigator

DAILY RECORD SHEET

Day 4 (10/9/99) RMS — Temperature beaker 20.5 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water changed*	Fed*	Air*	Comments
4								YES	ON	
11								↓	↓	
25										
30										
38										
41										
46										
51										
59										

Day 5 (10/10/99) RMS — Temperature beaker 20.0 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water changed*	Fed*	Air*	Comments
4									ON	
11										
25										
30										
38										
41										
46										
51										
59									↓	

*These columns refer to all beakers in the test; YSL 10-5-99

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-NA4

NEANTHES SP. 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-6 Client Foster Wheeler Investigator _____

DAILY RECORD SHEET

Day 6 (10/11/99) [illegible]

Temperature beaker 20.2 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water changed*	Fed*	Air*	Comments
4	20.2	5.2	28.5	7.9			yes	yes	OK	
11	20.0	6.1	28.0	8.1						
25	20.1	6.4	29.0	8.2						
30	19.7	6.4	29.0	8.1						
38	20.0	6.6	28.0	8.0						
41	20.1	6.7	28.5	8.1						
46	20.2	6.5	29.0	8.4						
51	20.0	6.5	29.0	8.2						
59	20.1	6.6	28.5	8.2						

Day 7 (10/12/99) [illegible]

Temperature beaker 20.0 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water changed*	Fed*	Air*	Comments
4									OK	
11										
25										
30										
38										
41										
46										
51										
59										

*These columns refer to all beakers in the test; MSL 10-5-99

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-NA4

NEANTHES SP. 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-6 Client Foster Wheeler Investigator _____

DAILY RECORD SHEET

Day 8 (10/13/99) [illegible] Temperature beaker 20.0 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water* changed	* Fed	* Air	Comments
4								yes	OK	
11										
25										
30										
38										
41										
46										
51										
59										

Day 9 (10/14/99) [illegible]/Rms/[illegible] Temperature beaker 20.5 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water* changed	* Fed	* Air	Comments
4	20.1	6.6	28.0	7.9			yes		OK	
11	19.9	6.8	28.0	8.0						
25	20.0	7.0	28.5	8.3						
30	19.7	6.8	28.5	7.9						
38	20.1	6.8	28.0	8.0						
41	20.0	7.0	28.0	8.1						
46	20.0	7.1	28.5	8.2						
51	19.9	7.0	29.5	8.1						
59	20.2	7.2	28.5	8.2						

*These columns refer to all beakers in the test; MSL 10-5-99

5/1/91

NORTHWESTERN AQUATIC SCIENCES — PROTOCOL NO. NAS-XXX-NA4

NEANTHES SP. 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-6 Client Foster Wheeler Investigator _____

DAILY RECORD SHEET

Day 10 (10/15/99) [illegible]

Temperature beaker 20.1 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water changed*	Fed*	Air*	Comments
4								yes	OK	
11								↓	↓	
25										
30										
38										
41										
46										
51										
59								↓	↓	

Day 11 (10/16/99)

Temperature beaker 20.2 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water changed*	Fed*	Air*	Comments
4									OK	
11									↓	
25										
30										
38										
41										
46										
51										
59									↓	

*These columns refer to all beakers in the test; YKL 10-5-99

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-NA4

NEANTHES SP. 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-6 Client Foster Wheeler Investigator _____

DAILY RECORD SHEET

Day 12 (10/17/99) ✓2 Temperature beaker 20.1 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water changed*	Fed*	Air*	Comments
4	20.3	7.1	29.0	7.7			Yes	Yes	OK	
11	20.1	7.2	28.5	7.7						
25	20.1	7.2	28.5	8.0						
30	20.0	6.9	28.0	7.8						
38	20.2	7.0	28.0	7.8						
41	20.2	7.0	28.5	7.9						
46	20.2	6.8	28.0	8.0						
51	20.2	7.1	28.5	7.9						
59	20.2	7.6	28.5	8.0						

Day 13 (10/18/99) ✓2 Temperature beaker 20.1 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water changed*	Fed*	Air*	Comments
4									OK	
11										
25										
30										
38										
41										
46										
51										
59										

*These columns refer to all beakers in the test; YKSL 10-5-99

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-NA4

NEANTHES SP. 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-6 Client Foster Wheeler Investigator _____

DAILY RECORD SHEET

Day 14 (10/19/99) Temperature beaker 20.0 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water changed*	Fed*	Air*	Comments
4								yes	OK	
11								↓	↓	
25										
30										
38										
41										
46										
51										
59										

Day 15 (10/20/99) Temperature beaker 20.1 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water changed*	Fed*	Air*	Comments
4	20.1	6.6	28.0	8.1			yes		OK	
11	20.0	6.6	28.5	8.2			↓		↓	
25	20.0	7.0	30.0	8.3						
30	19.8	6.8	28.5	8.0						
38	20.0	6.8	28.5	8.1						
41	20.0	6.8	29.5	8.1						
46	20.1	7.0	30.0	8.2						
51	20.1	7.0	29.5	8.0						
59	20.1	7.0	30.0	8.2						
34		7.1							off	Re-established

*These columns refer to all beakers in the test; MSL 10-5-99

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-NA4

NEANTHES SP. 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-6 Client Foster Wheeler Investigator _____

DAILY RECORD SHEET

Day 16 (10/21/99) RWS / [illegible] Temperature beaker 20.5 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water* changed	* Fed	* Air	Comments
4								yes	OK	
11										
25										
30										
38										
41										
46										
51										
59										
									2WS	

Day 17 (10/~~20~~ 22/99) [illegible] Temperature beaker 20.5 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water* changed	* Fed	* Air	Comments
4									OK	
11										
25										
30										
38										
41										
46										
51										
59										

*These columns refer to all beakers in the test; MSL 10-5-99

5/1/91

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-NA4

NEANTHES SP. 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-6 Client Foster Wheeler Investigator _____

DAILY RECORD SHEET

Day 18 (10/23/99) Temperature beaker 20.3 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water changed*	Fed*	Air*	Comments
4	20.1	7.1	28.0	8.4			yes	yes	OK	
11	19.9	7.0	28.0	8.0						
25	20.1	7.1	29.0	8.4						
30	19.8	7.1	28.5	8.1						
38	20.1	6.8	28.0	8.1						
41	20.1	6.9	29.0	8.1						
46	20.2	7.0	29.5	8.2						
51	20.2	7.1	28.5	8.1						
59	20.2	7.2	29.5	8.3						

Day 19 (10/24/99) Temperature beaker 20.1 °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water changed*	Fed*	Air*	Comments
4									OK	
11										
25										
30										
38										
41										
46										
51										
59										
									OK	

*These columns refer to all beakers in the test; MSL 10-5-99

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-NA4

NEANTHES SP. 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-6 Client Foster Wheeler Investigator _____

DAILY RECORD SHEET

Day 20 (10/25/99) cms/EGA/-2 Temperature beaker 20 | °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water changed*	Fed*	Air*	Comments
4	20.1	7.3	23.5	8.5	<0.02				OK	
11	19.9	7.1	23.5	8.1	<0.02					
25	19.9	7.0	29.5	8.4	<0.02					
30	19.8	7.0	28.0	8.1	<0.02					
38	19.8	7.1	28.0	8.2	<0.02					
41	20.0	7.1	29.0	8.2	<0.02					
46	20.1	7.1	29.5	8.2	<0.02					
51	20.0	7.1	28.5	8.1	<0.02					
59	20.1	7.1	29.5	8.3	<0.02					

Day ____ (/ /) Temperature beaker ____ °C

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Water changed*	Fed*	Air*	Comments
4										
11										
25										
30										
38										
41										
46										
51										
59										

YNR 10-5-99

*These columns refer to all beakers in the test; YNR 10-5-99

NEANTHES SP. 20-DAY SOLID PHASE SEDIMENT TEST

Test No 590-6 Client Foster Wheeler Investigator _____

DAY 20 TEST TERMINATION SHEET

Beaker No.	Interstitial salinity (ppt)	Number of survivors	Initial
1			
2		5	RMS
3		5	
4			
5		5	RMS
6		5	
7			
8			
9			
10		5	
11			
12		5	
13		5	
14			
15		5	RMS
16		5	
17		4	RMS
18		5	
19		5	RMS
20		5	RMS
21			
22			
23			
24			
25			
26		5	
27		5	RMS
28			
29		5	
30			
31		5	RMS
32		5	
33		5	
34		5	
35		5	
36		5	RMS
37		5	
38			
39		5	RMS
40		5	
41			
42		3	RMS
43			
44		5	
45		5	
46			
47		5	RMS
48		5	

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-NA4

NEANTHES SP. 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-6 Client Foster Wheeler Investigator

DAY 20 TEST TERMINATION SHEET

Beaker No.	Interstitial salinity (ppt)	Number of survivors	Initial
49		4	RMS
50		5	
51			
52		5	
53		5	
54		5	
55		5	RMS
56			
57		5	
58			
59			
60			
61			
62		5	RMS
63			
64		5	RMS
65			
66		5	RMS
67		5	RMS
68			
69		5	RMS
70		5	RMS
71		4	RMS
72		5	RMS

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-NA4

NEANTHES SP. 20 DAY SOLID PHASE SEDIMENT TEST

Test No. 590-6 Client Foster Wheeler Environmental Investigator _____

ZERO-TIME WEIGHING DATA SHEET

Tare: Date 9-27-99 Oven Temp(°C) 52 °C Drying Time(Hr.) 24 Initials JMR

Final: Date 10-6-99 Oven Temp(°C) 52°C Drying Time(Hr.) 24 Initials JMR

Equip. Used: Oven BLUE M Balance Sartorius

Pan #	Tare wt. (mg)	Total wt. (mg) 1	2	3	#weighed
1	32.35 ~~32.349~~ JMR2	35.88	35.87	35.86	5
2	27.92	31.58	31.58	31.58	5
3	24.96	29.16	29.16	29.16	5
4					
5					
6					

JMR 9-29-99

9-29-99 JMR 100 mg standard weight = 100.02 mg

10-6-99 JMR 100 mg standard weight = 100.02 mg

10-7-99 JMR 100 mg std wt = 100.02 mg

10-8 99 JMR 100 mg std wt = 100.02 mg

NORTHWESTERN AQUATIC SCIENCES

PROTOCOL NO: NAS-XXX-NA4

NEANTHES SP. 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-6 Client Foster Wheeler Investigator

WEIGHING DATA SHEET

Tare: Date 10.8.99 Oven temp (C.) 50.2 Drying time (hr.) 24 Initials JRF
Final: Date 10.26.99 Oven temp (C.) 51 Drying time (hr.) 24 Initials JRF
Equip. used: Oven Blue 17 Balance Sartorius

Beaker #	Pan #	Tare wt. (mg)	Total wt. (mg) 1	2	3	#weighed	Comments
~~1~~	~~1~~	—	—	—	—	—	
2	2	60.74	142.38	142.00	141.87	5	
3	3	62.11	137.64	137.25	137.08	5	
~~4~~	~~4~~	—	—	—	—	—	
5	5	65.80	133.97	133.68	133.54	5	
6	6	59.70	121.43	121.03	120.77	5	
~~7~~	~~7~~	—	—	—	—	—	
~~8~~	~~8~~	—	—	—	—	—	
~~9~~	~~9~~	—	—	—	—	—	
10	10	60.34	129.34	129.08	128.87	5	
~~11~~	~~11~~	—	—	—	—	—	
12	12	58.85	125.34	124.78	124.66	5	
13	13	57.30	141.05	140.76	140.58	5	
~~14~~	~~14~~	—	—	—	—	—	
15	15	61.02	182.84	182.21	181.82	5	
16	16	63.97	121.01	120.78	120.55	5	
17	17	54.24	109.20	109.06	108.80	4	
18	18	50.59	115.75	115.51	115.34	5	
19	19	56.53	174.49	173.99	173.80	5	
20	20	62.59	157.65	157.14	156.87	5	
~~21~~	~~21~~	—	—	—	—	—	
~~22~~	~~22~~	—	—	—	—	—	
~~23~~	~~23~~	—	—	—	—	—	
~~24~~	~~24~~	—	—	—	—	—	
~~25~~	~~25~~	—	—	—	—	—	
26	26	59.41	124.24	124.05	123.93	5	
27	27	56.75	164.30	163.87	163.63	5	
~~28~~	~~28~~	—	—	—	—	—	
29	29	58.30	131.70	131.08	131.03	5	
~~30~~	~~30~~	—	—	—	—	—	
31	31	60.10	148.34	147.37	147.20	5	
32	32	60.76	145.77	144.73	144.55	5	
33	33	63.34	169.98	166.25	168.16	5	
34	34	61.14	122.20	121.70	121.62	5	

JRF 10-8-99 3000 100mg std wt= 100.02 mg
JRF 10-26-99 100mg std wt = 100.02
JRF 10-27-99 100mg std wt = 100.02
10-29-99 JRF 100mg std wt = 100.02

NEANTHES.WTS

NORTHWESTERN AQUATIC SCIENCES

PROTOCOL NO: WAS-XXX-WAY

NEANTHES SP. 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-6 Client Foster Wheeler Investigator

WEIGHING DATA SHEET

Tare: Date 10.8.99 Oven temp (C.) 50°C Drying time (hr.) 24 Initials JME
Final: Date 10.26.99 Oven temp (C.) 51 Drying time (hr.) 24 Initials JME
Equip. used: Oven Blue M Balance Sartorius

Beaker #	Pan #	Tare wt. (mg)	Total wt. (mg) 1	2	3	#weighed	Comments
~~35~~	35	48.32	98.61	98.33	98.31	5	
~~36~~	36	51.95	139.95 ~~138.67~~	139.30	139.23	5	
37	37	53.19	138.65	137.97	137.83	5	
~~38~~	~~38~~	—	—	—	—	—	
39	39	49.56	129.33	128.88	128.79	5	
40	40	50.23	97.29	96.98	96.96	5	
~~41~~	~~41~~	—	—	—	—	—	
42	42	59.17	102.50	102.12	102.01	3	
~~43~~	~~43~~	—	—	—	—	—	
44	44	56.50	122.43	121.95	121.83	5	
45	45	52.36	127.59	127.17	127.02	5	
~~46~~	~~46~~	—	—	—	—	—	
47	47	55.62	154.58	154.06	153.86	5	
48	48	53.20	127.50	126.92	126.82	5	
49	49	52.92	125.21	124.66	124.58	4	
50	50	53.15	107.48	107.24	107.18	5	
~~51~~	~~51~~	—	—	—	—	—	
52	52	54.61	129.48	129.18	129.08	5	
53	53	55.88	151.48	150.72	150.54	5	
54	54	58.74	117.29	116.97	116.90	5	
55	55	57.35	129.87	129.55	129.40	5	
~~56~~	~~56~~	—	—	—	—	—	
57	57	60.12	144.46	144.26	144.17	5	
~~58~~	~~58~~	—	—	—	—	—	
~~59~~	~~59~~	—	—	—	—	—	
~~60~~	~~60~~	—	—	—	—	—	
~~61~~	~~61~~	—	—	—	—	—	
62	62	58.19	125.26	124.90	124.73	5	
~~63~~	~~63~~	—	—	—	—	—	
64	64	62.57	141.27	140.89	140.68	5	
~~65~~	~~65~~	—	—	—	—	—	
66	66	57.70	147.15	146.94	146.70	5	
67	67	58.69	158.71	158.04	157.54	5	
~~68~~	~~68~~	—	—	—	—	—	

NORTHWESTERN AQUATIC SCIENCES

PROTOCOL NO: NAS-XXX-NA4

NEANTHES SP. 20-DAY SOLID PHASE SEDIMENT TEST

Test No. 590-6 Client Foster Wheeler Investigator

WEIGHING DATA SHEET

Tare: Date 11-6-99 Oven temp (C.) 50 Drying time (hr.) 24 Initials JME
Final: Date Oven temp (C.) Drying time (hr.) Initials
Equip. used: Oven BLUE M Balance Sartorius

Beaker #	Pan #	Tare wt. (mg)	Total wt. (mg) 1	2	3	#weighed	Comments
69	69	55.64	150.33	149.90	149.60	5	
70	70	50.37	135.13	134.79	134.53	5	
71	71	56.07	150.21	149.97	149.72	4	
72	72	58.16	166.06	165.99	165.81	5	
73	73						
74	74						
75	75						
76	76						
77	77						
78	78						
79	79						
80	80						
81	81						
82	82						
83	83						
84	84						
85	85						
86	86						
87	87						
88	88						
89	89						
90	90						
91	91						
92	92						
93	93						
94	94						
95	95						
96	96						
97	97						
98	98						
99	99						
100	100						
101	101						
102	102						

NEANTHES.WTS

10/4/99

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: Foster Wheeler Interstitial water & samples

	Sample description	DI&K	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	4231F		0.2															QC STD (NH3N)			
2	4232F			0.2														Nom.		Meas	
3	4233F				0.2													10		10.0	
4	4234F					0.2												3		3.0	
5	4235F						0.2											1		1.0	
6	4245F							0.2													
7	4246F								0.2												
8	4272F									0.2											
9	4273F										0.2										
10	4274F											0.2									
11																					
12																					
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater	5.0	4.8	→								→									
	Measured concentration (mg/L)	<0.1	0.4	0.3	0.1	0.3	0.2	0.1	0.2	0.1	<0.1	0.1									
	x multiplier	1.0	25	→								→									
	Final concentration (mg/L)	<0.1	10.0	7.5	2.5	7.5	5.0	2.5	5.0	2.5	<2.5	2.5									

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

-12-1

RSe 10/22/99

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: 590-6 Day ✗ Foster Overlying Water Whitelaw — Meanthus (10-5-99)

	Sample description	BLK	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	4		1.0									dupl.							QC Std (NH3/N)		
2	11			1.0															Nom.		Meas.
3	25				1.0							1.0							10		10.5
4	30					1.0							1.0						3		3.5
5	38						1.0												1		1.0
6	41							1.0													
7	46								1.0												
8	51									1.0											
9	59										1.0										
10																					
11																					
12																					
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater	5.0	4.0 →																		
	Measured concentration (mg/L)	<0.1	0.1	0.5	0.3	<0.1	0.2	<0.1	0.1	0.2	0.5	0.3	<0.1								
	x multiplier	1.0	5.0 →																		
	Final concentration (mg/L)	<0.1	0.5	2.5	1.5	<0.5	1.0	<0.5	0.5	1.0	2.5	1.5	<0.5								

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

Sulfide

Rse 10/5/99

ANALYSIS BENCHSHEET - SULFIDE

Description of analytical group: 590-6 Menantes test. Day 0 interstitial water. Sampled and analyzed 10-5-99.

	Sample description	BLK	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Beaker 1		1.0																		
2	8			1.0																	
3	14				1.0																
4	21					1.0															
5	43						1.0														
6	56							1.0													
7	58								1.0												
8	63									1.0											
9	65										1.0										
10																					
11																					
12																					
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater or DI water	5.0	4.0	→							→										
	Measured concentration (mg/L)	<0.2	<0.2	<0.2	<0.2	<0.2	0.9	1.2	<0.2	<0.2	<0.2										
	x multiplier	1.0	5.0	→							→										
	Final concentration (mg/L)	<0.2	<1.0	<1.0	<1.0	<1.0	4.5	6.0	<1.0	<1.0	<1.0										

Add sufficient seawater to make 5 ml. Then add 0.2 ml sulfuric acid reagent (stir), followed by 0.2 ml dichromate reagent (stir)

1 of 1

DSe 10/5/99

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: 590-6 Foster Wheeler – Memphis
Day Ø Interstitial water (10-5-99)

	Sample description	BLK	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	1		0.2															QC Std (NH_3 N)			
2	8			0.2														Nom		Meas	
3	14				0.2													10		10.5	
4	21					0.2												3		3.0	
5	43						0.2											1		1.0	
6	56							0.2													
7	58								0.2												
8	63									0.2											
9	65										0.2										
10																					
11																					
12																					
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater	5.0	4.8	→																	
	Measured concentration (mg/L)	<0.1	0.3	<0.1	0.9	0.5	<0.1	0.3	0.4	0.4	0.2										
	x multiplier	1.0	25	→																	
	Final concentration (mg/L)	<0.1	7.5	<2.5	22.5	12.5	<2.5	7.5	10.0	10.0	5.0										

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

DSL 10/15/99

ANALYSIS BENCHSHEET - SULFIDE

Description of analytical group: 590-6 Neanthes growth test. Day 10 interstitial water. Sampled and analyzed 10-15-99.

	Sample description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Beaker 7		1.0																		
2	9			1.0																	
3	22				1.0																
4	23					1.0															
5	24						1.0														
6	28							1.0													
7	60								1.0												
8	61									1.0											
9	68										1.0										
10																					
11																					
12																					
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater or DI water	5.0	4.0	→							→										
	Measured concentration (mg/L)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1										
	x multiplier	1.0	5.0	→							→										
	Final concentration (mg/L)	<0.1	<0.5	→							→										

Add sufficient seawater to make 5 ml. Then add 0.2 ml sulfuric acid reagent (stir), followed by 0.2 ml dichromate reagent (stir)

1061

RC 11/9/99

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: 590-6 10-day Foster Wheeler + Neanthes Interstitial water (10/15/99)

	Sample description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	7		0.2															QC Std (NH3N)			
2	9			0.2														Nom.		Meas.	
3	22				0.2													10		10.0	
4	23					0.2												3		3.0	
5	24						0.2											1		1.0	
6	28							0.2													
7	60								0.2												
8	61									0.2											
9	68										0.2										
10																					
11																					
12																					
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater	5.0	4.8	→																	
	Measured concentration (mg/L)	<0.1	<0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.1	<0.1										
	x multiplier	1.0	25	→																	
	Final concentration (mg/L)	<0.1	<2.5	2.5	5.0	2.5	5.0	2.5	2.5	2.5	<2.5										

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

[illegible] 11/8/99

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: 590-6 Foster Wheeler — Neanthes
Day 20 Overlying Water 10/25/99

	Sample description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	4		1.0															QC Std (NH3 N)			
2	11			1.0														Nom.		Meas	
3	25				1.0													10		10.0	
4	30					1.0												3		3.5	
5	38						1.0											1		1.0	
6	41							1.0													
7	46								1.0												
8	51									1.0											
9	59										1.0										
10																					
11																					
12																					
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater	5.0	4.0	→																	
	Measured concentration (mg/L)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1										
	x multiplier	1.0	5.0	→																	
	Final concentration (mg/L)	<0.1	<0.5	→																	

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

BENCHSH.XLS

ANALYSIS BENCHSHEET - SULFIDE

Description of analytical group: 590-6 Nearshore test. Day 20 interstitial water. Sampled and analyzed 10-25-99 MSR

	Sample description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	PRE	POST
1	Beaker #4	1.0																			
2	11		1.0																		
3	25			1.0																	
4	30				1.0																
5	38					1.0															
6	41 *						1.0														
7	46							1.0													
8	51								1.0												
9	59									1.0											
10																					
11																					
12																					
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater ~~or DI~~ water	4.0	→																		
	Measured concentration (mg/L)	<0.1	→																		
	x multiplier	5	→																		
	Final concentration (mg/L)	<0.5	→																		

Add sufficient seawater to make 5 ml. Then add 0.2 ml sulfuric acid reagent (stir), followed by 0.2 ml dichromate reagent (stir)

* sample obtained by allowing material to settle out in capped centrifuge tube. Other samples obtained by centrifugation.

BENCHSH.XLS

onia

RSC 11/9/99

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: 590-6 Foster Wheeler - Meanthus Day 20 Interstitial water (10-25-99)

	Sample description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19 pH	20 Sal
1	4		0.2												QC Std (NH3-N)					6.8	28.5
2	11			0.2											Mon		Meas			7.4	28.0
3	25				0.2										10		10.0			7.7	29.0
4	30					0.2									3		3.0			7.1	27.5
5	38						0.2								1		1.0			7.3	29.0
6	41							0.2												7.7	29.5
7	46								0.2											7.6	29.5
8	51									0.2										7.6	29.5
9	59										0.2									7.6	29.5
10																				RSC	
11																				11/19/99	
12																					
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater	5.0	4.8	→	→	→	→	→	→	→	→										
	Measured concentration (mg/L)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1										
	x multiplier	1.0	25	→	→	→	→	→	→	→	→										
	Final concentration (mg/L)	<0.1	<2.5	→	→	→	→	→	→	→	→										

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanurate reagent packet contents with mixing.

-62-

Michelle —

500 worms 20/bag

Billing for 500

Thanks,

Don

BKR	NAS SMPL	CLIENT DESCRIP	REPL	
29	4287F	control	1	
15	4287F	control	2	
39	4287F	control	3	
27	4287F	control	4	
33	4287F	control	5	
41	4287F	control	6	water quality replicate
22	4287F	control	7	day 10 sacrificial beaker
43	4287F	control	8	day 0 sacrificial beaker
35	4231F	MWAT042R1	1	
16	4231F	MWAT042R1	2	
50	4231F	MWAT042R1	3	
54	4231F	MWAT042R1	4	
17	4231F	MWAT042R1	5	
59	4231F	MWAT042R1	6	water quality replicate
9	4231F	MWAT042R1	7	day 10 sacrificial beaker
14	4231F	MWAT042R1	8	day 0 sacrificial beaker
18	4232F	MWAT045R1	1	
49	4232F	MWAT045R1	2	
12	4232F	MWAT045R1	3	
52	4232F	MWAT045R1	4	
10	4232F	MWAT045R1	5	
38	4232F	MWAT045R1	6	water quality replicate
60	4232F	MWAT045R1	7	day 10 sacrificial beaker
1	4232F	MWAT045R1	8	day 0 sacrificial beaker
57	4234F	MWAT047R1	1	
66	4234F	MWAT047R1	2	
45	4234F	MWAT047R1	3	
40	4234F	MWAT047R1	4	
72	4234F	MWAT047R1	5	
51	4234F	MWAT047R1	6	water quality replicate
24	4234F	MWAT047R1	7	day 10 sacrificial beaker
58	4234F	MWAT047R1	8	day 0 sacrificial beaker

BKR	NAS SMPL	CLIENT DESCRIP	REPL	
70	4246F	MWAT046R1	1	
26	4246F	MWAT046R1	2	
62	4246F	MWAT046R1	3	
6	4246F	MWAT046R1	4	
34	4246F	MWAT046R1	5	
11	4246F	MWAT046R1	6	water quality replicate
23	4246F	MWAT046R1	7	day 10 sacrificial beaker
63	4246F	MWAT046R1	8	day 0 sacrificial beaker
53	4272F	MWAS034R1	1	
42	4272F	MWAS034R1	2	
69	4272F	MWAS034R1	3	
71	4272F	MWAS034R1	4	
5	4272F	MWAS034R1	5	
4	4272F	MWAS034R1	6	water quality replicate
61	4272F	MWAS034R1	7	day 10 sacrificial beaker
65	4272F	MWAS034R1	8	day 0 sacrificial beaker
67	4273F	MWAS037R1	1	
55	4273F	MWAS037R1	2	
2	4273F	MWAS037R1	3	
3	4273F	MWAS037R1	4	
44	4273F	MWAS037R1	5	
30	4273F	MWAS037R1	6	water quality replicate
7	4273F	MWAS037R1	7	day 10 sacrificial beaker
8	4273F	MWAS037R1	8	day 0 sacrificial beaker
37	4274F	MWRC213R1	1	
48	4274F	MWRC213R1	2	
47	4274F	MWRC213R1	3	
20	4274F	MWRC213R1	4	
32	4274F	MWRC213R1	5	
46	4274F	MWRC213R1	6	water quality replicate
28	4274F	MWRC213R1	7	day 10 sacrificial beaker
56	4274F	MWRC213R1	8	day 0 sacrificial beaker
13	4275F	MWRC214R1	1	
64	4275F	MWRC214R1	2	
19	4275F	MWRC214R1	3	
36	4275F	MWRC214R1	4	
31	4275F	MWRC214R1	5	
25	4275F	MWRC214R1	6	water quality replicate
68	4275F	MWRC214R1	7	day 10 sacrificial beaker
21	4275F	MWRC214R1	8	day 0 sacrificial beaker

Endpoints Data Entry and Calculations File

BKR=beaker number (=pan number)
INIT NO.=initial number of worms exposed
FINAL IW PPT=interstitial salinity in ppt on day 20
SURV=number of worms surviving after 20 days
MORT=number of worms dead after 20 days
INIT WT=mean weight of worms sampled on day zero (mg)
TARE WT=weight of pan used for that replicate on day 20 (mg)
WT COUNT=number of worms weighed at test end
FINAL WT=TARE WT + weight of worms recovered on day 20 (mg)
PSURV=% SURV=100(SURV/INIT NO.)
TWT=total biomass=FINAL-TARE
WT=individual biomass=TWT/WT COUNT
GR=individual growth rate=(WT-INIT WT)/20

Data Entry Verified 11-22-99 LKN

MSR 11-24-99

INIT WT

pan#	tare wt	total wt	# weighed	individual wt
1	32.35	35.86	5	0.70
2	27.92	31.58	5	0.73
3	24.96	29.16	5	0.84
			MEAN	0.76

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL	INIT NO.	FINAL IW Salin. (ppt)	SURV	MORT	INIT WT	TARE WT	WT COUNT	FINAL WT	PSURV	PMORT	TWT	WT	GR		TWT	WT	GR	PSURV
1	29	4287F	control	1	5		5	0	0.76	58.30	5	131.03	100.0	0.0	72.7	14.5	0.69					
2	15	4287F	control	2	5		5	0	0.76	61.02	5	181.82	100.0	0.0	120.8	24.2	1.17	Mean	96.9	19.4	0.93	100.0
3	39	4287F	control	3	5		5	0	0.76	49.56	5	128.79	100.0	0.0	79.2	15.8	0.75	S.D.	20.2	4.0	0.20	0.0
4	27	4287F	control	4	5		5	0	0.76	56.75	5	163.63	100.0	0.0	106.9	21.4	1.03	n	5	5	5	5
5	33	4287F	control	5	5		5	0	0.76	63.34	5	168.16	100.0	0.0	104.8	21.0	1.01					
6	41	4287F	control	6		29.5		water quality replicate														
7	22	4287F	control	7				day 10 sacrificial beaker														
8	43	4287F	control	8				day 0 sacrificial beaker														
9	35	4231F	MWAT042R1	1	5		5	0	0.76	51.95	5	139.23	100.0	0.0	87.3	17.5	0.83					
10	16	4231F	MWAT042R1	2	5		5	0	0.76	63.97	5	120.55	100.0	0.0	56.6	11.3	0.53	Mean	62.1	13.0	0.61	96.0
11	50	4231F	MWAT042R1	3	5		5	0	0.76	53.15	5	107.18	100.0	0.0	54.0	10.8	0.50	S.D.	14.2	2.7	0.14	8.9
12	54	4231F	MWAT042R1	4	5		5	0	0.76	58.74	5	116.90	100.0	0.0	58.2	11.6	0.54	n	5	5	5	5
13	17	4231F	MWAT042R1	5	5		4	1	0.76	54.24	4	108.80	80.0	20.0	54.6	13.6	0.64					
14	59	4231F	MWAT042R1	6		29.5		water quality replicate														
15	9	4231F	MWAT042R1	7				day 10 sacrificial beaker														
16	14	4231F	MWAT042R1	8				day 0 sacrificial beaker														
17	18	4232F	MWAT045R1	1	5		5	0	0.76	50.59	5	115.34	100.0	0.0	64.8	13.0	0.61					
18	49	4232F	MWAT045R1	2	5		4	1	0.76	52.92	4	124.58	80.0	20.0	71.7	17.9	0.86	Mean	69.0	14.5	0.69	96.0
19	12	4232F	MWAT045R1	3	5		5	0	0.76	58.85	5	124.66	100.0	0.0	65.8	13.2	0.62	S.D.	4.0	2.0	0.10	8.9
20	52	4232F	MWAT045R1	4	5		5	0	0.76	54.61	5	129.08	100.0	0.0	74.5	14.9	0.71	n	5	5	5	5
21	10	4232F	MWAT045R1	5	5		5	0	0.76	60.34	5	128.87	100.0	0.0	68.5	13.7	0.65					
22	38	4232F	MWAT045R1	6		29.0		water quality replicate														
23	60	4232F	MWAT045R1	7				day 10 sacrificial beaker														
24	1	4232F	MWAT045R1	8				day 0 sacrificial beaker														
25	57	4234F	MWAT047R1	1	5		5	0	0.76	60.12	5	144.17	100.0	0.0	84.1	16.8	0.80					
26	66	4234F	MWAT047R1	2	5		5	0	0.76	57.70	5	146.70	100.0	0.0	89.0	17.8	0.85	Mean	80.4	16.1	0.77	100.0
27	45	4234F	MWAT047R1	3	5		5	0	0.76	52.36	5	127.02	100.0	0.0	74.7	14.9	0.71	S.D.	22.3	4.5	0.22	0.0
28	40	4234F	MWAT047R1	4	5		5	0	0.76	50.23	5	96.96	100.0	0.0	46.7	9.3	0.43	n	5	5	5	5
29	72	4234F	MWAT047R1	5	5		5	0	0.76	58.16	5	165.81	100.0	0.0	107.7	21.5	1.04					
30	51	4234F	MWAT047R1	6		29.5		water quality replicate														
31	24	4234F	MWAT047R1	7				day 10 sacrificial beaker														
32	58	4234F	MWAT047R1	8				day 0 sacrificial beaker														

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL	INIT NO.	IW Salin. (ppt)	SURV	MORT	INIT WT	TARE WT	WT COUNT	FINAL WT	PSURV	PMORT	TWT	WT	GR		TWT	WT	GR	PSURV
33	70	4246F	MWAT046R1	1	5		5	0	0.76	58.37	5	134.53	100.0	0.0	76.2	15.2	0.72					
34	26	4246F	MWAT046R1	2	5		5	0	0.76	59.41	5	123.93	100.0	0.0	64.5	12.9	0.61	Mean	65.8	13.2	0.62	100.0
35	62	4246F	MWAT046R1	3	5		5	0	0.76	58.19	5	124.73	100.0	0.0	66.5	13.3	0.63	S.D.	6.3	1.3	0.06	0.0
36	6	4246F	MWAT046R1	4	5		5	0	0.76	59.70	5	120.77	100.0	0.0	61.1	12.2	0.57	n	5	5	5	5
37	34	4246F	MWAT046R1	5	5		5	0	0.76	61.14	5	121.62	100.0	0.0	60.5	12.1	0.57					
38	11	4246F	MWAT046R1	6		28.0		water quality replicate														
39	23	4246F	MWAT046R1	7				day 10 sacrificial beaker														
40	63	4246F	MWAT046R1	8				day 0 sacrificial beaker														
41	53	4272F	MWAS034R1	1	5		5	0	0.76	55.88	5	150.54	100.0	0.0	94.7	18.9	0.91					
42	42	4272F	MWAS034R1	2	5		3	2	0.76	59.17	3	102.01	60.0	40.0	42.8	14.3	0.68	Mean	78.6	17.8	0.85	88.0
43	69	4272F	MWAS034R1	3	5		5	0	0.76	55.64	5	149.60	100.0	0.0	94.0	18.8	0.90	S.D.	23.0	4.0	0.20	17.9
44	71	4272F	MWAS034R1	4	5		4	1	0.76	56.07	4	149.72	80.0	20.0	93.7	23.4	1.13	n	5	5	5	5
45	5	4272F	MWAS034R1	5	5		5	0	0.76	65.80	5	133.54	100.0	0.0	67.7	13.5	0.64					
46	4	4272F	MWAS034R1	6		28.5		water quality replicate														
47	61	4272F	MWAS034R1	7				day 10 sacrificial beaker														
48	65	4272F	MWAS034R1	8				day 0 sacrificial beaker														
49	67	4273F	MWAS037R1	1	5		5	0	0.76	58.69	5	157.54	100.0	0.0	98.9	19.8	0.95					
50	55	4273F	MWAS037R1	2	5		5	0	0.76	57.35	5	129.40	100.0	0.0	72.1	14.4	0.68	Mean	78.5	15.7	0.75	100.0
51	2	4273F	MWAS037R1	3	5		5	0	0.76	60.74	5	141.87	100.0	0.0	81.1	16.2	0.77	S.D.	12.7	2.5	0.13	0.0
52	3	4273F	MWAS037R1	4	5		5	0	0.76	62.11	5	137.08	100.0	0.0	75.0	15.0	0.71	n	5	5	5	5
53	44	4273F	MWAS037R1	5	5		5	0	0.76	56.50	5	121.83	100.0	0.0	65.3	13.1	0.62					
54	30	4273F	MWAS037R1	6		27.5		water quality replicate														
55	7	4273F	MWAS037R1	7				day 10 sacrificial beaker														
56	8	4273F	MWAS037R1	8				day 0 sacrificial beaker														
57	37	4274F	MWRC213R1	1	5		5	0	0.76	53.19	5	137.83	100.0	0.0	84.6	16.9	0.81					
58	48	4274F	MWRC213R1	2	5		5	0	0.76	53.20	5	126.82	100.0	0.0	73.6	14.7	0.70	Mean	86.9	17.4	0.83	100.0
59	47	4274F	MWRC213R1	3	5		5	0	0.76	55.62	5	153.86	100.0	0.0	98.2	19.6	0.94	S.D.	9.7	1.9	0.10	0.0
60	20	4274F	MWRC213R1	4	5		5	0	0.76	62.59	5	156.87	100.0	0.0	94.3	18.9	0.90	n	5	5	5	5
61	32	4274F	MWRC213R1	5	5		5	0	0.76	60.76	5	144.55	100.0	0.0	83.8	16.8	0.80					
62	46	4274F	MWRC213R1	6		29.5		water quality replicate														
63	28	4274F	MWRC213R1	7				day 10 sacrificial beaker														
64	56	4274F	MWRC213R1	8				day 0 sacrificial beaker														
65	13	4275F	MWRC214R1	1	5		5	0	0.76	57.30	5	140.58	100.0	0.0	83.3	16.7	0.79					
66	64	4275F	MWRC214R1	2	5		5	0	0.76	62.57	5	140.68	100.0	0.0	78.1	15.6	0.74	Mean	83.2	16.6	0.79	100.0
67	19	4275F	MWRC214R1	3	5		5	0	0.76	56.53	5	173.80	100.0	0.0	117.3	23.5	1.13	S.D.	24.0	4.8	0.24	0.0
68	36	4275F	MWRC214R1	4	5		5	0	0.76	48.32	5	98.31	100.0	0.0	50.0	10.0	0.46	n	5	5	5	5
69	31	4275F	MWRC214R1	5	5		5	0	0.76	60.10	5	147.20	100.0	0.0	87.1	17.4	0.83					
70	25	4275F	MWRC214R1	6		29.0		water quality replicate														
71	68	4275F	MWRC214R1	7				day 10 sacrificial beaker														
72	21	4275F	MWRC214R1	8				day 0 sacrificial beaker														

Project Name: Test 590-6 Neanthes, % survival 11/24/99

Sample ID: MWAT042R1	**Replicates:** 5	**Reference ID:** MWRC213R1 *	**Replicates:** 5
Alias: NAS #4231F - X1		**Alias:** NAS #4274F* - X2	
Mean: 96.000	**Transform Mean:** 104.359	**Mean:** 100.000	**Transform Mean:** 114.591
SD: 8.944	**Transform SD:** 22.877	**SD:** 0.000	**Transform SD:** 0.000

Shipiro-Wilk Results:

Residual Mean:	
Residual SD:	
SS:	
K:	
b:	
Alpha Level:	
Calculated Value:	
Critical Value:	
Normally Distributed:	
Override Option:	N/A

Levene's Results:

Test Residual Mean:	
Test Residual SD:	
Reference Residual Mean:	
Reference Residual SD:	
Degrees of Freedom:	
Alpha Level:	
Calculated Value:	
Critical Value:	
Variances Homogeneous:	

Test Results:

Statistic:	1-Sample T-Test
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	4
Experimental Alpha Level:	0.05
Calculated Value:	-1.0000
Critical Value:	<= -2.132
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	100.0000	14.5912	100.0000	114.5912					
2	100.0000	14.5912	100.0000	114.5912					
3	100.0000	14.5912	100.0000	114.5912					
4	100.0000	14.5912	100.0000	114.5912					
5	80.0000	63.4348	100.0000	114.5912					
6									
7									
8									
9		114.5912							
10		MKR							
11		11-24-99							
12									
13									
14									
15									
16									
17									
18									
19									
20									

* Results of analysis would be identical for reference sediment MWRC214R1 (NAS #4275F), as replicate survival was also 100%, 100%, 100%, 100%, 100% in that sediment MKR 11-24-99

Project Name: P590-6 Neanthes, % survival 11/24/99

Sample ID: MWAT045R1	**Replicates:** 5	**Reference ID:** MWRC213R1*	**Replicates:** 5
Alias: NAS #4232F - X1		**Alias:** NAS #4274F* - X2	
Mean: 96.000	**Transform Mean:** 104.359	**Mean:** 100.000	**Transform Mean:** 114.591
SD: 8.944	**Transform SD:** 22.877	**SD:** 0.000	**Transform SD:** 0.000

Shipiro-Wilk Results:

Residual Mean:

Residual SD:

SS:

K:

b:

Alpha Level:

Calculated Value:

Critical Value:

Normally Distributed:

Override Option: N/A

Levene's Results:

Test Residual Mean:

Test Residual SD:

Reference Residual Mean:

Reference Residual SD:

Degrees of Freedom:

Alpha Level:

Calculated Value:

Critical Value:

Variances Homogeneous:

Test Results:

Statistic: 1-Sample T-Test
Balanced Design: Yes
Transformation: ArcSin

Experimental Hypothesis
Null: x1 >= x2
Alternate: x1 < x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	4
Experimental Alpha Level:	0.05
Calculated Value:	-1.0000
Critical Value:	<= -2.132
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	100.0000	14.5912	100.0000	114.5912					
2	80.0000	63.4348	100.0000	114.5912					
3	100.0000	14.5912	100.0000	114.5912					
4	100.0000	14.5912	100.0000	114.5912					
5	100.0000	14.5912	100.0000	114.5912					
6									
7									
8									
9		114.5912							
10		MSR							
11		11-24-99							
12									
13									
14									
15									
16									
17									
18									
19									
20									

* Analysis would be identical for reference sediment MWRC214R1 (NAS #4275F), as replicate survival was also 100%, 100%, 100%, 100%, 100% in that sediment MSR 11-24-99

Project Name: P590-6 Neanthes, % survival 11/24/99

Sample ID: MWAT047R1	**Replicates:** 5	**Reference ID:** MWRC213R1 *	**Replicates:** 5
Alias: NAS #4234F - X1		**Alias:** NAS #4274F* - X2	
Mean: 100.000	**Transform Mean:** 114.591	**Mean:** 100.000	**Transform Mean:** 114.591
SD: 0.000	**Transform SD:** 0.000	**SD:** 0.000	**Transform SD:** 0.000

Shipiro-Wilk Results:

Residual Mean:

Residual SD:

SS:
K:
b:

Alpha Level:

Calculated Value:

Critical Value:

Normally Distributed:

Override Option: N/A

Levene's Results:

Test Residual Mean:

Test Residual SD:

Reference Residual Mean:

Reference Residual SD:

Degrees of Freedom:

Alpha Level:

Calculated Value:

Critical Value:

Variances Homogeneous:

Test Results:

Statistic: 1-Sample T-Test
Balanced Design: Yes
Transformation: ArcSin

Experimental Hypothesis
Null: x1 >= x2
Alternate: x1 < x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	4
Experimental Alpha Level:	0.05
Calculated Value:	0.0000
Critical Value:	<= -2.132
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	100.0000	14.5912	100.0000	114.5912					
2	100.0000	14.5912	100.0000	114.5912					
3	100.0000	14.5912	100.0000	114.5912					
4	100.0000	14.5912	100.0000	114.5912					
5	100.0000	14.5912	100.0000	114.5912					
6									
7									
8									
9		114.5912							
10									
11		MNK							
12		11-24-99							
13									
14									
15									
16									
17									
18									
19									
20									

* Results of analysis would be identical for reference sediment MWRC214R1 (NAS #4275F)
MNK 11-24-99

Project Name: P590-6 Neanthes % survival 11/24/99

Sample ID: MWAT046R1	**Replicates:** 5	**Reference ID:** MWRC213R1*	**Replicates:** 5
Alias: NAS #4246F - X1		**Alias:** NAS #4274F* - X2	
Mean: 100.000	**Transform Mean:** 114.591	**Mean:** 100.000	**Transform Mean:** 114.59
SD: 0.000	**Transform SD:** 0.000	**SD:** 0.000	**Transform SD:** 0.000

Shipiro-Wilk Results:

Residual Mean:	
Residual SD:	
SS:	
K:	
b:	
Alpha Level:	
Calculated Value:	
Critical Value:	
Normally Distributed:	
Override Option:	N/A

Levene's Results:

Test Residual Mean:	
Test Residual SD:	
Reference Residual Mean:	
Reference Residual SD:	
Degrees of Freedom:	
Alpha Level:	
Calculated Value:	
Critical Value:	
Variances Homogeneous:	

Test Results:

Statistic:	1-Sample T-Test
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	4
Experimental Alpha Level:	0.05
Calculated Value:	0.0000
Critical Value:	<= -2.132
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	100.0000	14.5912	100.0000	114.5912					
2	100.0000	14.5912	100.0000	114.5912					
3	100.0000	14.5912	100.0000	114.5912					
4	100.0000	14.5912	100.0000	114.5912					
5	100.0000	14.5912	100.0000	114.5912					
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

1
114.5912
MSR
11-24-99

* Results of analysis would be identical for reference sediment MWRC214R1 (NAS # 4275F)
MSR 11-24-99

Project Name: P590-6 Neanthes, % survival 11/24/99

Sample ID: MWAS034R1	**Replicates:** 5	**Reference ID:** MWRC213R1 *	**Replicates:** 5
Alias: NAS #4272F - X1		**Alias:** NAS #4274F* - X2	
Mean: 88.000	**Transform Mean:** 91.595	**Mean:** 100.000	**Transform Mean:** 114.591
SD: 17.888	**Transform SD:** 31.805	**SD:** 0.000	**Transform SD:** 0.000

Shipiro-Wilk Results:

Residual Mean:

Residual SD:

SS:
K:
b:

Alpha Level:

Calculated Value:

Critical Value:

Normally Distributed:

Override Option: N/A

Levene's Results:

Test Residual Mean:

Test Residual SD:

Reference Residual Mean:

Reference Residual SD:

Degrees of Freedom:

Alpha Level:

Calculated Value:

Critical Value:

Variances Homogeneous:

Test Results:

Statistic: 1-Sample T-Test
Balanced Design: Yes
Transformation: ArcSin

Experimental Hypothesis
Null: x1 >= x2
Alternate: x1 < x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	4
Experimental Alpha Level:	0.05
Calculated Value:	-1.6167
Critical Value:	<= -2.132
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	100.0000	14.5912	100.0000	114.5912					
2	60.0000	50.7683	100.0000	114.5912					
3	100.0000	14.5912	100.0000	114.5912					
4	80.0000	63.4348	100.0000	114.5912					
5	100.0000	14.5912	100.0000	114.5912					
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

114.5912
MJR
11-24-99

* Results of analysis would be identical for reference sediment MWRC214R1 (NAS #4275F).
MJR 11-24-99

Project Name: P590-6 Neanthes, % survival 11/24/99

Sample ID: MWAS037R1	**Replicates:** 5	**Reference ID:** MWRC213R1 *	**Replicates:** 5
Alias: NAS #4273F - X1		**Alias:** NAS #4274F * - X2	
Mean: 100.000	**Transform Mean:** 114.591	**Mean:** 100.000	**Transform Mean:** 114.59.
SD: 0.000	**Transform SD:** 0.000	**SD:** 0.000	**Transform SD:** 0.000

Shipiro-Wilk Results:

Residual Mean:

Residual SD:

SS:

K:

b:

Alpha Level:

Calculated Value:

Critical Value:

Normally Distributed:

Override Option: N/A

Levene's Results:

Test Residual Mean:

Test Residual SD:

Reference Residual Mean:

Reference Residual SD:

Degrees of Freedom:

Alpha Level:

Calculated Value:

Critical Value:

Variances Homogeneous:

Test Results:

Statistic: 1-Sample T-Test
Balanced Design: Yes
Transformation: ArcSin

Experimental Hypothesis
Null: x1 >= x2
Alternate: x1 < x2

Mann-Whitney N1, N2: N/A
Degrees of Freedom: 4
Experimental Alpha Level: 0.05
Calculated Value: 0.0000
Critical Value: <= -2.132
Failed to Reject Null Hypo: Yes
Power:
Significant Diff for Power:

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	100.0000	14.5912	100.0000	114.5912					
2	100.0000	14.5912	100.0000	114.5912					
3	100.0000	14.5912	100.0000	114.5912					
4	100.0000	14.5912	100.0000	114.5912					
5	100.0000	14.5912	100.0000	114.5912					
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

114.5912
MJR
11-24-99

* Results of analyses would be identical for reference sediment MWRC 214R1 (NAS #4275F).
MJR 11-24-99

Project Name: P590-6 Neanthes, individual biomass 11/24/99

Sample ID: MWAT046R1		**Replicates:**	5
Alias: NAS #4246F - X1			
Mean:	13.140	**Transform Mean:**	13.140
SD:	1.254	**Transform SD:**	1.254

Reference ID: MWRC213R1		**Replicates:**	5
Alias: NAS #4274F - X2			
Mean:	17.380	**Transform Mean:**	17.380
SD:	1.935	**Transform SD:**	1.935

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	1.0583
SS:	21.2800
K:	5.0000
b:	4.4591
Alpha Level:	0.05
Calculated Value:	0.9344
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.8880
Test Residual SD:	0.7663
Reference Residual Mean:	1.4960
Reference Residual SD:	0.9744
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.0966
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	No Transformation

Experimental Hypothesis

Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	4.1105
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	No
Power:	
Significant Diff for Power:	

significantly different MJR 11-24-99

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	15.2000	15.2000	16.8999	16.8999	2.0600	0.4800			-2.6800
2	12.9000	12.9000	14.7000	14.7000	0.2400	2.6800			-1.0400
3	13.3000	13.3000	19.6000	19.6000	0.1600	2.2200			-0.9400
4	12.2000	12.2000	18.8999	18.8999	0.9400	1.5200			-0.5799
5	12.1000	12.1000	16.8000	16.8000	1.0400	0.5799			-0.4800
6									-0.2400
7									0.1600
8									1.5200
9									2.0600
10									2.2200
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes individual biomass 11/24/99

Sample ID: MWAT042R1	**Replicates:** 5	**Reference ID:** MWRC213R1	**Replicates:** 5
Alias: NAS #4231F - X1		**Alias:** NAS #4274F - X2	
Mean: 12.960	**Transform Mean:** 12.960	**Mean:** 17.380	**Transform Mean:** 17.38
SD: 2.751	**Transform SD:** 2.751	**SD:** 1.935	**Transform SD:** 1.935

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	1.5437
SS:	45.2800
K:	5.0000
b:	6.5146
Alpha Level:	0.05
Calculated Value:	0.9372
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	2.0720
Test Residual SD:	1.4854
Reference Residual Mean:	1.4960
Reference Residual SD:	0.9744
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.7250
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	No Transformation
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	2.9375
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	No
Power:	
Significant Diff for Power:	

significantly different MSK 11-24-99

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	17.5000	17.5000	16.8999	16.8999	4.5400	0.4800			-2.6800
2	11.3000	11.3000	14.7000	14.7000	1.6600	2.6800			-2.1600
3	10.8000	10.8000	19.6000	19.6000	2.1600	2.2200			-1.6600
4	11.6000	11.6000	18.8999	18.8999	1.3600	1.5200			-1.3600
5	13.6000	13.6000	16.8000	16.8000	0.6399	0.5799			-0.5799
6									-0.4800
7									0.6399
8									1.5200
9									2.2200
10									4.5400
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes, individual biomass 11/24/99

Sample ID: MWAT045R1	**Replicates:** 5	**Reference ID:** MWRC213R1	**Replicates:** 5
Alias: NAS #4232F - X1		**Alias:** NAS #4274F - X2	
Mean: 14.540	**Transform Mean:** 14.540	**Mean:** 17.380	**Transform Mean:** 17.380
SD: 2.018	**Transform SD:** 2.018	**SD:** 1.935	**Transform SD:** 1.935

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	1.2830
SS:	31.2800
K:	5.0000
b:	5.4669
Alpha Level:	0.05
Calculated Value:	0.9554
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	1.4880
Test Residual SD:	1.1425
Reference Residual Mean:	1.4960
Reference Residual SD:	0.9744
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.0119
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: No Transformation

Experimental Hypothesis
Null: x1 >= x2
Alternate: x1 < x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	2.2709
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	No
Power:	
Significant Diff for Power:	

significantly different MJK 11-24-99

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	13.0000	13.0000	16.8999	16.8999	1.5400	0.4800			-2.6800
2	17.8999	17.8999	14.7000	14.7000	3.3600	2.6800			-1.5400
3	13.2000	13.2000	19.6000	19.6000	1.3400	2.2200			-1.3400
4	14.9000	14.9000	18.8999	18.8999	0.3600	1.5200			-0.8400
5	13.7000	13.7000	16.8000	16.8000	0.8400	0.5799			-0.5799
6									-0.4800
7									0.3600
8									1.5200
9									2.2200
10									3.3600
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes individual biomass 11/24/99

Sample ID: MWAT047R1		**Replicates:** 5	**Reference ID:** MWRC213R1		**Replicates:** 5
Alias: NAS #4234F - X1			**Alias:** NAS #4274F - X2		
Mean:	16.059	**Transform Mean:** 16.059	**Mean:**	17.380	**Transform Mean:** 17.38
SD:	4.478	**Transform SD:** 4.478	**SD:**	1.935	**Transform SD:** 1.935

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	2.2384
SS:	95.2000
K:	5.0000
b:	9.5407
Alpha Level:	0.05
Calculated Value:	0.9561
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	3.1680
Test Residual SD:	2.7400
Reference Residual Mean:	1.4960
Reference Residual SD:	0.9744
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.2856
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	No Transformation
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	0.6050
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	16.8000	16.8000	16.8999	16.8999	0.7399	0.4800			-6.7600
2	17.8000	17.8000	14.7000	14.7000	1.7400	2.6800			-2.6800
3	14.9000	14.9000	19.6000	19.6000	1.1599	2.2200			-1.1599
4	9.3000	9.3000	18.8999	18.8999	6.7600	1.5200			-0.5799
5	21.5000	21.5000	16.8000	16.8000	5.4400	0.5799			-0.4800
6									0.7399
7									1.5200
8									1.7400
9									2.2200
10									5.4400
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes individual biomass 11/24/99

Sample ID: MWAS034R1		**Replicates:** 5	**Reference ID:** MWRC213R1		**Replicates:** 5
Alias: NAS #4272F - X1			**Alias:** NAS #4274F - X2		
Mean:	17.780	**Transform Mean:** 17.780	**Mean:**	17.380	**Transform Mean:** 17.380
SD:	4.009	**Transform SD:** 4.009	**SD:**	1.935	**Transform SD:** 1.935

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	2.0429
SS:	79.2960
K:	5.0000
b:	8.7246
Alpha Level:	0.05
Calculated Value:	0.9599
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	3.1040
Test Residual SD:	2.0083
Reference Residual Mean:	1.4960
Reference Residual SD:	0.9744
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.6107
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: No Transformation

Experimental Hypothesis
Null: x1 >= x2
Alternate: x1 < x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-0.2008
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	18.8999	18.8999	16.8999	16.8999	1.1200	0.4800			-4.2800
2	14.3000	14.3000	14.7000	14.7000	3.4800	2.6800			-3.4800
3	18.8000	18.8000	19.6000	19.6000	1.0200	2.2200			-2.6800
4	23.4000	23.4000	18.8999	18.8999	5.6200	1.5200			-0.5799
5	13.5000	13.5000	16.8000	16.8000	4.2800	0.5799			-0.4800
6									1.0200
7									1.1200
8									1.5200
9									2.2200
10									5.6200
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes individual biomass 11/24/99

Sample ID: MWAS037R1	**Replicates:** 5	**Reference ID:** MWRC213R1	**Replicates:** 5
Alias: NAS #4273F - X1		**Alias:** NAS #4274F - X2	
Mean: 15.700	**Transform Mean:** 15.700	**Mean:** 17.380	**Transform Mean:** 17.38
SD: 2.549	**Transform SD:** 2.549	**SD:** 1.935	**Transform SD:** 1.935

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	1.4687
SS:	40.9880
K:	5.0000
b:	6.2319
Alpha Level:	0.05
Calculated Value:	0.9475
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	1.8400
Test Residual SD:	1.5059
Reference Residual Mean:	1.4960
Reference Residual SD:	0.9744
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.4288
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	No Transformation
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	1.1735
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	19.8000	19.8000	16.8999	16.8999	4.0999	0.4800			-2.6800
2	14.4000	14.4000	14.7000	14.7000	1.3000	2.6800			-2.6000
3	16.2000	16.2000	19.6000	19.6000	0.5000	2.2200			-1.3000
4	15.0000	15.0000	18.8999	18.8999	0.6999	1.5200			-0.6999
5	13.1000	13.1000	16.8000	16.8000	2.6000	0.5799			-0.5799
6									-0.4800
7									0.5000
8									1.5200
9									2.2200
10									4.0999
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes, individual biomass 11/24/99

Sample ID: MWAT042R1	**Replicates:** 5	**Reference ID:** MWRC214R1	**Replicates:** 5
Alias: NAS #4231F - X1		**Alias:** NAS #4275F - X2	
Mean: 12.960	**Transform Mean:** 12.960	**Mean:** 16.640	**Transform Mean:** 16.640
SD: 2.751	**Transform SD:** 2.751	**SD:** 4.816	**Transform SD:** 4.816

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	2.5454
SS:	123.1040
K:	5.0000
b:	10.7594
Alpha Level:	0.05
Calculated Value:	0.9403
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	2.0720
Test Residual SD:	1.4854
Reference Residual Mean:	3.0720
Reference Residual SD:	3.3773
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.6060
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: No Transformation

Experimental Hypothesis
Null: x1 >= x2
Alternate: x1 < x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	1.4832
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	17.5000	17.5000	16.7000	16.7000	4.5400	0.0599			-6.6400
2	11.3000	11.3000	15.6000	15.6000	1.6600	1.0400			-2.1600
3	10.8000	10.8000	23.5000	23.5000	2.1600	6.8600			-1.6600
4	11.6000	11.6000	10.0000	10.0000	1.3600	6.6400			-1.3600
5	13.6000	13.6000	17.3999	17.3999	0.6399	0.7599			-1.0400
6									0.0599
7									0.6399
8									0.7599
9									4.5400
10									6.8600
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes individual biomass 11/24/99

Sample ID: MWAT045R1		**Replicates:** 5	**Reference ID:** MWRC214R1		**Replicates:** 5
Alias: NAS #4232F - X1			**Alias:** NAS #4275F - X2		
Mean:	14.540	**Transform Mean:** 14.540	**Mean:**	16.640	**Transform Mean:** 16.64
SD:	2.018	**Transform SD:** 2.018	**SD:**	4.816	**Transform SD:** 4.816

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	2.3963
SS:	109.1040
K:	5.0000
b:	10.0171
Alpha Level:	0.05
Calculated Value:	0.9197
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	1.4880
Test Residual SD:	1.1425
Reference Residual Mean:	3.0720
Reference Residual SD:	3.3773
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.9934
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	No Transformation
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	0.8991
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	13.0000	13.0000	16.7000	16.7000	1.5400	0.0599			-6.6400
2	17.8999	17.8999	15.6000	15.6000	3.3600	1.0400			-1.5400
3	13.2000	13.2000	23.5000	23.5000	1.3400	6.8600			-1.3400
4	14.9000	14.9000	10.0000	10.0000	0.3600	6.6400			-1.0400
5	13.7000	13.7000	17.3999	17.3999	0.8400	0.7599			-0.8400
6									0.0599
7									0.3600
8									0.7599
9									3.3600
10									6.8600
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes, individual biomass 11/24/99

Sample ID: MWAT047R1		**Replicates:** 5	**Reference ID:** MWRC214R1		**Replicates:** 5
Alias: NAS #4234F - X1			**Alias:** NAS #4275F - X2		
Mean:	16.059	**Transform Mean:** 16.059	**Mean:**	16.640	**Transform Mean:** 16.640
SD:	4.478	**Transform SD:** 4.478	**SD:**	4.816	**Transform SD:** 4.816

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	3.0177
SS:	173.0240
K:	5.0000
b:	12.6603
Alpha Level:	0.05
Calculated Value:	0.9263
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	3.1680
Test Residual SD:	2.7400
Reference Residual Mean:	3.0720
Reference Residual SD:	3.3773
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.0493
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	No Transformation
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	0.1971
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	16.8000	16.8000	16.7000	16.7000	0.7399	0.0599			-6.7600
2	17.8000	17.8000	15.6000	15.6000	1.7400	1.0400			-6.6400
3	14.9000	14.9000	23.5000	23.5000	1.1599	6.8600			-1.1599
4	9.3000	9.3000	10.0000	10.0000	6.7600	6.6400			-1.0400
5	21.5000	21.5000	17.3999	17.3999	5.4400	0.7599			0.0599
6									0.7399
7									0.7599
8									1.7400
9									5.4400
10									6.8600
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes, individual biomass 11/24/99

Sample ID: MWAT046R1	**Replicates:** 5	**Reference ID:** MWRC214R1	**Replicates:** 5
Alias: NAS #4246 - X1		**Alias:** NAS #4275F - X2	
Mean: 13.140	**Transform Mean:** 13.140	**Mean:** 16.640	**Transform Mean:** 16.640
SD: 1.254	**Transform SD:** 1.254	**SD:** 4.816	**Transform SD:** 4.816

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	2.2838
SS:	99.1040
K:	5.0000
b:	9.2998
Alpha Level:	0.05
Calculated Value:	0.8726
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.8880
Test Residual SD:	0.7663
Reference Residual Mean:	3.0720
Reference Residual SD:	3.3773
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.4101
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	No Transformation
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	1.5723
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	15.2000	15.2000	16.7000	16.7000	2.0600	0.0599			-6.6400
2	12.9000	12.9000	15.6000	15.6000	0.2400	1.0400			-1.0400
3	13.3000	13.3000	23.5000	23.5000	0.1600	6.8600			-1.0400
4	12.2000	12.2000	10.0000	10.0000	0.9400	6.6400			-0.9400
5	12.1000	12.1000	17.3999	17.3999	1.0400	0.7599			-0.2400
6									0.0599
7									0.1600
8									0.7599
9									2.0600
10									6.8600
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes, individual biomass 11/24/99

Sample ID: MWAS034R1		**Replicates:**	5
Alias: NAS #4272F - X1			
Mean:	17.780	**Transform Mean:**	17.780
SD:	4.009	**Transform SD:**	4.009

Reference ID: MWRC214R1		**Replicates:**	5
Alias: NAS #4275F - X2			
Mean:	16.640	**Transform Mean:**	16.640
SD:	4.816	**Transform SD:**	4.816

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	2.8756
SS:	157.1200
K:	5.0000
b:	12.2706
Alpha Level:	0.05
Calculated Value:	0.9583
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	3.1040
Test Residual SD:	2.0083
Reference Residual Mean:	3.0720
Reference Residual SD:	3.3773
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.0182
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: No Transformation

Experimental Hypothesis
Null: x1 >= x2
Alternate: x1 < x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-0.4067
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	18.8999	18.8999	16.7000	16.7000	1.1200	0.0599			-6.6400
2	14.3000	14.3000	15.6000	15.6000	3.4800	1.0400			-4.2800
3	18.8000	18.8000	23.5000	23.5000	1.0200	6.8600			-3.4800
4	23.4000	23.4000	10.0000	10.0000	5.6200	6.6400			-1.0400
5	13.5000	13.5000	17.3999	17.3999	4.2800	0.7599			0.0599
6									0.7599
7									1.0200
8									1.1200
9									5.6200
10									6.8600
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes, individual biomass 11/24/99

Sample ID: MWAS037R1		**Replicates:** 5	**Reference ID:** MWRC214R1		**Replicates:** 5
Alias: NAS #4273F - X1			**Alias:** NAS #4275F - X2		
Mean:	15.700	**Transform Mean:** 15.700	**Mean:**	16.640	**Transform Mean:** 16.64
SD:	2.549	**Transform SD:** 2.549	**SD:**	4.816	**Transform SD:** 4.816

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	2.5006
SS:	118.8120
K:	5.0000
b:	10.6124
Alpha Level:	0.05
Calculated Value:	0.9479
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	1.8400
Test Residual SD:	1.5059
Reference Residual Mean:	3.0720
Reference Residual SD:	3.3773
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.7449
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: No Transformation

Experimental Hypothesis
Null: x1 >= x2
Alternate: x1 < x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	0.3856
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	19.8000	19.8000	16.7000	16.7000	4.0999	0.0599			-6.6400
2	14.4000	14.4000	15.6000	15.6000	1.3000	1.0400			-2.6000
3	16.2000	16.2000	23.5000	23.5000	0.5000	6.8600			-1.3000
4	15.0000	15.0000	10.0000	10.0000	0.6999	6.6400			-1.0400
5	13.1000	13.1000	17.3999	17.3999	2.6000	0.7599			-0.6999
6									0.0599
7									0.5000
8									0.7599
9									4.0999
10									6.8600
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes, growth rate 11/24/99

Sample ID: MWAT042R1			**Replicates:** 5	**Reference ID:** MWRC213R1			**Replicates:** 5
Alias: NAS #4231F - X1				**Alias:** NAS #4274F - X2			
Mean:	0.608	**Transform Mean:**	0.608	**Mean:**	0.830	**Transform Mean:**	0.830
SD:	0.134	**Transform SD:**	0.134	**SD:**	0.093	**Transform SD:**	0.093

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	0.0753
SS:	0.1078
K:	5.0000
b:	0.3180
Alpha Level:	0.05
Calculated Value:	0.9378
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.1016
Test Residual SD:	0.0725
Reference Residual Mean:	0.0719
Reference Residual SD:	0.0481
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.7598
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: No Transformation

Experimental Hypothesis
Null: x1 >= x2
Alternate: x1 < x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	3.0227
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	No
Power:	
Significant Diff for Power:	

significantly different MSR 11-24-99

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.8300	0.8300	0.8100	0.8100	0.2220	0.0199			-0.1300
2	0.5300	0.5300	0.7000	0.7000	0.0780	0.1300			-0.1080
3	0.5000	0.5000	0.9400	0.9400	0.1080	0.1100			-0.0780
4	0.5400	0.5400	0.9000	0.9000	0.0679	0.0700			-0.0679
5	0.6400	0.6400	0.8000	0.8000	0.0320	0.0299			-0.0299
6									-0.0199
7									0.0320
8									0.0700
9									0.1100
10									0.2220
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes growth rate 11/24/99

Sample ID: MWAT045R1		**Replicates:** 5	**Reference ID:** MWRC213R1		**Replicates:** 5
Alias: NAS #4232F - X1			**Alias:** NAS #4274F - X2		
Mean:	0.690	**Transform Mean:** 0.690	**Mean:**	0.830	**Transform Mean:** 0.83[illegible]
SD:	0.102	**Transform SD:** 0.102	**SD:**	0.093	**Transform SD:** 0.093

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	0.0638
SS:	0.0773
K:	5.0000
b:	0.2724
Alpha Level:	0.05
Calculated Value:	0.9587
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.0760
Test Residual SD:	0.0577
Reference Residual Mean:	0.0719
Reference Residual SD:	0.0481
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.1189
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: No Transformation

Experimental Hypothesis
Null: x1 >= x2
Alternate: x1 < x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	2.2504
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	No
Power:	
Significant Diff for Power:	

significantly different mwrk 11-24-99

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.6100	0.6100	0.8100	0.8100	0.0800	0.0199			-0.1300
2	0.8600	0.8600	0.7000	0.7000	0.1700	0.1300			-0.0800
3	0.6200	0.6200	0.9400	0.9400	0.0700	0.1100			-0.0700
4	0.7100	0.7100	0.9000	0.9000	0.0200	0.0700			-0.0399
5	0.6500	0.6500	0.8000	0.8000	0.0399	0.0299			-0.0299
6									-0.0199
7									0.0200
8									0.0700
9									0.1100
10									0.1700
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes growth rate 11/24/99

Sample ID: MWAT047R1		**Replicates:**	5	**Reference ID:** MWRC213R1		**Replicates:**	5
Alias: NAS #4234F - X1				**Alias:** NAS #4274F - X2			
Mean:	0.766	**Transform Mean:**	0.766	**Mean:**	0.830	**Transform Mean:**	0.830
SD:	0.223	**Transform SD:**	0.223	**SD:**	0.093	**Transform SD:**	0.093

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	0.1110
SS:	0.2345
K:	5.0000
b:	0.4734
Alpha Level:	0.05
Calculated Value:	0.9557
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.1568
Test Residual SD:	0.1381
Reference Residual Mean:	0.0719
Reference Residual SD:	0.0481
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.2956
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	No Transformation

Experimental Hypothesis

Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	0.5910
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.8000	0.8000	0.8100	0.8100	0.0340	0.0199			-0.3360
2	0.8500	0.8500	0.7000	0.7000	0.0840	0.1300			-0.1300
3	0.7100	0.7100	0.9400	0.9400	0.0560	0.1100			-0.0560
4	0.4300	0.4300	0.9000	0.9000	0.3360	0.0700			-0.0299
5	1.0400	1.0400	0.8000	0.8000	0.2740	0.0299			-0.0199
6									0.0340
7									0.0700
8									0.0840
9									0.1100
10									0.2740
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes growth rate 11/24/99

Sample ID: MWAT046R1		**Replicates:** 5	**Reference ID:** MWRC213R1		**Replicates:** 5
Alias: NAS #4246F - X1			**Alias:** NAS #4274F - X2		
Mean:	0.620	**Transform Mean:** 0.620	**Mean:**	0.830	**Transform Mean:** 0.830
SD:	0.061	**Transform SD:** 0.061	**SD:**	0.093	**Transform SD:** 0.093

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	0.0515
SS:	0.0504
K:	5.0000
b:	0.2180
Alpha Level:	0.05
Calculated Value:	0.9437
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.0439
Test Residual SD:	0.0371
Reference Residual Mean:	0.0719
Reference Residual SD:	0.0481
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.0293
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	No Transformation
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	4.1833
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	No
Power:	
Significant Diff for Power:	

significantly different MSR 11-24-99

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.7200	0.7200	0.8100	0.8100	0.1000	0.0199			-0.1300
2	0.6100	0.6100	0.7000	0.7000	0.0100	0.1300			-0.0500
3	0.6300	0.6300	0.9400	0.9400	0.0100	0.1100			-0.0500
4	0.5699	0.5699	0.9000	0.9000	0.0500	0.0700			-0.0299
5	0.5699	0.5699	0.8000	0.8000	0.0500	0.0299			-0.0199
6									-0.0100
7									0.0100
8									0.0700
9									0.1000
10									0.1100
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes growth rate 11/24/99

Sample ID: MWAS034R1		**Replicates:**	5
Alias: NAS #4272F - X1			
Mean:	0.852	**Transform Mean:**	0.852
SD:	0.198	**Transform SD:**	0.198

Reference ID: MWRC213R1		**Replicates:**	5
Alias: NAS #4274F - X2			
Mean:	0.830	**Transform Mean:**	0.830
SD:	0.093	**Transform SD:**	0.093

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	0.1007
SS:	0.1926
K:	5.0000
b:	0.4303
Alpha Level:	0.05
Calculated Value:	0.9610
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.1536
Test Residual SD:	0.0993
Reference Residual Mean:	0.0719
Reference Residual SD:	0.0481
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.6520
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	No Transformation
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-0.2241
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.9100	0.9100	0.8100	0.8100	0.0580	0.0199			-0.2120
2	0.6800	0.6800	0.7000	0.7000	0.1720	0.1300			-0.1720
3	0.9000	0.9000	0.9400	0.9400	0.0480	0.1100			-0.1300
4	1.1299	1.1299	0.9000	0.9000	0.2780	0.0700			-0.0299
5	0.6400	0.6400	0.8000	0.8000	0.2120	0.0299			-0.0199
6									0.0480
7									0.0580
8									0.0700
9									0.1100
10									0.2780
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes, growth rate 11/24/99

Sample ID: MWAS037R1		**Replicates:** 5	**Reference ID:** MWRC213R1		**Replicates:** 5
Alias: NAS #4273F - X1			**Alias:** NAS #4274F - X2		
Mean:	0.746	**Transform Mean:** 0.746	**Mean:**	0.830	**Transform Mean:** 0.830
SD:	0.126	**Transform SD:** 0.126	**SD:**	0.093	**Transform SD:** 0.093

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	0.0721
SS:	0.0989
K:	5.0000
b:	0.3062
Alpha Level:	0.05
Calculated Value:	0.9478
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.0912
Test Residual SD:	0.0743
Reference Residual Mean:	0.0719
Reference Residual SD:	0.0481
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.4844
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	No Transformation
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	1.1944
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.9500	0.9500	0.8100	0.8100	0.2039	0.0199			-0.1300
2	0.6800	0.6800	0.7000	0.7000	0.0659	0.1300			-0.1260
3	0.7700	0.7700	0.9400	0.9400	0.0240	0.1100			-0.0659
4	0.7100	0.7100	0.9000	0.9000	0.0359	0.0700			-0.0359
5	0.6200	0.6200	0.8000	0.8000	0.1260	0.0299			-0.0299
6									-0.0199
7									0.0240
8									0.0700
9									0.1100
10									0.2039
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes growth rate 11/24/99

Sample ID: MWAT042R1		**Replicates:**	5	**Reference ID:** MWRC214R1	**Replicates:** 5
Alias: NAS #4231F - X1				**Alias:** NAS #4275F - X2	
Mean:	0.608	**Transform Mean:**	0.608	**Mean:** 0.790	**Transform Mean:** 0.790
SD:	0.134	**Transform SD:**	0.134	**SD:** 0.239	**Transform SD:** 0.239

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Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	0.1259
SS:	0.3012
K:	5.0000
b:	0.5326
Alpha Level:	0.05
Calculated Value:	0.9415
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.1016
Test Residual SD:	0.0725
Reference Residual Mean:	0.1520
Reference Residual SD:	0.1681
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.6153
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: No Transformation

Experimental Hypothesis
Null: x1 >= x2
Alternate: x1 < x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	1.4828
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.8300	0.8300	0.7900	0.7900	0.2220	0.0000			-0.3300
2	0.5300	0.5300	0.7400	0.7400	0.0780	0.0500			-0.1080
3	0.5000	0.5000	1.1299	1.1299	0.1080	0.3400			-0.0780
4	0.5400	0.5400	0.4600	0.4600	0.0679	0.3300			-0.0679
5	0.6400	0.6400	0.8300	0.8300	0.0320	0.0399			-0.0500
6									0.0000
7									0.0320
8									0.0399
9									0.2220
10									0.3400
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes, growth rate 11/24/99

Sample ID: MWAT045R1		**Replicates:** 5	**Reference ID:** MWRC214R1		**Replicates:** 5
Alias: NAS #4232F - X1			**Alias:** NAS #4275F - X2		
Mean:	0.690	**Transform Mean:** 0.690	**Mean:**	0.790	**Transform Mean:** 0.790
SD:	0.102	**Transform SD:** 0.102	**SD:**	0.239	**Transform SD:** 0.239

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	0.1193
SS:	0.2708
K:	5.0000
b:	0.5005
Alpha Level:	0.05
Calculated Value:	0.9250
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.0760
Test Residual SD:	0.0577
Reference Residual Mean:	0.1520
Reference Residual SD:	0.1681
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.9559
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: No Transformation

Experimental Hypothesis
Null: x1 >= x2
Alternate: x1 < x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	0.8593
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.6100	0.6100	0.7900	0.7900	0.0800	0.0000			-0.3300
2	0.8600	0.8600	0.7400	0.7400	0.1700	0.0500			-0.0800
3	0.6200	0.6200	1.1299	1.1299	0.0700	0.3400			-0.0700
4	0.7100	0.7100	0.4600	0.4600	0.0200	0.3300			-0.0500
5	0.6500	0.6500	0.8300	0.8300	0.0399	0.0399			-0.0399
6									0.0000
7									0.0200
8									0.0399
9									0.1700
10									0.3400
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes, growth rate 11/24/99

Sample ID: MWAT047R1		**Replicates:** 5	**Reference ID:** MWRC214R1		**Replicates:** 5
Alias: NAS #4234F - X1			**Alias:** NAS #4275F - X2		
Mean:	0.766	**Transform Mean:** 0.766	**Mean:**	0.790	**Transform Mean:** 0.790
SD:	0.223	**Transform SD:** 0.223	**SD:**	0.239	**Transform SD:** 0.239

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	0.1500
SS:	0.4279
K:	5.0000
b:	0.6290
Alpha Level:	0.05
Calculated Value:	0.9247
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.1568
Test Residual SD:	0.1381
Reference Residual Mean:	0.1520
Reference Residual SD:	0.1681
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.0493
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: No Transformation

Experimental Hypothesis
Null: x1 >= x2
Alternate: x1 < x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	0.1640
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.8000	0.8000	0.7900	0.7900	0.0340	0.0000			-0.3360
2	0.8500	0.8500	0.7400	0.7400	0.0840	0.0500			-0.3300
3	0.7100	0.7100	1.1299	1.1299	0.0560	0.3400			-0.0560
4	0.4300	0.4300	0.4600	0.4600	0.3360	0.3300			-0.0500
5	1.0400	1.0400	0.8300	0.8300	0.2740	0.0399			0.0000
6									0.0340
7									0.0399
8									0.0840
9									0.2740
10									0.3400
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes growth rate 11/24/99

Sample ID: MWAT046R1		**Replicates:** 5	**Reference ID:** MWRC214R1		**Replicates:** 5
Alias: NAS #4246F - X1			**Alias:** NAS #4275F - X2		
Mean:	0.620	**Transform Mean:** 0.620	**Mean:**	0.790	**Transform Mean:** 0.790
SD:	0.061	**Transform SD:** 0.061	**SD:**	0.239	**Transform SD:** 0.239

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	0.1132
SS:	0.2438
K:	5.0000
b:	0.4608
Alpha Level:	0.05
Calculated Value:	0.8712
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.0439
Test Residual SD:	0.0371
Reference Residual Mean:	0.1520
Reference Residual SD:	0.1681
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.4024
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: No Transformation

Experimental Hypothesis
Null: x1 >= x2
Alternate: x1 < x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	1.5397
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.7200	0.7200	0.7900	0.7900	0.1000	0.0000			-0.3300
2	0.6100	0.6100	0.7400	0.7400	0.0100	0.0500			-0.0500
3	0.6300	0.6300	1.1299	1.1299	0.0100	0.3400			-0.0500
4	0.5699	0.5699	0.4600	0.4600	0.0500	0.3300			-0.0500
5	0.5699	0.5699	0.8300	0.8300	0.0500	0.0399			-0.0100
6									0.0000
7									0.0100
8									0.0399
9									0.1000
10									0.3400
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes, growth rate 11/24/99

Sample ID: MWAS034R1		**Replicates:**	5	**Reference ID:** MWRC214R1	**Replicates:** 5
Alias: NAS #4272F - X1				**Alias:** NAS #4275F - X2	
Mean:	0.852	**Transform Mean:**	0.852	**Mean:** 0.790	**Transform Mean:** 0.790
SD:	0.198	**Transform SD:**	0.198	**SD:** 0.239	**Transform SD:** 0.239

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	0.1425
SS:	0.3860
K:	5.0000
b:	0.6086
Alpha Level:	0.05
Calculated Value:	0.9593
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.1536
Test Residual SD:	0.0993
Reference Residual Mean:	0.1520
Reference Residual SD:	0.1681
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.0183
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: No Transformation

Experimental Hypothesis
Null: x1 >= x2
Alternate: x1 < x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-0.4462
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.9100	0.9100	0.7900	0.7900	0.0580	0.0000			-0.3300
2	0.6800	0.6800	0.7400	0.7400	0.1720	0.0500			-0.2120
3	0.9000	0.9000	1.1299	1.1299	0.0480	0.3400			-0.1720
4	1.1299	1.1299	0.4600	0.4600	0.2780	0.3300			-0.0500
5	0.6400	0.6400	0.8300	0.8300	0.2120	0.0399			0.0000
6									0.0399
7									0.0480
8									0.0580
9									0.2780
10									0.3400
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-6 Neanthes, growth rate 11/24/99

Sample ID: MWAS037R1		**Replicates:** 5	**Reference ID:** MWRC214R1		**Replicates:** 5
Alias: NAS #4273F - X1			**Alias:** NAS #4275F - X2		
Mean:	0.746	**Transform Mean:** 0.746	**Mean:**	0.790	**Transform Mean:** 0.790
SD:	0.126	**Transform SD:** 0.126	**SD:**	0.239	**Transform SD:** 0.239

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	0.1240
SS:	0.2923
K:	5.0000
b:	0.5263
Alpha Level:	0.05
Calculated Value:	0.9475
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.0912
Test Residual SD:	0.0743
Reference Residual Mean:	0.1520
Reference Residual SD:	0.1681
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.7394
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	No Transformation
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	0.3639
Critical Value:	>= 1.86
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.9500	0.9500	0.7900	0.7900	0.2039	0.0000			-0.3300
2	0.6800	0.6800	0.7400	0.7400	0.0659	0.0500			-0.1260
3	0.7700	0.7700	1.1299	1.1299	0.0240	0.3400			-0.0659
4	0.7100	0.7100	0.4600	0.4600	0.0359	0.3300			-0.0500
5	0.6200	0.6200	0.8300	0.8300	0.1260	0.0399			-0.0359
6									0.0000
7									0.0240
8									0.0399
9									0.2039
10									0.3400
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Water Quality Data

					Overlying Water Quality						Interstitial Water Quality			
BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	TEMP	DO	SAL	pH	S	NH3	SAL	pH	S	NH3
1	4232F	MWAT045R1		0									<1.0	7.5
4	4272F	MWAS034R1	6	0	20.0	7.0	27.5	7.4	<0.02	0.5				
8	4273F	MWAS037R1											<1.0	<2.5
11	4246F	MWAT046R1	6	0	20.1	6.9	27.5	7.5	<0.02	2.5				
14	4231F	MWAT042R1											<1.0	23
21	4275F	MWRC214R1											<1.0	13
25	4275F	MWRC214R1	6	0	20.1	7.2	27.5	7.7	<0.02	1.5				
30	4273F	MWAS037R1	6	0	19.9	7.2	27.5	7.6	<0.02	<0.5				
38	4232F	MWAT045R1	6	0	20.0	7.1	27.0	7.6	<0.02	1.0				
41	4287F	control	6	0	20.1	7.2	27.5	7.7	<0.02	<0.5				
43	4287F	control											4.5	<2.5
46	4274F	MWRC213R1	6	0	20.2	7.3	27.5	7.8	<0.02	0.5				
51	4234F	MWAT047R1	6	0	20.1	7.3	27.5	7.8	<0.02	1.0				
56	4274F	MWRC213R1											6.0	7.5
58	4234F	MWAT047R1											<1.0	10
59	4231F	MWAT042R1	6	0	20.2	7.4	27.0	7.8	<0.02	2.5				
63	4246F	MWAT046R1											<1.0	10
65	4272F	MWAS034R1											<1.0	5.0
4	4272F	MWAS034R1	6	3	20.2	6.2	28.5	7.9						
11	4246F	MWAT046R1	6	3	20.1	6.4	28.5	8.1						
25	4275F	MWRC214R1	6	3	20.1	6.8	29.0	8.2						
30	4273F	MWAS037R1	6	3	19.8	6.8	28.5	8.2						
38	4232F	MWAT045R1	6	3	20.1	6.6	28.0	8.1						
41	4287F	control	6	3	20.1	6.8	28.5	8.2						
46	4274F	MWRC213R1	6	3	20.2	6.8	29.0	8.3						
51	4234F	MWAT047R1	6	3	20.0	7.0	29.0	8.3						
59	4231F	MWAT042R1	6	3	20.2	6.8	28.5	8.3						
4	4272F	MWAS034R1	6	6	20.2	5.2	28.5	7.9						
11	4246F	MWAT046R1	6	6	20.0	6.1	28.0	8.1						
25	4275F	MWRC214R1	6	6	20.1	6.4	29.0	8.2						
30	4273F	MWAS037R1	6	6	19.7	6.4	29.0	8.1						
38	4232F	MWAT045R1	6	6	20.0	6.6	28.0	8.0						
41	4287F	control	6	6	20.1	6.4	28.5	8.1						
46	4274F	MWRC213R1	6	6	20.2	6.5	29.0	8.4						
51	4234F	MWAT047R1	6	6	20.0	6.5	29.0	8.2						
59	4231F	MWAT042R1	6	6	20.1	6.6	28.5	8.2						
4	4272F	MWAS034R1	6	9	20.1	6.6	28.0	7.9						
11	4246F	MWAT046R1	6	9	19.9	6.8	28.0	8.0						
25	4275F	MWRC214R1	6	9	20.0	7.0	28.5	8.3						
30	4273F	MWAS037R1	6	9	19.7	6.8	28.5	7.9						
38	4232F	MWAT045R1	6	9	20.1	6.8	28.0	8.0						
41	4287F	control	6	9	20.0	7.0	28.0	8.1						
46	4274F	MWRC213R1	6	9	20.0	7.1	28.5	8.2						
51	4234F	MWAT047R1	6	9	19.9	7.0	29.5	8.1						
59	4231F	MWAT042R1	6	9	20.2	7.2	28.5	8.2						
7	4273F	MWAS037R1	7	10									<0.5	<2.5
9	4231F	MWAT042R1	7	10									<0.5	2.5
22	4287F	control	7	10									<0.5	5.0
23	4246F	MWAT046R1	7	10									<0.5	2.5
24	4234F	MWAT047R1	7	10									<0.5	5.0

					Overlying Water Quality						Interstitial Water Quality			
	NAS	CLIENT												
28	4274F	MWRC213R1	7	10									<0.5	2.5
60	4232F	MWAT045R1	7	10									<0.5	2.5
61	4272F	MWAS034R1	7	10									<0.5	2.5
68	4275F	MWRC214R1	7	10									<0.5	<2.5
4	4272F	MWAS034R1	6	12	20.3	7.1	29.0	7.7						
11	4246F	MWAT046R1	6	12	20.1	7.2	28.5	7.7						
25	4275F	MWRC214R1	6	12	20.1	7.2	28.5	8.0						
30	4273F	MWAS037R1	6	12	20.0	6.9	28.0	7.8						
38	4232F	MWAT045R1	6	12	20.2	7.0	28.0	7.8						
41	4287F	control	6	12	20.2	7.0	28.5	7.9						
46	4274F	MWRC213R1	6	12	20.2	6.8	28.0	8.0						
51	4234F	MWAT047R1	6	12	20.2	7.1	28.5	7.9						
59	4231F	MWAT042R1	6	12	20.2	7.0	28.5	8.0						
4	4272F	MWAS034R1	6	15	20.1	6.6	28.0	8.1						
11	4246F	MWAT046R1	6	15	20.0	6.6	28.5	8.2						
25	4275F	MWRC214R1	6	15	20.0	7.0	30.0	8.3						
30	4273F	MWAS037R1	6	15	19.8	6.8	28.5	8.0						
34				15		7.1								
38	4232F	MWAT045R1	6	15	20.0	6.8	28.5	8.1						
41	4287F	control	6	15	20.0	6.8	29.5	8.1						
46	4274F	MWRC213R1	6	15	20.1	7.0	30.0	8.2						
51	4234F	MWAT047R1	6	15	20.1	7.0	29.5	8.0						
59	4231F	MWAT042R1	6	15	20.1	7.0	30.0	8.2						
4	4272F	MWAS034R1	6	18	20.1	7.1	28.0	8.4						
11	4246F	MWAT046R1	6	18	19.9	7.0	28.0	8.0						
25	4275F	MWRC214R1	6	18	20.1	7.1	29.0	8.4						
30	4273F	MWAS037R1	6	18	19.8	7.1	28.5	8.1						
38	4232F	MWAT045R1	6	18	20.1	6.8	28.0	8.1						
41	4287F	control	6	18	20.1	6.9	29.0	8.1						
46	4274F	MWRC213R1	6	18	20.2	7.0	29.5	8.2						
51	4234F	MWAT047R1	6	18	20.2	7.1	28.5	8.1						
59	4231F	MWAT042R1	6	18	20.2	7.2	29.5	8.3						
4	4272F	MWAS034R1	6	20	20.1	7.3	28.5	8.5	<0.02	<0.5	28.5	6.8	<0.5	<2.5
11	4246F	MWAT046R1	6	20	19.9	7.1	28.5	8.1	<0.02	<0.5	28.0	7.4	<0.5	<2.5
25	4275F	MWRC214R1	6	20	19.9	7.0	29.5	8.4	<0.02	<0.5	29.0	7.7	<0.5	<2.5
30	4273F	MWAS037R1	6	20	19.8	7.0	28.0	8.1	<0.02	<0.5	27.5	7.1	<0.5	<2.5
38	4232F	MWAT045R1	6	20	19.8	7.1	28.0	8.2	<0.02	<0.5	29.0	7.3	<0.5	<2.5
41	4287F	control	6	20	20.0	7.1	29.0	8.2	<0.02	<0.5	29.5	7.7	<0.5	<2.5
46	4274F	MWRC213R1	6	20	20.1	7.1	29.5	8.2	<0.02	<0.5	29.5	7.6	<0.5	<2.5
51	4234F	MWAT047R1	6	20	20.0	7.1	28.5	8.1	<0.02	<0.5	29.5	7.6	<0.5	<2.5
59	4231F	MWAT042R1	6	20	20.1	7.1	29.5	8.3	<0.02	<0.5	29.5	7.6	<0.5	<2.5

Data Entry Verified
11-22-99 LKN

11-24-99

		Overlying Water						Interstitial Water			
Mean		20.1	6.9	28.5	8.1	---	---				
SD		0.1	0.3	0.7	0.2	---	---				
n		72	73	72	72	18	18	9	9	26	26
Max		20.3	7.4	30.0	8.5	<0.02	2.5	29.5	7.7	6.0	23
Min		19.7	5.2	27.0	7.4	<0.02	< 0.5	27.5	6.8	<0.5	<2.5

DCL
11/27/99

Chain of Custody Record & Laboratory Analysis Request

Date: 9/21/99

Page 1 of 1

Number of coolers: 1

ANALYTICAL RESOURCES INCORPORATED
333 Ninth Ave. North
Seattle, WA 98109-5187
(206) 621-6490
(206) 621-7523 (FAX)

Client: Foster Wheeler Phone #: 425 688 3700

Client Contact: GARY BRAUN

Client Project ID: Middle Waterway 1B

Samplers: GB, BJ, PS, KL, BMcD

	Sample ID	Date	Time	Matx	No Cont	Lab ID	Analysis Required: BIOASSAYS Amphipod	Larval	Neanthes						Notes/Comments
1	MWAT042 R1	9/21	1225	sed	5		2	2	1			NAS # 4231F			Cool to 4°C
2	MWAT045 R1	9/21	1240	Sed	5		2	2	1			NAS # 4232F			" " "
3															
4															
5															
6															
7	all intact; 4.0°C					MR 9-23-99									
8															

Comments/Special Instructions:	Relinquished by: (Signature)	Relinquished by: (Signature)	Relinquished by: (Signature)
	Printed Name: Bruce McDonald	Printed Name: GARY M BRAUN	Printed Name:
	Company: Anchor	Company: FWENC	Company:
	Date: 9/21/99 Time: 1400	Date: 9/22/99 Time: 5:00	Date: Time:
	Received by: (Signature) Gary M Braun	Received by: (Signature) Michele S. Redmond	Received by: (Signature)
	Printed Name: GARY M BRAUN	Printed Name: Michele S. Redmond	Printed Name:
	Company: FWENC	Company: NAS	Company:
	Date: 9/22/99 Time: 5100	Date: 9-23-99 Time: 13:30	Date: Time:

FedEx USA Airbill — Tracking Number 4185416675

FedEx Retrieval Copy
1161148 00155/00500

1 From

Date 9/22/99 Sender's FedEx Account Number 1776-5771-9

Sender's Name Gary Brown Phone (425) ~~206~~ 688-3700

Dept./Floor/Suite/Room

Company FOSTER WHEELER ENVIRONMENTAL

Address 10900 NE 8TH ST STE 1300

City BELLEVUE State WA Zip 98004

2 Your Internal Billing Reference Information

3 To

Recipient's Name Dick Caldwell Phone (541) 265-7775

Dept./Floor/Suite/Room

Company Northwest Aquatics

Address 3814 Yaquina Bay

(To HOLD at FedEx location, print FedEx address here)

City Newport State OR Zip 97365

For HOLD at FedEx Location check here
1 [ ] Hold Weekday (Not available with FedEx First Overnight)
3 [ ] Hold Saturday (Not available at all locations) (Not available with FedEx First Overnight or FedEx Standard Overnight)

For Saturday Delivery check here
3 [ ] (Extra Charge. Not available for all locations) (Not available with FedEx First Overnight or FedEx Standard Overnight)

4 1 8 5 4 1 6 6 7 5

4a Express Package Service *Packages under 150 lbs* — Delivery commitment may be later in some areas
1 [ ] FedEx Priority Overnight
2 [X] FedEx Standard Overnight
3 [ ] FedEx 2Day* (Second business day)
4 [ ] NEW FedEx First Overnight
*Extra charge. Not available for FedEx 2Day rate

4b Express Freight Service *Packages over 150 lbs* — Delivery commitment may be later in some areas
5 [ ] FedEx Overnight Freight
6 [ ] FedEx 2Day Freight
7 [ ] FedEx Express Saver Freight
(Up to 3 business day service)
(Not available for freight products)

5 Packaging
1 [ ] FedEx Letter
2 [ ] FedEx Pak
3 [ ] FedEx Box
4 [ ] FedEx Tube
5 [X] Other Pkg

6 Special Handling
Does this shipment contain dangerous goods?
1 [ ] Yes
2 [ ] Dry Ice
3 [ ] Cargo Aircraft Only

7 Payment
1 [ ] Obtain Recipient FedEx Account No.
Bill to: 1 [X] Sender
2 [ ] Recipient
3 [ ] Third Party
4 [ ] Credit Card
5 [ ] Cash/Check

Credit Card No. Exp. Date

Total Packages 1 Total Weight 72 [redacted] Total Charges $

For each $100 per shipment you pay an additional charge. See SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY section for further information.

Credit Card Auth.

8 Release Signature

[illegible]

272

WCSL 0197
Rev. Date 8/98
PART #147956
1993-96 FedEx
PRINTED IN U.S.A.

[ ] Check here if packages are dropped off

-68-

MultiChem ANALYTICAL SERVICES

560 Naches Ave. SW Suite [redacted] Renton, WA 98055
(800) 609-0580 • (425) 228-8335 • FAX (425) 228-8336

[redacted]

DA[redacted] 9/22/99
PAGE 1 of 1

COMPANY: Foster Wheeler
ADDRESS: 10900 NE 8th St ste 1300
Bellevue WA 98004

PHONE: (425) 688-3700 FAX (425) 688-3952
PROJ. MGR / CONTACT: Gary Brown
PROJECT NUMBER: 1699.0014.0000
PROJECT NAME: Middle WW 1B
DISPOSAL: ☐ MAS ☐ HOLD ☐ RETURN

	DATE	TIME	MATRIX	LAB ID	FUELS: TPH-HCID	BETX / TPH-G BETX / AK101	BETX (by 8021)	TPH-G	TPH-D TPHD-extended	8015 modified	418.1	413.2	AK-GRO AK101	AK-DRO AK102 / 103	ORGANIC COMPOUNDS: 8240 / 8260 GCMS Volatiles	8270 GCMS Semivolatiles	8081 Pesticides / PCBs	PCB only (by 8081) STD / LL	8021 Halogenated VOCs	8021 Aromatic VOCs	8310 HPLC PAHs	8041 Phenols	8151 OC Herbicides	METALS: Metals indicate below	Total / Dissolved Lead	RCRA Metals (8)	PP Metals (13)	TAL Metals (23)	TCLP: TCLP 8240 (ZHE)	TCLP 8270 Semivolatiles	TCLP 8081 Pesticides	TCLP 8151 Herbicides	TCLP Metals	OTHER: Amphipod Bioassay	Lamp	Nicaltes	Total # of Containers
MWAT153R1	9/22	1035	Sed							NAS # 4233F																							2	2			4
MWAT047R1	9/22	1150	Sed							NAS # 4234F																							2	2			4
MWAT044R1	9/22	0910	Sed							NAS # 4233A																							2	2			4
All intact; 4.0 °C		MR 9-23-99																																			

SAMPLE RECEIPT:
- # OF CONTAINERS ☐ YES ☐ NO
- SEALS INTACT ☐ YES ☐ NO
- CHAIN OF CUSTODY ☐ YES ☐ NO
- PROPER PRESERVATION ☐ YES ☐ NO
- RECEIVED IN GOOD CONDITION ☐ YES ☐ NO

TAT:
- ☐ 24 HOURS
- ☐ 48 HOURS
- ☐ 72 HOURS
- ☐ 7 DAYS
- ☐ SP
- ☒ STANDARD

SPECIAL INSTRUCTIONS/COMMENTS:

*METALS NEEDED:

RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:
SIGNATURE: Gary M Brown	SIGNATURE:	SIGNATURE:
PRINT NAME: GARY M BRAUN	PRINT NAME:	PRINT NAME:
DATE: 9/22/99 TIME: 5:00 pm	DATE: TIME:	DATE: TIME:
COMPANY: FWENC	COMPANY:	COMPANY:
RECEIVED BY:	**RECEIVED BY:**	
SIGNATURE: Michele S. Redmond	SIGNATURE:	SIGNATURE:
PRINT NAME: Michele S. Redmond	PRINT NAME:	PRINT NAME:
DATE: 9-23-99 TIME: 13:30	DATE: TIME:	DATE: TIME:
COMPANY: NAS	COMPANY:	COMPANY:

-69-

FedEx USA Airbill

4185416664

FedEx Retrieval Copy

1161148 00154/00500

1 From

Date 9/22/99 Sender's FedEx Account Number 1776-5771-9

Sender's Name Greg Braun Phone (425) 688-3700

Company FOSTER WHEELER ENVIRONMENTAL

Address 10900 NE 8TH ST STE 1300

City BELLEVUE State WA Zip 98004

2 Your Internal Billing Reference Information

3 To

Recipient's Name Dick Caldwell Phone (541) 265-7225

Company Northwest Aquatics

Address 3514 Yaquina Bay Rd

(No "HOLD" at FedEx location, print FedEx address here)

City Newport State OR Zip 97365

For HOLD at FedEx Location check here

1 ☐ Hold Weekday (Not available with FedEx First Overnight) 31 ☐ Hold Saturday (Not available at all locations) (Not available with FedEx First Overnight or FedEx Standard Overnight)

For Saturday Delivery check here

3 ☐

4a Express Package Service *Packages under 150 lbs.*

FedEx Priority Overnight | FedEx Standard Overnight | X FedEx 2Day

4b Express Freight Service *Packages over 150 lbs.*

FedEx 1Day Freight | FedEx 2Day Freight | FedEx Express Saver Freight

5 Packaging FedEx Envelope | FedEx Pak | FedEx Box | FedEx Tube | X Other Pkg.

6 Special Handling

Does this shipment contain dangerous goods? No | Yes

Dry Ice | Cargo Aircraft Only

7 Payment Obtain Recipient FedEx Account No.

Bill to: X Sender | Recipient | Third Party | Credit Card | Cash/Check

FedEx Account No.

Credit Card No. Exp. Date

Total Packages 1 Total Weight 78 Total Charges $

CONDITIONS OF CARRIAGE AND LIMIT OF LIABILITY Credit Card Auth.

8 Release Signature

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WCSL 0197 Rev. Date 5/98 PART #147856

4 1 8 5 4 1 6 6 6 4

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Chain of Custody Record
Request for Analysis

Page ____ of ____ Lab. Ref. No. ____

FOSTER WHEELER ENVIRONMENTAL CORPORATION
10900 NE 8th Street • Bellevue, WA 98004
(425) 688-3700 • Fax (425) 688-3952

Project Name: Middle WW 1B
Project Address: Tacoma, WA
FW Project No.: 1699.00144.0000

Sampler(s): *(printed name)*

Sampler(s): *(signature)*

Special Instructions:

Sampling Date: 9/23/99
Shipping Date:
Shipping Ref.:

Hazard ID:
- ☐ Nonhazardous
- ☐ **Hazardous:**
  - ☐ Reactive
  - ☐ Toxic
  - ☐ Flammable
  - ☐ Irritant
  - ☐ Infectious
  - ☐ Radioactive

Sample Disposal Instructions:
- ☐ Lab disposal
- ☐ Return to FWENC
- ☐ Hold for pickup (will call)

Analysis Laboratory: Northwest Aquatics
Laboratory Contact: Dick Caldwell P.O. No.:
Reports to be Sent to:
Address/Phone No.: 3814 Yaquina Bay Rd; Newport, OR 97365

SAMPLE IDENTIFICATION	TIME COLLECTED	NO. OF CONTAINERS, SIZE & TYPE	PRESERVATIVE	MATRIX: Soil	MATRIX: Water	SAMPLE TYPE: Composite	SAMPLE TYPE: Grab	REMARKS
MW BT 041 R1	1030	32 oz glass		Sediment				NAS 4245F
Duplicate [illegible]		labelled "MW BT 041 R1"		Sediment				

Sample prep. Method Standard (EPA # ____) ____ Other ____
TCLP (1311) ____ Other ____
CLP Data Pkg.: Other ____

ANALYSES REQUEST (circle appropriate method number)

Halogenated Volatiles 8010B, 8121, 601, 502.1, CLP	Aromatic Volatiles 8020A, 802188, 602, 502.2, 503.1, CLP	BETX Only 8020A, 602, CLP	GC/MS VOAs 8260B, 624, 524.1, 524.2, CLP	GC/MS SVOAs 8270C, 625, 525, CLP	Pesticides (Organochlorine) 8081A, 608, 505, CLP	PCBs 8082 (Aroclors, Full Congeners)	HPLC PNA/PAHs 8310,610	Organophosphorus Comps. (Pest. & Herbs) 8141A	Chlorinated Herbicides 8151A	Dioxins 8290, CLP, 1613	Nitroaromatics and Nitramines(Ordnance) 8330	TPH-HCID AK, NWHCID	TPH-Gx AK101, NWTPHGx	TPH-Dx AK102,103, NWTPHDx	Lead 6010, 7420, 7421	Priority Poll. Metals (13) 6010B & 7000 Series, 6020 CLP	TCL Metals (23) 6010B & 7000 Series,6020 CLP	TCLP 1311 (metals, VOAs, SVOAs, Pest., Herb.)	Inorganic Anions (Cl, F, No_3, No_2, PO_4, SO_4) 300	Total Organic Carbon (TOC) 9060	BIOASSAY						
																							5						
																							4						

Collected from [illegible] labelled "MW BT 041 R1" 32 oz glass
Relinquished by Mary M Brown 9-26-99
Hold for all data, as per client 9-27-99 MSR

Turnaround Time:	Sample Receipt:	Relinquished by: *(signature)*	Relinquished by: *(signature)*	Relinquished by: *(signature)*	Relinquished by: *(signature)*
☐ Standard	Total # Containers Recvd.: ____	Mary M Brown			Total Organic Carbon (TOC 9060, ____
☐ 1 Week	COC Seals Present? ____	Date: 9/27/99 Time: 6:10	Date: Time:	Date: Time:	Date: Time:
☐ 4 Work Day	COC Seals Intact? ____	Received by: *(signature)*	Received by: *(signature)*	Received by: *(signature)*	Received by: *(signature)*
☐ 3 Work Day	Received Cold? ____				
☐ 2 Work Day	Received Intact? ____	Date: Time:	Date: Time:	Date: Time:	Date: 9.28.99 Time: 1000
☐ 24 Hour	Received Via: ____				

Rev 7/28/99

Gary Braun [gbraun@fwenc.com]
Monday, September 27, 1999 8:48 AM
Michele
Re: samples received

...for trhe note. The correct sample number should be MWAT041R1 for ...ers you received. We will be collecting two more test stations on ...two additional reference stations (Carr Inlet) for Middle Waterway ...day. These sample will likely be shipped out Monday night but it ...ld slip ...l Tuesday. I'll keep you posted. ...y

"Michele Redmond" <mredmond@nwaquatic.com> on 09/25/99 01:18:46 PM

Please respond to mredmond@nwaquatic.com

To: Gary Braun/Bellevue/FWENC@FWENC
cc:

Subject: samples received

Hi Gary,

We received one cooler of samples today (Sat.), with samples MWAT046R1 and
MWBT041R1. Everything was cold and intact.
There was one discrepancy: the chain of custody lists sample MWBT041R1, and
one of the jars was labelled that way, but the other three were labelled
MWAT041R1. When you get a chance, please send documentation as to which is
the correct sample number. And of course, let us know if for some reason we
have the wrong ones!

Hope you have good weather for your field work!

Michele S. Redmond
Northwestern Aquatic Sciences
P.O. Box 1437
Newport, OR 97365
541-265-7225
541-265-2799 fax
e-mail: mredmond@nwaquatic.com

CUSTODY SEAL

Person Collecting Sample: Gary W Braun (Signature) Sample No.

Date Collected: 9/24/99 Time Collected: 15:30

UPS Next Day Air
UPS Worldwide Express
Shipping Document

WEIGHT | WEIGHT: 58 | DIMENSIONAL WEIGHT: 58 | 403

UPS DRIVER
- RECORD 6-DIGIT UPS SHIPPER NUMBER FROM BOX [1].
- IF BOX [1] IS BLANK OR THE NUMBER IS MORE THAN 6 DIGITS, RECORD THE NUMBER FROM BOX [2].

[X] NEXT DAY AIR [ ] WORLDWIDE EXPRESS (INTERNATIONAL) [ ] DOCUMENTS ONLY

[ ] SATURDAY PICKUP [X] SATURDAY DELIVERY

SHIPMENT FROM

UPS SHIPPER NO: [1] 719-08W [2]

REFERENCE NUMBER

GARY BRAUN TELEPHONE 425 668 3840

FWENC

10700 ~~NE~~ NE 8th St

Bellevue WA 98004

DELIVERY TO

Dick Caldwell TELEPHONE (541) 265-7225

NW Aquatics

3814 Yaquina Bay Rd

Newport, OR 97365

J033 277 407 5 DELIVERY 1

J033 277 407 5 EXPORT 2

J033 277 407 5 EXPORT 1

[ ] BILL RECEIVER

UPS Next Day Air® EXTREMELY URGENT 1

J033 277 407 5 DELIVERY 2

J033 277 407 5

DATE OF SHIPMENT: 9/24/99

010191120 1/99 S United Parcel Service, Louisville, KY

MultiChem ANALYTICAL SERVICES

560 Naches Ave. SW Suite 101 Renton, WA 98055
(800) 609-0580 ◆ (425) 228-8335 ◆ FAX (425) 228-8336

LAB NUMBER:

DATE: 9/27/99
PAGE: 1 of

COMPANY: Foster Wheeler
ADDRESS: 10900 NE 8th St Ste B00
Bellevue WA 98004

PHONE: (425) 688 3700 FAX (425) 688 3952
PROJ. MGR / CONTACT: Gary Braun
PROJECT NUMBER: 1699.0014.0000
PROJECT NAME: Middle WW 1B
DISPOSAL: ☒ MAS ☐ HOLD ☐ RETURN

	DATE	TIME	MATRIX	LAB ID	FUELS: TPH-HCID	BETX / TPH-G BETX / AK101	BETX (by 8021)	TPH-G	TPH-D TPHD-extended	8015 modified	418.1	413.2	AK-GRO AK101	AK-DRO AK102 / 103	ORGANIC COMPOUNDS: 8240 / 8260 GCMS Volatiles	8270 GCMS Semivolatiles	8081 Pesticides / PCBs	PCB only (by 8081) STD / LL	8021 Halogenated VOCs	8021 Aromatic VOCs	8310 HPLC PAHs	8041 Phenols	8151 OC Herbicides	METALS: Metals indicate below*	Total / Dissolved Lead	RCRA Metals (8)	PP Metals (13)	TAL Metals (23)	TCLP: TCLP 8240 (ZHE)	TCLP 8270 Semivolatiles	TCLP 8081 Pesticides	TCLP 8151 Herbicides	TCLP Metals	OTHER: Amphipod	Larval	Neanthes			Total # of Containers
MWAS034R1	9/27	1035	Sed			NAS #4272F																												2	2	1			5
MWA037R1	9/27	1009	Sed			NAS #4273F																												2	2	1			5
MWRC213R1	9/27	1030	Sed			NAS #4274F																												2	2	1			5
MWRC214R1	9/27	0900	Sed			NAS #4275F																												2	2	1			5

BIOASSAY

- jars labelled MWAS037R1

"MWAS037R1" is correct as per client 9-30-99 MSR

Samples placed under N2 upon receipt
All intact; 9.0°C MSR
9-29-99

SAMPLE RECEIPT	TAT:	RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:
[illegible]	☐ 24 HOURS	SIGNATURE: Gary M Braun	SIGNATURE:	SIGNATURE:
[illegible]	☐ 48 HOURS	PRINT NAME: GARY M BRAUN	PRINT NAME:	PRINT NAME:
[illegible]	☐ 72 HOURS	DATE: 9/28/99 TIME: 1400	DATE: TIME:	DATE: TIME:
[illegible]	☐ 7 DAYS	COMPANY: FWENC	COMPANY:	COMPANY:
[illegible]	☐ SP			
[illegible]	☐ STANDARD			

SPECIAL INSTRUCTIONS/COMMENTS:

RECEIVED BY:	RECEIVED BY:	RECEIVED BY:
SIGNATURE: Michele S. Redmond	SIGNATURE:	SIGNATURE:
PRINT NAME: Michele S. Redmond	PRINT NAME:	PRINT NAME:
DATE: 9-29-99 TIME: 14:30	DATE: TIME:	DATE: TIME:
COMPANY: NAS	COMPANY:	COMPANY:

*METALS NI[illegible]D:

[illegible] SUBCONTRACT LAB [illegible]

-74-

Michele

From: Gary Braun [gbraun@fwenc.com]
Sent: Thursday, September 30, 1999 9:06 AM
To: Michele
Subject: Re: samples

Glad to hear all samples arrived. Sample Nmber discrepency should be resolved
by using the sample number on the bottles; The "S" was inadvertantly left out of
the name. Hope this helps, if you need any other information, call or email me.
I should be out of the field by Monday.
Gary

"Michele Redmond" <mredmond@nwaquatic.com> on 09/29/99 05:06:45 PM

Please respond to mredmond@nwaquatic.com

To: Gary Braun/Bellevue/FWENC@FWENC
cc:

Subject: samples

Last batch of samples received, all intact. Sample number discrepancy: chain-of-custody says "MWA037R1", but jars are labelled "MWAS037R1". Please
advise.

Michele S. Redmond
Northwestern Aquatic Sciences
P.O. Box 1437
Newport, OR 97365
541-265-7225
541-265-2799 fax
e-mail: mredmond@nwaquatic.com

FedEx USA Airbill — Tracking Number 4185416701

Recipient's Copy

1161148 00158/00500

1 From

Date 9/28/99 [redacted]

Sender's Name GARY BRAUN Phone ~~206~~ 425 688-3700

Dept./Floor/Suite/Room

Company FOSTER WHEELER ENVIRONMENTAL

Address 10900 NE 8TH ST STE. 1300

City BELLEVUE State WA Zip 98004

2 Your Internal Billing Reference Information 1699.6014.0000.00002

3 To

Recipient's Name Dick Caldwell Phone (541) 265-7225

Dept./Floor/Suite/Room

Company NW Aquatics

Address 3814 Yaquina Bay Rd

(To "HOLD" at FedEx location, print FedEx address here)

City Newport State OR Zip 97365

For HOLD at FedEx Location check here

- [ ] Hold Weekday (Not available with FedEx First Overnight)
- [ ] Hold Saturday (Not available at all locations) (Not available with FedEx First Overnight or FedEx Standard Overnight)

For Saturday Delivery check here

- [ ] (Extra Charge. Not available to all locations) (Not available with FedEx First Overnight or FedEx Standard Overnight)

4 1 8 5 4 1 6 7 0 1

4a Express Package Service *Packages under 150 lbs.* Delivery commitment may be later in some areas

- [x] FedEx Priority Overnight (Next business morning)
- [x] FedEx Standard Overnight (Next business afternoon)
- [ ] FedEx 2Day* (Second business day)
- [ ] NEW FedEx First Overnight (Earliest next business morning delivery to select locations) (Higher rates apply)

* FedEx Letter Rate not available. Minimum charge. One pound FedEx 2Day rate

4b Express Freight Service *Packages over 150 lbs.* Delivery commitment may be later in some areas

- [ ] FedEx Overnight Freight (Next business-day service for any distance)
- [ ] FedEx 2Day Freight (Second business-day service for any distance)
- [ ] FedEx Express Saver Freight (Up to 3 business-day service based upon distance)

(Call for delivery schedule. See back for detailed descriptions of freight products.)

5 Packaging

- [ ] FedEx Letter
- [ ] FedEx Pak (Declared value limit $500)
- [ ] FedEx Box
- [ ] FedEx Tube
- [x] Other Pkg.

6 Special Handling

Does this shipment contain dangerous goods?

- [ ] Yes (As per attached Shipper's Declaration)
- [ ] Yes (Shipper's Declaration not required)
- [ ] Dry Ice (Dry Ice, 9, UN 1845 III _____ x _____ kg. 904) (Dangerous Goods Shipper's Declaration not required)
- CA [ ] Cargo Aircraft Only

7 Payment

- [ ] Obtain Recipient FedEx Account No.

Bill to: [x] Sender (Account no. in section 1 will be billed) [ ] Recipient [ ] Third Party [ ] Credit Card [ ] Cash/Check

(Enter FedEx account no. or Credit Card no. below)

[redacted]

Total Packages	Total Weight	Total Declared Value*
1	145	$ .00

* When declaring a value higher than $100 per shipment, you pay an additional charge. See SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY section for further information.

8 Release Signature

Your signature authorizes Federal Express to deliver this shipment without obtaining a signature and agrees to indemnify and hold harmless Federal Express from any resulting claims.

Questions? Call 1·800·Go·FedEx (1-800-463-3339)

272

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CUSTODY SEAL

Person Collecting Sample Gary Braun (signature) Sample No.

Date Collected 9/28/99 Time Collected 14:00

CUSTODY SEAL

Person Collecting Sample Gary Braun (signature) Sample No.

Date Collected 9/28/99 Time Collected 14:00

APPENDIX III

RAW DATA – REFERENCE TOXICANT TEST

Test No. 999-1083 Client QC Test Investigator reviewed pgs. 1-6 MLR 11-18-99
Test Type (rangefinding/definitive) Test Length (hr) 96
Species Neanthes

STUDY MANAGEMENT

Client: QC Test
Client's Study Monitor: NA
Testing Laboratory: Northwestern Aquatic Sciences
Test Location: Newport Laboratory
Laboratory's Study Personnel:
Proj. Man./Study Dir. M.S. Redmond MLR
QA Officer L.K. Nemeth
1. Erin Coffey 2. G.J. IRISSARRI GJI
3. Geoffrey Hayes GOH 4.
Study Schedule:
Test Beginning: 10-5-99 1600 Test Ending: 10-9-99 1500

TEST MATERIAL

Description: cadmium as $CdCl_2 \cdot 2\frac{1}{2} H_2O$, Mallinckrodt Lot TNZ, 1.0 mg/mL stock prepared 7-24-99

NAS Sample No.:				
Date of Collection:				
Date of Receipt:				
Temperature (°C):				
Dissolved oxygen (mg/L):				
Conductivity (umhos/cm):				
pH:				
Hardness (mg/L):				
Alkalinity (mg/L):				
:				

DILUTION WATER

Description: Yaquina Bay sea water
Date of Preparation/Collection: 9-29-99
Water Quality: Cond. (umhos/cm) — Salinity (ppt) 28.0 pH 7.9
Hardness (mg/L as $CaCO_3$) — Alkalinity (mg/L as $CaCO_3$ —
Treatments: filtered to ≤ 0.40 µm, salinity-adjusted with Milli Q deionized water, aerated.

TEST ORGANISMS

Species: Neanthes sp. Age: Size:
Source: Dept. of Biology, California State University, Long Beach, CA
Acclimation Data: received: 9-29-99

Date	Temp (°C)	DO (mg/L)	pH	Sal/~~Cond~~	Comments
9-29-99	23.2	6.1	7.3	33.0	receiving water; fed
9-30-99	20.6	5.2	7.6	30.5	
10-1-99	20.5	4.0	7.6	30.5	fed
10-3-99	20.8	5.0	7.8	30.5	fed; changed water
10-4-99	20.0	6.2	7.4	30.0	
10-5-99	20.1	6.3	8.0	30.0	
Mean	20.9	5.5	7.6	30.8	
S.D.	1.2	0.9	0.3	1.1	
(N)	6	6	6	6	

Rev. 2/97

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-
ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-1083 Client QC Test Investigator _____

TEST PROCEDURES AND CONDITIONS

Test concentrations: (50% series recommended) 25, 12.5, 6.25, 3.13, 1.56 and Ø mg/L
Test chambers: 600 mL glass beakers Test volume: 500 mL
Replicates/treatment: (2) 2 Organisms/treatment: (20) 20 (10/replicate)
Test water changes: none Aeration during test: none
Feeding: None Photoperiod: constant light
Temperature: 20 ± 1
Duration: 24-hr, 48-hr, (96-hr) Renewal: none
Beaker placement: Stratified randomization

Randomization chart:

A	25	Ø	6.25	1.56	12.5	3.13
B	Ø	3.13	25	1.56	12.5	6.25
C						
D						

MISCELLANEOUS NOTES

Test solution preparation:

Concentration (mg/L)	mL of 1.0 mg/mL stock per 1000 mL	
25	25	Made up to 1000 mL with dilution water and divided between 2 replicates
12.5	12.5	
6.25	6.25	
3.13	3.13	
1.56	1.56	
Ø	Ø	

10-5-99

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-

ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-102 Client QC Test Investigator

DAY 0 (10/5/99) RMS/BAO

Conc. (mg/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1. 25	20.3	7.4	27.0	/	7.8	/	/	10	10
2. 12.5	20.3	7.4	27.0	/	7.8	/	/	10	10
3. 6.25	20.3	7.4	27.0	/	7.8	/	/	10	10
4. 3.13	20.3	7.4	27.0	/	7.8	/	/	10	10
5. 1.56	20.3	7.4	27.5	/	7.8	/	/	10	10
6. Ø	20.3	7.4	27.0	/	7.8	/	/	10	10

DAY 1 (10/6/99) RMS/BJL

Conc. (mg/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1. 25	20.1	6.6	27.5	/	7.9	/	/	8(2D)	10
2. 12.5	20.1	6.6	27.5	/	7.9	/	/	10	10
3. 6.25	20.1	6.5	28.0	/	7.9	/	/	10	10
4. 3.13	20.1	6.4	28.0	/	7.9	/	/	10	10
5. 1.56	20.0	6.5	28.0	/	7.9	/	/	10	10
6. Ø	20.1	6.7	27.5	/	7.9	/	/	10	10

DAY 2 (10/7/99) RMS/BAO

Conc. (mg/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1. 25	20.2	6.7	27.5	/	8.0	/	/	7(1D)	7(3D)
2. 12.5	20.2	7.0	27.5	/	8.0	/	/	10	9(1D)
3. 6.25	20.1	6.9	28.0	/	8.0	/	/	10	10
4. 3.13	20.1	6.9	27.5	/	8.0	/	/	10	10
5. 1.56	20.2	6.9	28.0	/	8.0	/	/	10	10
6. Ø	20.2	7.0	27.5	/	8.0	/	/	9(1M)	10

DAY 3 (10/8/99) RMS/—

Conc. (mg/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1. 25	20.3	6.6	27.5	/	7.9	/	/	5(2D)	6(1D)
2. 12.5	20.3	6.6	28.0	/	7.9	/	/	9(1D)	8(1D)
3. 6.25	20.3	6.8	28.0	/	7.9	/	/	8(2D)	9(1D)
4. 3.13	20.3	6.5	28.0	/	7.9	/	/	10	10
5. 1.56	20.3	6.8	28.0	/	7.9	/	/	10	10
6. Ø	20.3	6.7	28.0	/	7.9	/	/	9	10

DAY 4 (10/9/99) RMS

Conc. (mg/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1. 25	20.2	7.0	27.5	/	7.9	/	/	Ø(5d)	1(5d)
2. 12.5	20.2	7.0	28.0	/	7.9	/	/	1(8d)	1(7d)
3. 6.25	20.2	7.0	28.0	/	7.9	/	/	7(1d)	5(4d)
4. 3.13	20.2	7.0	28.0	/	7.9	/	/	10	10
5. 1.56	20.2	7.0	28.0	/	7.9	/	/	10	10
6. Ø	20.2	7.0	28.0	/	7.9	/	/	7(2m)	10

Remarks:

Acute 96-hr Toxicity Test-96 Hr Survival

Start Date:	10/5/99 16:00	Test ID:	999-1083	Sample ID:	REF-Ref Toxicant
End Date:	10/9/99 15:00	Lab ID:	ORNAS-Northwestern Aquati	Sample Type:	CDCL-Cadmium chloride
Sample Date:		Protocol:	EPAA 91-EPA Acute	Test Species:	NA-Neanthes arenaceodentata
Comments:					

Conc-mg/L	1	2
D-Control	1.0000	1.0000
1.56	1.0000	1.0000
3.13	1.0000	1.0000
6.25	0.7000	0.5000
12.5	0.1000	0.1000
25	0.0000	0.1000

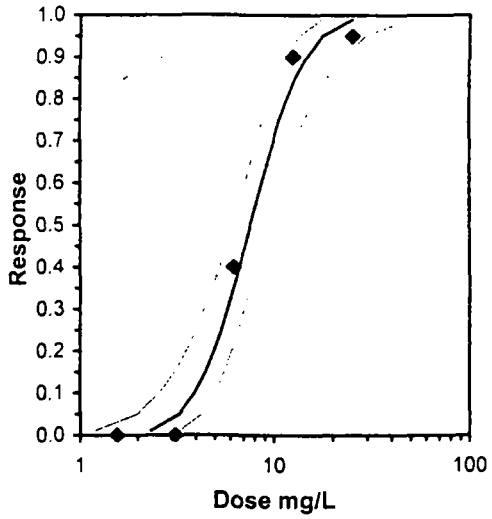
			Transform: Arcsin Square Root					Number	Total
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Resp	Number
D-Control	1.0000	1.0000	1.3963	1.3807	1.4120	1.587	2	0	17
1.56	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	0	20
3.13	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	0	20
6.25	0.6000	0.6000	0.8883	0.7854	0.9912	16.379	2	8	20
12.5	0.1000	0.1000	0.3218	0.3218	0.3218	0.000	2	18	20
25	0.0500	0.0500	0.2403	0.1588	0.3218	47.963	2	19	20

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Normality of the data set cannot be confirmed				
Equality of variance cannot be confirmed				

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	4.51288	0.79819	2.94843	6.07732	0	4.98661	7.81472	0.17	0.88193	0.22159	6
Intercept	1.01994	0.72934	-0.4096	2.44944							
TSCR											

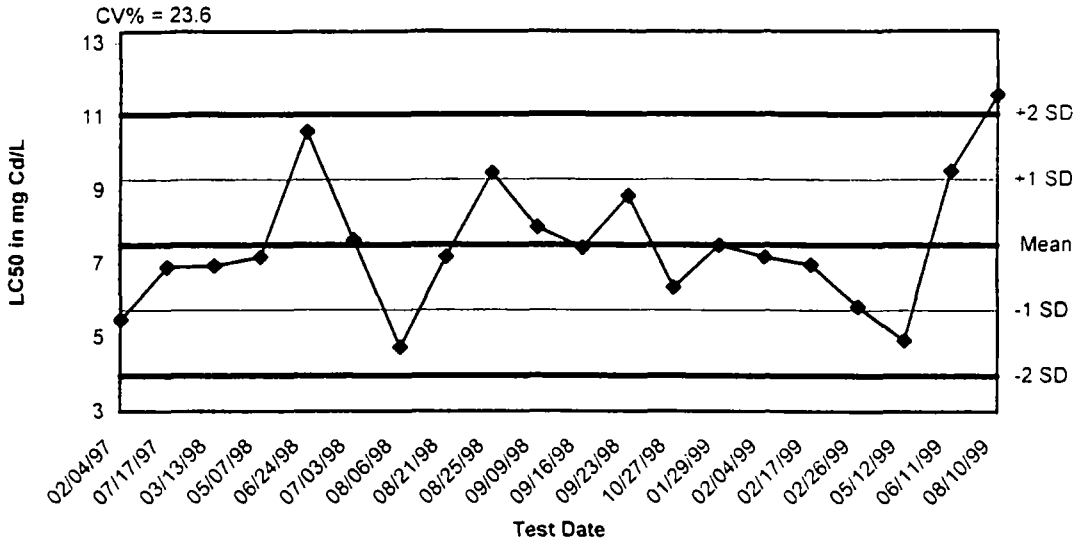
Point	Probits	mg/L	95% Fiducial Limits	
EC01	2.674	2.32511	1.18712	3.29512
EC05	3.355	3.29196	1.98977	4.3335
EC10	3.718	3.96239	2.6072	5.0404
EC15	3.964	4.49027	3.11789	5.60076
EC20	4.158	4.95953	3.5838	6.10793
EC25	4.326	5.40101	4.02757	6.59751
EC40	4.747	6.69569	5.31954	8.14108
EC50	5.000	7.61963	6.19813	9.37366
EC60	5.253	8.67107	7.13312	10.9271
EC75	5.674	10.7496	8.79656	14.4412
EC80	5.842	11.7065	9.50003	16.2322
EC85	6.036	12.9299	10.3587	18.6606
EC90	6.282	14.6525	11.5087	22.3189
EC95	6.645	17.6366	13.3842	29.2486
EC99	7.326	24.9704	17.5996	49.0309



Test: AT-Acute 96-hr Toxicity Test							Test ID: 999-1083		
Species: NA-Neanthes arenaceodentata							Protocol: EPAA 91-EPA Acute		
Sample ID: REF-Ref Toxicant							Sample Type: CDCL-Cadmium chloride		
Start Date: 10/5/99 16:00			End Date: 10/9/99 15:00				Lab ID: ORNAS-Northwestern Aquatic Sciences		
Pos	ID	Rep	Group	Start	24 Hr	48 Hr	72 Hr	96 Hr	Notes
	1	1	D-Control	7				7	
	2	2	D-Control	10				10	
	3	1	1.560	10				10	
	4	2	1.560	10				10	
	5	1	3.130	10				10	
	6	2	3.130	10				10	
	7	1	6.250	10				7	
	8	2	6.250	10				5	
	9	1	12.500	10				1	
	10	2	12.500	10				1	
	11	1	25.000	10				0	
	12	2	25.000	10				1	

Comments:

Neanthes sp. reference toxicant test control chart - last 20 points



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
02/04/97	5.4800	7.5095	5.7337	3.9578	9.2853	11.0612
07/17/97	6.9000	7.5095	5.7337	3.9578	9.2853	11.0612
03/13/98	6.9400	7.5095	5.7337	3.9578	9.2853	11.0612
05/07/98	7.1800	7.5095	5.7337	3.9578	9.2853	11.0612
06/24/98	10.6000	7.5095	5.7337	3.9578	9.2853	11.0612
07/03/98	7.6400	7.5095	5.7337	3.9578	9.2853	11.0612
08/06/98	4.7300	7.5095	5.7337	3.9578	9.2853	11.0612
08/21/98	7.1800	7.5095	5.7337	3.9578	9.2853	11.0612
08/25/98	9.4700	7.5095	5.7337	3.9578	9.2853	11.0612
09/09/98	7.9700	7.5095	5.7337	3.9578	9.2853	11.0612
09/16/98	7.4300	7.5095	5.7337	3.9578	9.2853	11.0612
09/23/98	8.8400	7.5095	5.7337	3.9578	9.2853	11.0612
10/27/98	6.3500	7.5095	5.7337	3.9578	9.2853	11.0612
01/29/99	7.5000	7.5095	5.7337	3.9578	9.2853	11.0612
02/04/99	7.1800	7.5095	5.7337	3.9578	9.2853	11.0612
02/17/99	6.9700	7.5095	5.7337	3.9578	9.2853	11.0612
02/26/99	5.8300	7.5095	5.7337	3.9578	9.2853	11.0612
05/12/99	4.9200	7.5095	5.7337	3.9578	9.2853	11.0612
06/11/99	9.5100	7.5095	5.7337	3.9578	9.2853	11.0612
08/10/99	11.5700	7.5095	5.7337	3.9578	9.2853	11.0612

-6J1
9-9-99

TOXICITY TEST NO. 590-7

TOXICITY TEST REPORT

TEST IDENTIFICATION

Test No.: 590-7

Title: *Dendraster excentricus* larval sediment toxicity test.

Protocol: NAS-XXX-SP/DE4, June 10, 1991 (Revised, October 31, 1997). Complies with: Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments (PSEP 1995), with modifications as specified by the Dredged Material Management Program (DMMP, formerly Puget Sound Dredged Disposal Analysis Program or PSDDA.

STUDY MANAGEMENT

Study Sponsor: Foster Wheeler Environmental, 10900 N.E. 8th St., Suite 1300, Bellevue, WA 98004

Sponsor's Study Monitor: Mr. Gary Braun

Testing Laboratory: Northwestern Aquatic Sciences, P.O. Box 1437, Newport, Oregon 97365.

Test Location: Newport Laboratory.

Laboratory's Study Personnel: M.S. Redmond, M.S., Proj. Mngr.; G.A. Buhler, B.S., Study Dir.; L.K. Nemeth, B.A., QA Officer; R.S. Caldwell, Ph.D., Sr. Aq. Toxicol.; G.J. Irissarri, B.S., Aq. Toxicol.; E. Coffey, B.S., Sr. Tech.; R. Singleton, M.S., Sr. Tech.; G.H. Hayes, B.S., Tech.

Study Schedule:

Test Beginning: 10-8-99, 1530 hrs.

Test Ending: 10-11-99, 1000 hrs.

Disposition of Study Records: All specimens, raw data, reports and other study records are stored according to Good Laboratory Practice regulations at Northwestern Aquatic Sciences, 3814 Yaquina Bay Rd., Newport, OR 97365.

Good Laboratory Practices: The test was conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

Statement of Quality Assurance: The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol and standard operating procedures. This report is an accurate reflection of the raw data.

TEST MATERIAL

Test Sediments: Unidentified marine sediments. Details are as follows:

NAS Sample No.	4231F	4232F	4233F	4234F
Foster Wheeler No.	MWAT042R1	MWAT045R1	MWAT044R1	MWAT047R1
Collection Date	9-21-99	9-21-99	9-22-99	9-22-99
Receipt Date	9-23-99	9-23-99	9-23-99	9-23-99
Interstitial salinity (ppt)	24.5	24.0	27.0	27.0

NAS Sample No.	4235F	4245F	4246F	4272F
Foster Wheeler No.	MWAT153R1	MWAT041R1	MWAT046R1	MWAS034R1
Collection Date	9-22-99	9-23-99	9-23-99	9-27-99
Receipt Date	9-23-99	9-25-99	9-25-99	9-29-99
Interstitial salinity (ppt)	27.5	21.0	28.5	30.5

NAS Sample No.	4273F	4274F	4275F
Foster Wheeler No.	MWAS037R1	MWRC213R1	MWRC214R1
Collection Date	9-27-99	9-27-99	9-27-99
Receipt Date	9-29-99	9-29-99	9-29-99
Interstitial salinity (ppt)	29.5	29.5	30.0

Storage: Samples were placed under nitrogen and stored at 4°C in the dark in capped containers until used.

Treatments: Homogenized.

TEST WATER

Source: Yaquina Bay, Oregon
Date of Collection: 10-8-99
Water Quality: Salinity 28.0 ppt; pH 7.8
Pretreatment: Filtered to ≤0.40 µm, adjusted with Milli-Q® water, and aerated.

TEST ORGANISMS

Species: *Dendraster excentricus*, sand dollar
Age: 1.0 hr post-fertilization
Source: Marinus, Inc., Long Beach, CA
Acclimation: Adults were received on 10-7-99 and held in the shipping carton until used on 10-8-99.
Source of Gametes: 63 females, 4 males.

TEST PROCEDURES AND CONDITIONS

The following is an abbreviated statement of the test procedures and a statement of the test conditions actually employed. See the test protocol (Appendix I) for a more detailed description of the test procedures used in this study.

Test Chambers: 1 L covered borosilicate glass beakers
Test Volumes: 18 g of test sediment brought up to a final volume of 900 ml with test water. Sediment was allowed to settle for the normal period of 4 hours as specified in the protocol.
Replicates/Treatment: 5 (plus a 6th water quality replicate).
Sediment Salinity Adjustment: None required.
Initial Concentration of Test Organisms: 22.1/ml
Water volume changes per 24 hours: None
Volume of Subsamples Taken for Counting: 10 ml
Aeration: Yes by slow bubbling at least 2 cm above the sediment surface.
Feeding: None
Acceptance Criteria: The percent normal in the seawater control must be ≥70%. Also, for DMMP projects, the combined mortality and abnormality in the reference sediments must be ≤ 35% of the seawater control value.
Effects Criteria: The effects criteria used were: 1) mortality; 2) abnormal development to the pluteus larval stage; and 3) the combined mortality/abnormality endpoint. Normal development is defined as attainment of the four armed pluteus larval stage. Data collected were: 1) the initial embryo density; 2) the number of abnormal larvae observed; and 3) the number of normal larvae observed. The results were expressed as: 1) percent abnormality; 2) percent mortality; 3) combined percent mortality and abnormality; and 4) seawater control normalized a) percent mortality and b) combined percent mortality and abnormality.
Water Quality and Other Test Conditions: The temperature, dissolved oxygen, salinity, and pH were measured in the water quality replicate test chamber daily. Ammonia-N and sulfide were measured in the overlying water of the water quality replicate test chamber on days zero and three. Total soluble sulfide and total ammonia-N were measured using Hach test kits based on the methylene blue (EPA Method 376.2) and salicylate (Clin. Chim. Acta 14:403, 1996) colorimetric methods, respectively. Samples were not distilled prior to analysis. The photoperiod was 14:10, L:D.

DATA ANALYSIS METHODS

Prior to issuance of the July 1995 revision of the PSEP recommended guidelines for conducting laboratory bioassays, no specific guidance was given for the computation of endpoints. All three standard endpoints, percent abnormal, percent combined mortality/abnormality, and percent mortality have occasionally been computed both with, and without, normalization for the seawater control. Endpoints in this report have been computed according to the following formulas:

PABN (Percent Abnormality) = 100*(A/T)
PABND (Combined Percent Mortality/Abnormality) = 100*((I-N)/I)
PMORT (Percent Mortality) = 100*((I-T)/I)
NPM (Normalized Percent Mortality) = 100*(1-(T/TS))
NCMA (Normalized Combined Percent Mortality/Abnormality) = 100*(1-(N/NS))

where the following are counts per 10 ml subsample:

N = normal larvae counted
A = abnormal larvae counted
T = N+A (total larvae counted)
I = number of inoculated embryos (from average of zero time counts)
TS = average of total larvae counted in seawater controls
NS = average of normal larvae counted in seawater controls

The means and standard deviations were then calculated for each treatment level. The statistical software employed for these calculations was Microsoft Excel 2000. Values of the normalized combined percent mortality and abnormality (NCMA) endpoint for the test sediments were statistically compared against each of the two reference sediments using BioStat ver. 2.0 (U.S. Army Corps of Engineers, Seattle District). An arcsine transformation was performed before analysis. Following transformation and determination of normality and homogeneity of variances, Student's T-Test was conducted at the 0.10 level of significance.

PROTOCOL DEVIATIONS

None

REFERENCE TOXICANT TEST

The reference toxicant test is a standard multi-concentration toxicity test using cadmium as $CdCl_2 \bullet 2\frac{1}{2}H_2O$, to evaluate the performance of the test organisms used in the sediment toxicity test. The performance is evaluated by comparing the results of this test with historical results obtained at the laboratory. The reference toxicant test raw data are found in Appendix III.

Test No.: 999-1086
Reference Toxicant and Source: Cadmium as $CdCl_2 \bullet 2\frac{1}{2}H_2O$, Mallinkrodt Lot #TNZ, 1.0 mg/ml stock prepared 7-24-99.
Test Date: 10-8-99
Dilution Water Used: Yaquina Bay, Oregon, seawater
Result: EC50, 10.2 mg/L Cd; IC25, 9.06 mg/L Cd. The EC50 result is within the laboratory's control chart warning limits (4.60 to 12.4 mg/L Cd).

RESULTS AND CONCLUSIONS

The means, and minimum and maximum values for the water quality parameters during the test are listed in Table 1. The values of individual water quality measurements are to be found in the raw data (Appendix II). The mean and standard deviation of the biological responses for each sediment are summarized in Table 2. Detailed data organized by sample and replicate, including the larval counts, for all calculated endpoints are given in Appendix II.

All water quality measurements of temperature, salinity, dissolved oxygen, and pH were within the protocol specified ranges. Sulfides were not detected (detection limit, 0.02 mg/L) in the overlying water of the water quality monitoring beakers at either the beginning or end of the test. Total ammonia-N concentrations ranged from <0.5 to 0.5 mg/L in the overlying water.

A total of eight test replicate subsamples were recounted (QC counts) by a second investigator as a check on the acceptability of the initial counts (Appendix II). In all instances the QC counts were very close (coefficients of variation from 0 to 4 for counts of normal larvae) to the initial counts and were considered acceptable.

The test was considered acceptable because 97.5% of the inoculated embryos (22.1/ml based on average counts of zero time samples) produced normal larvae in the seawater controls. This exceeds the test acceptance criterion of ≥70% as specified in the protocol. The reference sediments included in the study met the requirements of ≤ 35% combined mortality and abnormality when normalized to the seawater control (MWRC213R1 = 15.0, MWRC214R1 = 18.3; see Table 2).

Since normality in the seawater controls was acceptable (97.5%), the cadmium reference toxicant (positive control) result was within the normal range for this species (10.2 mg/L; control chart limits = 4.60 to 12.4 mg/L), and the reference sediment results were within performance limits, it is concluded that the test has developed acceptable data for use in making management decisions.

The normalized combined percent mortality & abnormality (NCMA) was not significantly higher ($P \leq 10.0\%$) in any of the nine test sediments than in either of the two reference sediments, MWRC213R1 and MWRC214R1, respectively. Therefore, none of the sediments are considered to be toxic in this study with larval echinoderms.

STUDY APPROVAL

Michele S. Redmond 12-9-99
Project Manager Date

[signature] 12-9-99
Study Director Date

Richard S. Caldwell 12/9/99
Laboratory Director Date

Julie R. Fiore 12-8-99
Quality Assurance Unit Date

Table 1. Summary of water quality conditions during the tests of sand dollar, *Dendraster excentricus*, larvae exposed to marine sediments.

Parameter	Mean ± SD	Minimum	Maximum	N
Temperature (°C)	15.0 ± 0.1	14.8	15.5	39
Dissolved Oxygen (mg/L)	8.4 ± 0.4	7.8	9.3	39
Salinity (ppt)	28.1 ± 0.2	28.0	29.0	39
pH	7.7 ± 0.1	7.5	8.0	39
Total Sulfide (mg/L)	--	<0.02	<0.02	15
Total Ammonia-N (mg/L)	--	<0.5	0.5	15

Table 2. Means and standard deviations (n=5) of responses of sand dollar, *Dendraster excentricus*., larvae exposed to marine sediments. Statistical comparisons were performed with the normalized combined percent mortality and abnormality endpoint only.

Sample Description	Percent mortality	Percent abnormality	Combined percent mortality & abnormality	Normalized percent mortality	Normalized combined percent mortality & abnormality
Seawater Control	-6.0 ± 2.5	8.0 ± 4.5	2.5 ± 4.3	0.0 ± 2.4	0.0 ± 4.4
MWAT042R1 (NAS #4231F)	12.7 ± 12.9	4.2 ± 3.5	16.0 ± 14.7	17.6 ± 12.1	13.8 ± 15.1
MWAT045R1 (NAS #4232F)	6.4 ± 11.8	3.0 ± 1.7	9.1 ± 12.2	11.7 ± 11.1	6.8 ± 12.5
MWAT044R1 (NAS #4233F)	10.9 ± 7.2	2.4 ± 0.8	13.0 ± 7.3	15.9 ± 6.8	10.7 ± 7.4
MWAT047R1 (NAS #4234F)	11.3 ± 5.4	4.1 ± 3.1	14.9 ± 6.6	16.3 ± 5.1	12.7 ± 6.7
MWAT153R1 (NAS #4235F)	11.0 ± 9.0	4.3 ± 2.0	14.7 ± 10.3	16.0 ± 8.5	12.5 ± 10.5
MWAT041R1 (NAS #4245F)	3.5 ± 3.8	3.1 ± 2.0	6.5 ± 4.4	9.0 ± 3.6	-4.1 ± 4.5
MWAT046R1 (NAS #4246F)	4.6 ± 4.6	3.6 ± 1.9	8.1 ± 4.4	10.0 ± 4.3	5.7 ± 4.5
MWAS034R1 (NAS #4272F)	18.8 ± 14.1	2.4 ± 2.2	20.8 ± 13.4	23.3 ± 13.3	18.8 ± 13.7
MWAS037R1 (NAS #4273F)	14.6 ± 14.2	2.8 ± 2.1	16.8 ± 14.7	19.4 ± 13.4	14.7 ± 15.1
MWRC213R1 (NAS #4274F)	15.6 ± 15.1	1.9 ± 1.2	17.1 ± 15.1	20.3 ± 14.3	15.0 ± 15.5
MWRC214R1 (NAS #4275F)	15.1 ± 8.7	6.0 ± 8.0	20.4 ± 9.4	19.9 ± 8.2	18.3 ± 9.7

[a] Significantly different ($p \leq 0.10$) from reference sediment MWRC213R1.
[b] Significantly different ($p \leq 0.10$) from reference sediment MWRC214R1.

APPENDIX I

PROTOCOL

TEST PROTOCOL

ECHINODERM EMBRYO SEDIMENT BIOASSAY

1. INTRODUCTION:

1.1 Purpose of Study: The purpose of this study is to identify marine sediments that are toxic to echinoderm embryos.

1.2 Summary of Method: The 48- to 96-hr static test is performed using newly fertilized embryos of one of three species of echinoderms: purple urchin, (Strongylocentrotus purpuratus), green urchin, (S. droebachiensis), or sand dollar (Dendraster excentricus). Eighteen grams of test sediment is brought up to a final volume of 900 mL with test water and vigorously mixed for 10 sec in the 1 L glass test vessels to produce the test medium. After 4 hr, the test containers are inoculated with <2-hr-old embryos at a level sufficient to yield a final concentration of 20-30 per ml. Five replicates are used for each treatment, reference, and control sediment. *(A sixth replicate is used only for water quality measurements).* *Mortality and abnormal development* during exposure are the response criteria used. A combined mortality/abnormality endpoint can also be calculated. The mean ± S.D. for each treatment and test endpoint is given in the final report. Between-treatment comparisons may be made with Student's t-test, Wilcoxon's Two-Sample test, or Mann-Whitney U test, where each treatment is compared to the control or the reference sediment.

2. STUDY MANAGEMENT

2.1 Sponsor's Name and Address:

_____
_____
_____

2.2 Sponsor's Study Monitor:

_____

2.3 Name of Testing Laboratory:
Northwestern Aquatic Sciences
Yaquina Bay Road, P.O. Box 1437
Newport, OR 97365

2.4 Test Location: _____

2.5 Laboratory's Personnel to be Assigned to the Study:
Project Manager/Technical Director: _____
Qual. Assurance Officer: _____
Aquatic Biologist: _____
Aquatic Biologist: _____

2.6 Proposed Testing Schedule: Tests to begin within 14 days (8 weeks if held under nitrogen for PSDDA) of sample collection. Reference toxicant test to be run concurrently.

2.7 Good Laboratory Practices: The test is conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

3. TEST MATERIAL

The test materials are marine sediments. The collected sediments are placed in solvent and acid cleaned 1 L glass jars fitted with TFE-lined screw caps. The samples are stored at 4°C in the dark for up to 14 days. For PSDDA

testing, the samples may be stored under nitrogen at 4°C in the dark in the original sealed containers for up to 8 weeks prior to testing. In addition to the test sediments, one or more reference sediments (a clean sediment with physical characteristics similar to the test sediments), must be employed. A second control sediment from a clean site may also be used (optional).

4. TEST WATER

Test water is filtered Yaquina Bay seawater adjusted to a salinity of 28 ppt. The water is pumped daily from Yaquina Bay into a 6000 gal seasoned fiberglass reservoir from which it is supplied under pump pressure to the laboratory. Filtration is accomplished using a sand filter followed by a medium porosity (10-25 um) cartridge filter, then a ≤ 0.45 um filter. An alternative seawater supply of similar quality may be used. The use of sterile seawater may be desirable.

5. TEST ORGANISMS

5.1 Species: Sea urchins, Strongylocentrotus purpuratus, S. droebachiensis, or sand dollars, Dendraster excentricus.

5.2 Source: Adult purple sea urchins may be purchased from a commercial supplier, but are normally collected from the exposed coast intertidal zone near Newport, OR. Sand dollars and green sea urchins are field collected or purchased from a biological supplier.

5.3 Age at Study Initiation: Less than two-hour-old embryos.

5.4 Conditioning/Holding of Adult Echinoderms: Adult sea urchins or sand dollars are maintained in flowing and/or partially recirculated natural seawater in fiberglass-lined trays, or other suitable containers, at temperatures in the range of 8-16°C and at a salinity >28 ppt. A layer of collection site sand is used in the tray for sand dollars. Holding times can vary from a few days to months. Urchins are fed frequently (at least twice weekly) with fresh kelp (Laminaria) or lettuce. Decaying food should be removed as necessary. Sand dollars feed on plankton or detrital material in the sand in which they are kept. Animals are checked daily and any obviously unhealthy animals are discarded.

5.5 Spawning and Fertilization: Sea urchins are spawned by inverting over empty 100- to 250-mL beakers; sand dollars over 10- to 30- mL seawater-filled beakers. Spawning is induced by injection of 1.0 mL (0.5 mL for sand dollars) of 0.5 M Kcl into the coelomic cavity through the peristomal membrane (through the oral opening for sand dollars). Animals are allowed to spawn about 30 minutes. Eggs are suspended in cold dilution water. Sea urchin sperm are "dry" collected with a Pasteur pipet, placed into a chilled 16 x 100 mm test tube, and refrigerated until used. For sand dollars, sperm is not dry collected.

Many females (especially sand dollars) may need to be spawned to ensure an adequate quantity of eggs. Eggs from females discharging relatively small numbers of eggs should be discarded. Eggs should be examined microscopically for viability and ripeness (Ripe eggs are round, uniform and slightly granular; immature eggs contain a large clear spot, the germinal vesicle; overripe eggs are less circular, inconsistent in granularity, and have associated debris). Acceptable eggs are pooled together into a large (e.g. 1-L) beaker and washed three times by repeatedly decanting the water above the eggs and adding 500-1,000 mL of new seawater. Eggs are allowed to settle to the bottom of the beaker (approx. 20 min.) between washes.

The sperm collected from males is combined to provide a stock. Sperm are activated by mixing three or more drops of the stock in 50 ml of test water which yields a density of approximately 100,000,000 sperm/ml. A sample of the sperm stock is counted to determine the actual density. Fertilization should be initiated within 1 hour of spawning by adding enough sperm to a beaker containing approximately 2500 eggs/ml to yield a sperm:egg ratio of ≤2000:1. A perforated plastic plunger is used to gently mix the contents of the beaker. Fertilization is monitored by examining successive 1-mL aliquots microscopically and determining the percentage of eggs with a raised fertilization membrane. When >90% of eggs are

fertilized, the developing eggs are counted and the density is adjusted to 20,000-30,000 per mL, either by diluting with seawater or decanting excess surficial water.

6. DESCRIPTION OF TEST SYSTEM

6.1 Test Chambers and Environmental Control: Test chambers used in the toxicity test are covered 1 L glass beakers. Test chambers are maintained at constant temperature by partial immersion in a temperature-controlled water bath or placement in a temperature-controlled environmental chamber. Aeration is not required by PSEP unless dissolved oxygen falls below 60% saturation. Aeration is required for PSDDA. The test is performed under a 14:10 L:D photoperiod with illumination supplied by fluorescent lamps.

6.2 Cleaning: All laboratory glassware, including test chambers, is cleaned as described in EPA/600/4-90/027. (NAS SOP No. G-1.) New glassware and test systems are soaked 15 minutes in tap water and scrubbed with detergent (or cleaned in an automatic dishwasher); rinsed twice with tap water; carefully rinsed once with fresh, dilute (10%,V:V) hydrochloric or nitric acid to remove scale, metals, and bases; rinsed twice with deionized water; rinsed once with acetone to remove organic compounds (using a fume hood or canopy); and rinsed three times with deionized water. Test systems and chambers are rinsed again with dilution water just before use.

7. EXPERIMENTAL DESIGN AND TEST PROCEDURES

7.1 Experimental Design: The experimental design consists of exposure of echinoderm embryos to a number of test sediments, one or more reference sediments, a clean sand control sediment (optional), and a no-sediment (seawater) control. Each treatment consists of five replicate test containers, each containing about 25,000 echinoderm embryos. A sixth replicate series is used for water quality measurements. Complete randomization of test containers is used.

7.2 Test Procedure: Eighteen grams of test or control sediment is added to the appropriate 1 L test container and the test water is added to a final volume of 900 mL. The containers are vigorously mixed for 10 seconds and then allowed to settle for 4 hr. Each test vessel is then inoculated with 20,000 to 30,000 <2-hr-old echinoderm embryos (~ 1 ml of embryo stock). The embryos are incubated at 15 ± 1°C for 48-96 h to permit development into normal pluteus stage larvae. Immediately after inoculation of the test vessels with embryos, 10 ml aliquots are removed from each of the five no-sediment control replicates and preserved in 5% buffered formalin. These are counted at a later date to establish the average initial embryo concentration.

The test is terminated after 48-96 hr by carefully decanting the supernatant liquid into a 1000-mL beaker. A ten milliliter aliquot is then taken from each beaker and preserved in 5% buffered formalin in a 30-mL capped glass vial. The beaker contents are gently agitated using a perforated plastic plunger at the time of aliquot removal to ensure that the aliquots accurately reflect the embryo/larval concentration of the entire test vessel. Larvae are subsequently counted directly in the 30-mL vial using an inverted microscope to determine the total number of larvae and the number failing to develop into the pluteus stage; these data are used for calculating the percent mortality, percent abnormality, and percent combined mortality and abnormality (percent abnormal/dead). Approximately 10% of the samples are recounted by a second investigator as a QA/QC measure. The capped samples are archived for up to one year following submittal of the final data package.

7.3 Effect Criteria: Effect criteria are: 1) mortality of the embryos, and 2) abnormal development (failure to develop into the four-armed pluteus stage during the course of exposure). A third effect expression is a combination of these two, percent combined mortality and abnormality. This is functionally equivalent to percent normal.

The initial number of embryos are determined by averaging the counts of all eggs in initial subsamples of the five seawater control test containers. Live abnormal larvae are those observed at 48-96 hr in which a normal four-armed pluteus stage has not been achieved. Live normal larvae are those observed at 48-96 hr which have reached the four-armed pluteus stage.

7.4 Test Conditions: The test exposure duration is 48-96 h. The test temperature is 15 ± 1°C. The salinity is 28 ~~± 2~~ ± 1 ppt. The photoperiod is a 14:10 hr, L:D cycle of fluorescent light. Aeration is not required for PSEP unless dissolved oxygen falls below 60% saturation; aeration is required for PSDDA (dissolved oxygen must be maintained at ≥ 4 mg/L). Test chambers are 1 L glass beakers held in a controlled temperature environment.

RBL 6/2/98

7.5 Feeding: Embryos are not fed during the test.

7.6 Test Duration, Type and Frequency of Observations, and Methods: The test duration is 48-96 hours. The type and frequency of observations to be made during the test are summarized as follows:

TYPE OF OBSERVATION	TIMES OF OBSERVATION
Biological Data	
Mortality and abnormal development	End of test (at 48-96 hours)
Physical and Chemical Data	
Temperature, dissolved oxygen, salinity, & pH	Daily in water quality beakers
Ammonia-N and sulfide (required)	Beginning & end of test in water quality beakers

Temperature is measured with a calibrated mercury thermometer or telethermometer. Dissolved oxygen is directly measured in test vessels using a polarographic oxygen probe calibrated according to the manufacturer's recommendations. Salinity is measured using a refractometer. The pH is measured with a pH probe and a calibrated meter with scale divisions of 0.1 pH units. Ammonia-N is measured using the HACH Model FF-3 test kit (ammonia-N detection limit 0.1 mg/L). Sulfide is measured using the HACH Hydrogen Sulfide Test Kit Model HS-WR (sulfide detection limit 0.01-0.05 mg/L).

7.7 Criteria of Test Acceptance: The test results are acceptable if at least 70% of the seawater control larvae achieve a normal pluteus stage. Also, for PSDDA, effects in the reference sediments must be ≤35% over the seawater control.

8. DATA ANALYSIS METHODS

Prior to issuance of the July 1995 revision of the PSEP recommended guidelines for conducting laboratory bioassays, no specific guidance was given for the computation of endpoints. All three standard endpoints, percent abnormal, percent mortality, and percent combined mortality and abnormality have occasionally been computed both with, and without, normalization for the seawater control. At NAS, the three non-normallized endpoints, and normalized percent mortality (NPM) and normalized combined mortality and abnormality (NCMA) are routinely computed. The formulas employed for each of these computations are as follows:

PABN (Percent Abnormality) = 100*(A/T)
PABND (Combined Percent Mortalty & Abnormality) = 100*((I-N)/I)
PMORT (Percent Mortality) = 100*((I-T)/I)
NPM (Normalized Percent Mortality) = 100*(1-(T/TS))
NCMA (Normalized Combined Mortality & Abnormality) = 100*(1-(N/NS))

where the following are counts per 10 ml sample:

N = normal larvae counted
A = abnormal larvae counted
T = N + A (total larvae counted)
I = number of inoculated embryos (from average of zero time counts)
TS = average of total larvae counted in seawater controls
NS = average of normal larvae counted in seawater controls

The means and standard deviations are then calculated for each treatment level. Between treatment comparisons may be made using a Student's t-test, Wilcoxon's Two-Sample test, or Mann-Whitney U test, where each treatment is compared to the control or the reference sediment. An arcsine-square root transformation of proportional data, and tests for normality and heterogeneity of variances, are performed prior to statistical comparisons.

9. REPORTING

A standard NAS report of the test results must include the following information: name and identification of the test; the investigator and laboratory; sediment holding temperature data; information on the test sediment including the interstitial salinity; information on the source of seawater used; detailed information about the test organisms including acclimation conditions; a description of the experimental design and test chambers and other test conditions including water quality; information about any aeration that may have been required; definition of the effect criteria and other observations; unusual responses, if any, in the control treatment; individual replicate and mean and S.D. data for larval mortality after 48-96 hr; individual replicate and mean and S.D. data for larval abnormalities after 48-96 hr; individual replicate and mean and S.D. data for combined abnormality and mortality; 48-hr LC50 and EC50 with reference toxicant; a description of data analysis methods and documentation of statistical test results if any; any unusual information about the test or deviations from procedures.

10. STUDY DESIGN ALTERATION

Amendments made to the protocol must be approved by the sponsor and study director and should include a description of the change, the reason for the change, the date the change took effect, and the dated signatures of the study director and sponsor. Any deviations in the protocol must be described and recorded in the study raw data.

11. REFERENCED GUIDELINES

ASTM. 1995. Standard guide for conducting static acute toxicity tests with echinoid embryos. ASTM Standard Guide E1563-95. Am. Soc. Test. Mat., Philadelphia, PA.

PSDDA. 1990. Summary and conclusions of the Puget Sound Dredged Disposal Analysis (PSDDA) Bioassay Workshop, memorandum for the record. U.S. Army Corps of Engineers, Seattle District.

Puget Sound Dredged Disposal Analysis (PSDDA). 1989. Management plan report - unconfined open-water disposal of dredged material, Phase II - (north and south Puget Sound). Puget Sound Dredged Disposal Analysis, Army Corps of Engineers, Seattle, WA.

Puget Sound Estuary Program. 1995. Recommended guidelines for conducting laboratory bioassays on Puget Sound sediments. Prepared for U.S. Env. Prot. Agency, Region 10, Office of Puget Sound, Seattle, WA and Puget Sound Water Quality Authority, P.O. Box 40900, Olympia, WA.

Snedecor, G.W. and W.G. Cochran. 1967. Statistical methods. Sixth ed., The Iowa State Univ. Press. Ames, Iowa., 593 pp.

Weber, C.I. (Ed.) 1991. Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms (Fourth Edition). EPA/600/4-90/027.

12. APPROVALS

_____ for _____
Name Date

_____ for **NORTHWESTERN AQUATIC SCIENCES**
Name Date

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-~~C04~~ SP/DE4 MSR

SEDIMENT LARVAE TEST BASED ON PSEP PROTOCOLS

Test No. 590-7 Client Foster Wheeler Investigator reviewed ppg 1-44 MSR 12-1-99

STUDY MANAGEMENT

Client: Foster Wheeler Environmental, 10900 NE 8th St., Suite 1300, Bellevue WA 98004

Client's Study Monitor: Mr. Gary Braun

Testing Laboratory: Northwestern Aquatic Sciences

Test Location: Newport Laboratory

Laboratory's Study Personnel:

Proj. Man./Study Dir. M.S. Redmond / GA Buhler GJL

QA Officer LK Nemeth

1. Robert Singleton RWS 2. Erin Coffey 5. G.J. IRISSARRI

3. Richard J. Caldwell RJC 4. Geoffrey Hayes GAH

Study Schedule:

Test Beginning: 10-8-99 1530 Test Ending: 10/11/99 1000

TEST MATERIAL

General description (see sample logbook/chain-of-custody for details):

NAS Sample No.:	4231F	4232F	4233F	4234F	4235F
Description:	MWAT042R1	MWAT045R1	MWAT044R1	MWAT047R1	MWAT153R1
Collection Date:	9-21-99	9-21-99	9-22-99	9-22-99	9-22-99
Receipt Date:	9-23-99	9-23-99	9-23-99	9-23-99	9-23-99
Inters.Salinity (ppm):	24.5	24.0	27.0	27.0	27.5

NAS Sample No.:	4245F	4246F	4272F	4273F	4274F	4275F
Description:	MWAT041R1	MWAT046R1	MWAS037R1	MWAS037R1	MWRC213R1	MWRC214R1
Collection Date:	9-23-99	9-23-99	9-27-99	9-27-99	9-27-99	9-27-99
Receipt Date:	9-25-99	9-25-99	9-29-99	9-29-99	9-29-99	9-29-99
Inters.Salinity (ppm):	21.0	28.5	30.5	29.5	29.5	30.0

TEST WATER

Source: Yaquina Bay, OR

Date of Collection: 10-8-99 Salinity (ppt) 28.0 pH 7.8

Treatments: Filtered to 0.40 µm, salinity adjusted w/ Milli-Q DI water, aerated.

TEST ORGANISMS

Species: Dendraster excentricus Date Purchased: 10-7-99

Source: Marinus Inc, Long Beach, CA

Acclimation Data: NONE: Animals spawned from Box

Date	Temp (°C)	DO (mg/L)	pH	Sal (ppt)	Comments
Mean					
S.D.					
(N)					

5/1/91 (Rev. 9-1-94)

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-~~C04~~ SP/DE4

SEDIMENT LARVAE TEST BASED ON PSEP PROTOCOLS

Test No. 590-7 Client Foster Wheeler Investigator _____

SPAWNING AND GAMETE HANDLING

Spawning: Initial 1200 ~~AM/PM~~; Final 1400 ~~AM/PM~~. Fertilization 1430 ~~AM/PM~~

Number of Organisms Used: females 63 ; males 4

Egg Dilution (1 ml diluted to 100 ml):

Count/ml of dilution: 1. 29 ; 2. 31 ; 3. 32 ; Mean 30.7

DF (mean x 100/~~3000~~ 20,000 OB) = 0.15

TEST PROCEDURES AND CONDITIONS

Test chambers: 1 L glass containers (beakers or ~~bottles~~) – covered w/ watchglasses

Test volumes: ~~20~~ 175 g of test sediment; ~~1000~~ 600 ml of test water

Replicates/treatment: ~~(5)~~ 5+6 replicate Organisms/treatment: (20-40/ml) 22.1

Use: 6th replicate/test sediment for WQ; development assessment beaker.

Test water changes: None Aeration: yes ; Feeding: None

Bottle placement: Total randomization

Larval stock (~~2,000-4,000~~/ml) inoculation volume: ~~10 ml~~ 1 ml; <2-hr old

Subsample size for counting: 10 ml

Photoperiod: 14L:10D

Controls: Negative (clean sediment, no sediment)

Positive (reference toxicant test by ASTM 89 method)

Randomization chart:

1											
2											
3											72 OB
4	3	6								69	72
5	2	5	→							68	71
6	1	4 OB								67	70

Top shelf

Randomization chart:

1											
2											
3											
4											
5											
6											

MISCELLANEOUS NOTES

NORTHWESTERN AQUATIC SCIENCES LARVAL PROTOCOL NO. NAS-XXX-~~RM~~
~~MARINE AMPHIPOD 10-DAY SOLID PHASE~~ SEDIMENT TEST
MJR 10-6-99

Test No. 590-~~8~~ 7 Client Foster - Wheeler Investigator _____

MJR 10-6-99 SEDIMENT DESCRIPTIONS--SUPLEMENTAL NOTES

Sample No.	Description
~~4230F~~	~~Gray, coarse sand~~ } not used in this test MJR 10-6-99
~~4239F~~	~~Gray, coarse sand~~ }
4232F	dark brown sandy mud
4231F	DARK GRAY, FINE, WOOD PIECES AND PLANT DEBIS
4233F	Dark brown sandy mud
4245F	Dark brown sandy mud
4235F	dark brown sandy mud
4234F	DARK GRAY GREEN FINE MUD + FINE SAND
4272F	Dark gray/light black, fine mud
4246F	dark brown mud
4273F	DARK GRAY, FINE MUD
4274F	Dark brown sandy mud
4275F	light brown sandy mud

Samples 4272F, 4273F, 4274F, 4275F were placed under nitrogen upon receipt. Samples 4232F, 4231F, 4233F, 4245F, 4235F, 4234F and 4246F were placed under nitrogen on 9-29-99 MJR

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-~~864~~ SP/DE4 MSR

SEDIMENT LARVAE TEST BASED ON PSEP PROTOCOLS

Test No. 590-7 Client Foster Wheeler Investigator

WATER QUALITY RECORD

Day 0 (10/8/99) 2/~~[illegible]~~

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Comments
13	15.3	8.0	28.0	7.7	<0.02		
18	15.3	7.8	28.0	7.7	<0.02		
24	15.2 ~~15.2~~	8.0	28.5	7.7	<0.02		
28	15.0	8.0	28.0	7.7	<0.02		
29	15.0	8.2	28.0	7.7	<0.02		
32	15.1	8.2	28.0	7.6	<0.02		
54	15.1	8.0	28.0	7.7	<0.02		
59	15.0	8.0	28.0	7.7	<0.02		
62	15.0	8.0	28.0	7.7	<0.02		
66	14.9	7.9	28.0	7.7	<0.02		
67	14.9	8.0	28.0	7.7	<0.02		
69	14.9	8.0	28.0	7.8	<0.02		

Day 1 (10/9/99) RMS

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Comments
13	15.1	8.1	28.0	7.6			
18	15.0	8.1	28.0	7.8			
24	15.1	8.3	29.0	7.8			
28	15.0	8.4	28.0	7.8			
29	15.0	8.5	28.0	7.8			
32	15.1	8.3	28.0	7.7			
54	14.9	8.2	28.0	7.7			
59	14.9	8.2	28.0	7.7			
62	14.9	8.5	28.0	7.7			
66	14.9	8.3	28.0	7.7			
67	14.9	8.2	28.0	7.8			
69	14.8	8.3	28.0	7.9			

Day 2 (10/10/99) RMS

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Comments
13	15.0	8.5	28.0	7.5			
18	15.0	8.5	28.0	7.6			
24	15.0	9.0	28.5	7.7			
28	15.0	9.1	28.5	7.7			
29	15.0	9.0	28.0	7.7			
32	15.0	9.0	28.0	7.7			
54	15.0	9.0	28.0	7.7			
59	14.9	8.9	28.0	7.7			
62	14.9	9.2	28.0	7.7			
66	14.9	9.0	28.0	7.7			
67	14.9	9.2	28.0	7.8			
69	14.8	9.3	28.0	7.9			

5/1/91 (Rev. 9-1-94)

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-~~C64~~ SP/DE4 XLR

SEDIMENT LARVAE TEST BASED ON PSEP PROTOCOLS

Test No. 590-7 Client Foster Whett Wheeler Investigator

WATER QUALITY RECORD

Day ~~0~~ 3 (30/11/99) ~~[illegible]~~ /2/ rms

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Comments
13	15.5	8.0	28.0	7.9	<0.02		
18	15.1	8.2	28.0	8.0	<0.02		
24	15.1	8.2	28.0	8.0	<0.02		
28	15.0	8.2	28.5	8.0	<0.02		
29	15.0	8.3	28.0	8.0	<0.02		
32	14.9	8.3	27.5	7.9	<0.02		
54	15.0	8.2	28.0	7.9	<0.02		
59	14.8	8.2	28.0	7.9	<0.02		
62	14.8	8.2	28.0	7.9	<0.02		
66	14.8	8.2	28.5	7.9	<0.02		
67	14.8	8.2	28.0	8.0	<0.02		
69	14.8	8.2	28.0	8.1	<0.02		

Day ~~1~~ 4 (/ /)

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Comments
13							
18							
24							
28							
29							
32							
54							
59							
62							
66							
67							
69							

Day 2 (/ /)

Beaker No.	Temp. (°C)	DO (ppm)	Sal. (ppt)	pH	S (ppm)	NH3 (ppm)	Comments
13							
18							
24							
28							
29							
32							
54							
59							
62							
66							
67							
69							

5/1/91 (Rev. 9-1-94)

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-~~C64~~ SP/DE4 MSR

SEDIMENT LARVAE TEST BASED ON PSEP PROTOCOLS

Test No. 590-7 Client Foster Wheeler Investigator

LARVAL COUNT DATA 11/10/99

Beaker No.	Response N	Response A
1	209	5
2	180	9
3	183	10
4	136	2
5	179	13
6	213	5
7	192	4
8	168	7
9	170	8
10	193	2
11	185	3
12	200	3
13	—	—
14	189	4
15	210	20
16	197	1
17	172	7
18	—	—
19	179	1
20	174	5
21	129	15
22	137	9
23	199	3
24	—	—
25	209	5
26	203	4
27	218	5
28	—	—
29	—	—
30	181	8
31	209	9
32	—	—
33	161	10
34	202	37
35	228	3
36	236	8
37	195	6
38	201	6
39	220	11
40	170	5
41	220	4
42	209	7
43	220	6
44	198	13
45	200	6
46	127	0
47	205	11
48	210	5

Beaker No.	Response N	Response A
49	159	40
50	175	17
51	183	11
52	211	4
53	217	2
54	—	—
55	227	14
56	198	12
57	159	7
58	168	6
59	—	—
60	188	6
61	208	4
62	—	—
63	199	5
64	178	4
65	198	5
66	—	—
67	—	—
68	186	3
69	—	—
70	217	12
71	212	1
72	182	1
73		
74		
75	Zero	Time
~~76~~ A	235	
~~77~~ B	209	
~~78~~ C	239	
~~79~~ D	229	
~~80~~ E	192	
81		
82		
83		
84		
85		
86		
87		
88		
89		
90		
91		
92		
93		
94		
95		
96		

Beaker No.	Response N	Response A
97		
98		
99		
100		
101		
102		
103		
104		
105		
106		
107		
108		
109		
110		
111		
112		
113		
114		
115		
116		
117		
118		
119		
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140		
141		
142		
143		
144		

5/1/91 (Rev. 9-1-94)

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-~~CG1~~ SP/DE4 MSR

SEDIMENT LARVAE TEST BASED ON PSEP PROTOCOLS

Test No. 590-7 Client FOSTER WHEELER Investigator

QC COUNTS LARVAL COUNT DATA 11-12-99 -6J7

Beaker No.	Response N	Response A	Beaker No.	Response N	Response A	Beaker No.	Response N	Response A
1			49			97		
2			50			98		
3			51			99		
4			52			100		
5			53			101		
6			54			102		
7			55			103		
8			56			104		
9			57			105		
10			58			106		
11			59			107		
12			60			108		
13			61			109		
14			62			110		
15			63			111		
16			64			112		
17			65			113		
18			66			114		
19			67			115		
20			68			116		
21			69			117		
22			70			118		
23			71			119		
24			72			120		
25			73			121		
26			74			122		
27			75			123		
28			76			124		
29			77			125		
30			78			126		
31			79			127		
32			80			128		
33	160	7	81			129		
34	194	49	82			130		
35	216	7	83			131		
36	228	7	84			132		
37	184	9	85			133		
38	189	11	86			134		
39	216	14	87			135		
40	168	4	88			136		
41			89			137		
42			90			138		
43			91			139		
44			92			140		
45			93			141		
46			94			142		
47			95			143		
48			96			144		

5/1/91 (Rev. 9-1-94)

1 of 1

[illegible] 10/11/99

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: 590-7 Foster Wheeler - Dendrester
Day Ø overlying water (10-8-99)

	Sample description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	13		1.0															QC Std (NH_3N)			
2	18			1.0														Nom.		Measur.	
3	24				1.0													10		10.0	
4	28					1.0												3		3.5	
5	29						1.0											1		1.0	
6	32							1.0													
7	54								1.0												
8	59									1.0											
9	63										1.0										
10	66											1.0									
11	67												1.0								
12	69													1.0							
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater	5.0	4.0	→	→	→	→	→	→	→	→	→	→	→							
	Measured concentration (mg/L)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1							
	x multiplier	1.0	5.0	→	→	→	→	→	→	→	→	→	→	→							
	Final concentration (mg/L)	<0.1	<0.5	→	→	→	→	→	→	→	→	→	→	→							

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

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1 of 1

10/11/99

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: 590-7 Foster Wheeler - Dendrostar
Day 3 overlying water (10/11/99)

	Sample description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	17		1.0															QC Std		(NH3-N)	
2	18			1.0														11 mm.		11 mis	
3	24				1.0													10		10.0	
4	28					1.0												3		3.5	
5	29						1.0											1		1.0	
6	32							1.0													
7	54								1.0												
8	59									1.0											
9	63										1.0										
10	66											1.0									
11	67												1.0								
12	69													1.0							
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater	5.0	4.0	→										→							
	Measured concentration (mg/L)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.1							
	x multiplier	1.0	5.0											→							
	Final concentration (mg/L)	<0.1	<0.5						→	0.5	0.5	<0.5	→	→							

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

MARINUS, INC.
1500 PIER C St.
LONG BEACH, CA. 90813

Ph 562-435 6522 Fx 562-495 3120

MARINUS, INC.
1500 Pier C Street
Long Beach, CA 90813
(310) 435-6522

PACKINGSLIP

DATE
10/6/99

SHIP TO

North West Aquatic Sciences
Gary Buhler
3814 Yaquina Bay Rd.
Newport, OR 97365

P.O. NUMBER	TERMS	REP	SHIP	VIA	F.O.B.	PROJECT
G.Buhler	**Net 30**	**GK**	**10/6/99**	**Federal Exp...**	**origin**	

QUANTITY	ITEM CODE	DESCRIPTION
200 ~~175~~	**Sand Dollar**	**Dendraster excentricus**
2	**B900**	**Styro,crdbrd**

Test number 590-7 Larval Sediment Test - *Dendraster excentricus* 10/6/99

Randomization Key

BKR	NAS SMPL	CLIENT DESCRIP	REPL
15	swcontrol	swcontrol	1
55	swcontrol	swcontrol	2
34	swcontrol	swcontrol	3
39	swcontrol	swcontrol	4
70	swcontrol	swcontrol	5
69	swcontrol	swcontrol	6
65	4231F	MWAT042R1	1
42	4231F	MWAT042R1	2
26	4231F	MWAT042R1	3
21	4231F	MWAT042R1	4
60	4231F	MWAT042R1	5
59	4231F	MWAT042R1	6
53	4232F	MWAT045R1	1
2	4232F	MWAT045R1	2
36	4232F	MWAT045R1	3
12	4232F	MWAT045R1	4
9	4232F	MWAT045R1	5
13	4232F	MWAT045R1	6
45	4233F	MWAT044R1	1
25	4233F	MWAT044R1	2
58	4233F	MWAT044R1	3
11	4233F	MWAT044R1	4
23	4233F	MWAT044R1	5
32	4233F	MWAT044R1	6
51	4234F	MWAT047R1	1
64	4234F	MWAT047R1	2
50	4234F	MWAT047R1	3
7	4234F	MWAT047R1	4
52	4234F	MWAT047R1	5
66	4234F	MWAT047R1	6
30	4235F	MWAT153R1	1
33	4235F	MWAT153R1	2
41	4235F	MWAT153R1	3
38	4235F	MWAT153R1	4
5	4235F	MWAT153R1	5
67	4235F	MWAT153R1	6
27	4245F	MWAT041R1	1
31	4245F	MWAT041R1	2
37	4245F	MWAT041R1	3
56	4245F	MWAT041R1	4
71	4245F	MWAT041R1	5
62	4245F	MWAT041R1	6
44	4246F	MWAT046R1	1
47	4246F	MWAT046R1	2
14	4246F	MWAT046R1	3
6	4246F	MWAT046R1	4
48	4246F	MWAT046R1	5
24	4246F	MWAT046R1	6
8	4272F	MWAS034R1	1
3	4272F	MWAS034R1	2
46	4272F	MWAS034R1	3
63	4272F	MWAS034R1	4
16	4272F	MWAS034R1	5
54	4272F	MWAS034R1	6

6th replicate is water quality replicate --- // ---

Test number 590-7 Larval Sediment Test - *Dendraster excentricus* 10/6/99
Randomization Key

BKR	NAS SMPL	CLIENT DESCRIP	REPL
20	4273F	MWAS037R1	1
22	4273F	MWAS037R1	2
61	4273F	MWAS037R1	3
43	4273F	MWAS037R1	4
19	4273F	MWAS037R1	5
28	4273F	MWAS037R1	6
68	4274F	MWRC213R1	1
10	4274F	MWRC213R1	2
35	4274F	MWRC213R1	3
4	4274F	MWRC213R1	4
17	4274F	MWRC213R1	5
18	4274F	MWRC213R1	6
40	4275F	MWRC214R1	1
1	4275F	MWRC214R1	2
72	4275F	MWRC214R1	3
49	4275F	MWRC214R1	4
57	4275F	MWRC214R1	5
29	4275F	MWRC214R1	6

6th replicate is water quality replicate — 12 —

Endpoints Data Entry and Calculations File

BKR=beaker number

INIT=number of inoculated embryos (from average of zero-time counts)

NORM=number normal

ABN=number abnormal

TOTAL=NORM+ABN

PMORT=percent mortality=100((INIT-TOTAL)/INIT)

PABN=percent abnormality=100(ABN/TOTAL),

PABND=combined percent mortality and abnormality=100((INIT-NORM)/INIT)

NPM=normalized percent mortality=100(1-(TOTAL/TS)),

where TS=average of total larvae counted in seawater controls

NCMA=normalized combined percent mortality and abnormality=100(1-(NORM/NS)),

where NS=average of normal larvae counted in seawater controls

zero counts	
a	235
b	209
c	239
d	229
e	192
Mean =	221

Data entry
Verified
RKE 11/23/99

NS (mean normal)	TS (mean total)
215.2	234.0

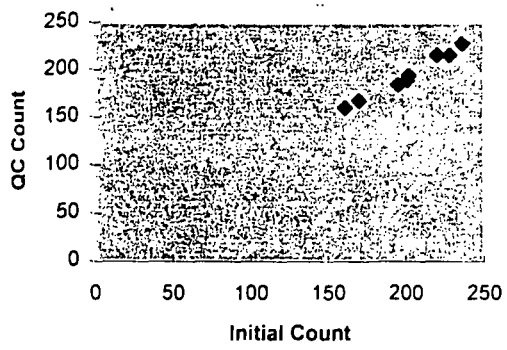
%normal in SW cont relative to INIT
97.5

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL	INIT	NORM	ABN	TOTAL	PMORT	PABN	PABND	NPM	NCMA		PMORT	PABN	PABND	NPM	NCMA
1	15	swcontrol	swcontrol	1	221	210	20	230	-4.2	8.7	4.9	1.7	2.4						
2	55	swcontrol	swcontrol	2	221	227	14	241	-9.1	5.8	-2.8	-3.0	-5.5	Mean	-6.0	8.0	2.5	0.0	0.0
3	34	swcontrol	swcontrol	3	221	202	37	239	-8.2	15.5	8.5	-2.1	6.1	S.D.	2.5	4.5	4.3	2.4	4.4
4	39	swcontrol	swcontrol	4	221	220	11	231	-4.6	4.8	0.4	1.3	-2.2	n	5	5	5	5	5
5	70	swcontrol	swcontrol	5	221	217	12	229	-3.7	5.2	1.7	2.1	-0.8						
6	69	swcontrol	swcontrol	6	221			0	100.0	#DIV/0!	100.0	100.0	100.0						
7	65	4231F	MWAT042R1	1	221	198	5	203	8.1	2.5	10.3	13.2	8.0						
8	42	4231F	MWAT042R1	2	221	209	7	216	2.2	3.2	5.3	7.7	2.9	Mean	12.7	4.2	16.0	17.6	13.8
9	26	4231F	MWAT042R1	3	221	203	4	207	6.3	1.9	8.1	11.5	5.7	S.D.	12.9	3.5	14.7	12.1	15.1
10	21	4231F	MWAT042R1	4	221	129	15	144	34.8	10.4	41.6	38.5	40.1	n	5	5	5	5	5
11	60	4231F	MWAT042R1	5	221	188	6	194	12.1	3.1	14.9	17.1	12.6						
12	59	4231F	MWAT042R1	6	221			0	100.0	#DIV/0!	100.0	100.0	100.0						
13	53	4232F	MWAT045R1	1	221	217	2	219	0.8	0.9	1.7	6.4	-0.8						
14	2	4232F	MWAT045R1	2	221	180	9	189	14.4	4.8	18.5	19.2	16.4	Mean	6.4	3.0	9.1	11.7	6.8
15	36	4232F	MWAT045R1	3	221	236	8	244	-10.5	3.3	-6.9	-4.3	-9.7	S.D.	11.8	1.7	12.2	11.1	12.5
16	12	4232F	MWAT045R1	4	221	200	3	203	8.1	1.5	9.4	13.2	7.1	n	5	5	5	5	5
17	9	4232F	MWAT045R1	5	221	170	8	178	19.4	4.5	23.0	23.9	21.0						
18	13	4232F	MWAT045R1	6	221			0	100.0	#DIV/0!	100.0	100.0	100.0						
19	45	4233F	MWAT044R1	1	221	200	6	206	6.7	2.9	9.4	12.0	7.1						
20	25	4233F	MWAT044R1	2	221	209	5	214	3.1	2.3	5.3	8.5	2.9	Mean	10.9	2.4	13.0	15.9	10.7
21	58	4233F	MWAT044R1	3	221	168	6	174	21.2	3.4	23.9	25.6	21.9	S.D.	7.2	0.8	7.3	6.8	7.4
22	11	4233F	MWAT044R1	4	221	185	3	188	14.9	1.6	16.2	19.7	14.0	n	5	5	5	5	5
23	23	4233F	MWAT044R1	5	221	199	3	202	8.5	1.5	9.9	13.7	7.5						
24	32	4233F	MWAT044R1	6	221			0	100.0	#DIV/0!	100.0	100.0	100.0						
25	51	4234F	MWAT047R1	1	221	183	11	194	12.1	5.7	17.1	17.1	15.0						
26	64	4234F	MWAT047R1	2	221	178	4	182	17.6	2.2	19.4	22.2	17.3	Mean	11.3	4.1	14.9	16.3	12.7
27	50	4234F	MWAT047R1	3	221	175	17	192	13.0	8.9	20.7	17.9	18.7	S.D.	5.4	3.1	6.6	5.1	6.7
28	7	4234F	MWAT047R1	4	221	192	4	196	11.2	2.0	13.0	16.2	10.8	n	5	5	5	5	5
29	52	4234F	MWAT047R1	5	221	211	4	215	2.6	1.9	4.4	8.1	2.0						
30	66	4234F	MWAT047R1	6	221			0	100.0	#DIV/0!	100.0	100.0	100.0						
31	30	4235F	MWAT153R1	1	221	181	8	189	14.4	4.2	18.0	19.2	15.9						
32	33	4235F	MWAT153R1	2	221	161	10	171	22.6	5.8	27.1	26.9	25.2	Mean	11.0	4.3	14.7	16.0	12.5
33	41	4235F	MWAT153R1	3	221	220	4	224	-1.4	1.8	0.4	4.3	-2.2	S.D.	9.0	2.0	10.3	8.5	10.5
34	38	4235F	MWAT153R1	4	221	201	6	207	6.3	2.9	9.0	11.5	6.6	n	5	5	5	5	5
35	5	4235F	MWAT153R1	5	221	179	13	192	13.0	6.8	18.9	17.9	16.8						
36	67	4235F	MWAT153R1	6	221			0	100.0	#DIV/0!	100.0	100.0	100.0						

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL	INIT	NORM	ABN	TOTAL	PMORT	PABN	PABND	NPM	NCMA		PMORT	PABN	PABND	NPM	NC
37	27	4245F	MWAT041R1	1	221	218	5	223	-1.0	2.2	1.3	4.7	-1.3						
38	31	4245F	MWAT041R1	2	221	209	9	218	1.3	4.1	5.3	6.8	2.9	Mean	3.5	3.1	6.5	9.0	4.1
39	37	4245F	MWAT041R1	3	221	195	6	201	9.0	3.0	11.7	14.1	9.4	S.D.	3.8	2.0	4.4	3.6	4.5
40	56	4245F	MWAT041R1	4	221	198	12	210	4.9	5.7	10.3	10.3	8.0	n	5	5	5	5	5
41	71	4245F	MWAT041R1	5	221	212	1	213	3.5	0.5	4.0	9.0	1.5						
42	62	4245F	MWAT041R1	6	221			0	100.0	#DIV/0!	100.0	100.0	100.0						
43	44	4246F	MWAT046R1	1	221	198	13	211	4.4	6.2	10.3	9.8	8.0						
44	47	4246F	MWAT046R1	2	221	205	11	216	2.2	5.1	7.2	7.7	4.7	Mean	4.6	3.6	8.1	10.0	5.7
45	14	4246F	MWAT046R1	3	221	189	4	193	12.6	2.1	14.4	17.5	12.2	S.D.	4.6	1.9	4.4	4.3	4.5
46	6	4246F	MWAT046R1	4	221	213	5	218	1.3	2.3	3.5	6.8	1.0	n	5	5	5	5	5
47	48	4246F	MWAT046R1	5	221	210	5	215	2.6	2.3	4.9	8.1	2.4						
48	24	4246F	MWAT046R1	6	221			0	100.0	#DIV/0!	100.0	100.0	100.0						
49	8	4272F	MWAS034R1	1	221	168	7	175	20.7	4.0	23.9	25.2	21.9						
50	3	4272F	MWAS034R1	2	221	183	10	193	12.6	5.2	17.1	17.5	15.0	Mean	18.8	2.4	20.8	23.3	18.8
51	46	4272F	MWAS034R1	3	221	127	0	127	42.5	0.0	42.5	45.7	41.0	S.D.	14.1	2.2	13.4	13.3	13.7
52	63	4272F	MWAS034R1	4	221	199	5	204	7.6	2.5	9.9	12.8	7.5	n	5	5	5	5	5
53	16	4272F	MWAS034R1	5	221	197	1	198	10.3	0.5	10.8	15.4	8.5						
54	54	4272F	MWAS034R1	6	221			0	100.0	#DIV/0!	100.0	100.0	100.0						
55	20	4273F	MWAS037R1	1	221	174	5	179	18.9	2.8	21.2	23.5	19.1						
56	22	4273F	MWAS037R1	2	221	137	9	146	33.9	6.2	38.0	37.6	36.3	Mean	14.6	2.8	16.8	19.4	14.7
57	61	4273F	MWAS037R1	3	221	208	4	212	4.0	1.9	5.8	9.4	3.3	S.D.	14.2	2.1	14.7	13.4	15.1
58	43	4273F	MWAS037R1	4	221	220	6	226	-2.4	2.7	0.4	3.4	-2.2	n	5	5	5	5	5
59	19	4273F	MWAS037R1	5	221	179	1	180	18.5	0.6	18.9	23.1	16.8						
60	28	4273F	MWAS037R1	6	221			0	100.0	#DIV/0!	100.0	100.0	100.0						
61	68	4274F	MWRC213R1	1	221	186	3	189	14.4	1.6	15.8	19.2	13.6						
62	10	4274F	MWRC213R1	2	221	193	2	195	11.7	1.0	12.6	16.7	10.3	Mean	15.6	1.9	17.1	20.3	15.0
63	35	4274F	MWRC213R1	3	221	228	3	231	-4.6	1.3	-3.3	1.3	-5.9	S.D.	15.1	1.2	15.1	14.3	15.5
64	4	4274F	MWRC213R1	4	221	136	2	138	37.5	1.4	38.4	41.0	36.8	n	5	5	5	5	5
65	17	4274F	MWRC213R1	5	221	172	7	179	18.9	3.9	22.1	23.5	20.1						
66	18	4274F	MWRC213R1	6	221			0	100.0	#DIV/0!	100.0	100.0	100.0						
67	40	4275F	MWRC214R1	1	221	170	5	175	20.7	2.9	23.0	25.2	21.0						
68	1	4275F	MWRC214R1	2	221	209	5	214	3.1	2.3	5.3	8.5	2.9	Mean	15.1	6.0	20.4	19.9	16.
69	72	4275F	MWRC214R1	3	221	182	1	183	17.1	0.5	17.6	21.8	15.4	S.D.	8.7	8.0	9.4	8.2	9.7
70	49	4275F	MWRC214R1	4	221	159	40	199	9.9	20.1	28.0	15.0	26.1	n	5	5	5	5	5
71	57	4275F	MWRC214R1	5	221	159	7	166	24.8	4.2	28.0	29.1	26.1						
72	29	4275F	MWRC214R1	6	221			0	100.0	#DIV/0!	100.0	100.0	100.0						

Comparison of Initial Counts and QC Counts

	Normal Larvae				
Beaker	Initial Count		QC Count		
No.	Normal	Abnormal	Normal	Abnormal	cv(normal)
33	161	10	160	7	0
34	202	37	194	49	3
35	228	3	216	7	4
36	236	8	228	7	2
37	195	6	184	9	4
38	201	6	189	11	4
39	220	11	216	14	1
40	170	5	168	4	1



Intercept	12.61529
Slope	0.901474
r square	0.97798

Data entry verified
QSL 11/23/99

Water Quality Data File

BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	TEMP	DO	SAL	PH	S	NH3
13	4232F	MWAT045R1	6	0	15.3	8.0	28.0	7.7	<0.02	<0.5
18	4274F	MWRC213R1	6	0	15.3	7.8	28.0	7.7	<0.02	<0.5
24	4246F	MWAT046R1	6	0	15.2	8.0	28.5	7.7	<0.02	<0.5
28	4273F	MWAS037R1	6	0	15.0	8.0	28.0	7.7	<0.02	<0.5
29	4275F	MWRC214R1	6	0	15.0	8.2	28.0	7.7	<0.02	<0.5
32	4233F	MWAT044R1	6	0	15.1	8.2	28.0	7.6	<0.02	<0.5
54	4272F	MWAS034R1	6	0	15.1	8.0	28.0	7.7	<0.02	<0.5
59	4231F	MWAT042R1	6	0	15.0	8.0	28.0	7.7	<0.02	<0.5
62	4245F	MWAT041R1	6	0	15.0	8.0	28.0	7.7	<0.02	<0.5
66	4234F	MWAT047R1	6	0	14.9	7.9	28.0	7.7	<0.02	<0.5
67	4235F	MWAT153R1	6	0	14.9	8.0	28.0	7.7	<0.02	<0.5
69	swcontrol	swcontrol	6	0	14.9	8.0	28.0	7.8	<0.02	<0.5
13	4232F	MWAT045R1	6	1	15.1	8.1	28.0	7.6		
18	4274F	MWRC213R1	6	1	15.0	8.1	28.0	7.8		
24	4246F	MWAT046R1	6	1	15.1	8.3	29.0	7.8		
28	4273F	MWAS037R1	6	1	15.0	8.4	28.0	7.8		
29	4275F	MWRC214R1	6	1	15.0	8.5	28.0	7.8		
32	4233F	MWAT044R1	6	1	15.1	8.3	28.0	7.7		
54	4272F	MWAS034R1	6	1	14.9	8.2	28.0	7.7		
59	4231F	MWAT042R1	6	1	14.9	8.2	28.0	7.7		
62	4245F	MWAT041R1	6	1	14.9	8.5	28.0	7.7		
66	4234F	MWAT047R1	6	1	14.9	8.3	28.0	7.7		
67	4235F	MWAT153R1	6	1	14.9	8.2	28.0	7.8		
69	swcontrol	swcontrol	6	1	14.8	8.3	28.0	7.9		
13	4232F	MWAT045R1	6	2	15.0	8.5	28.0	7.5		
18	4274F	MWRC213R1	6	2	15.0	8.5	28.0	7.6		
24	4246F	MWAT046R1	6	2	15.0	9.0	28.5	7.7		
28	4273F	MWAS037R1	6	2	15.0	9.1	28.5	7.7		
29	4275F	MWRC214R1	6	2	15.0	9.0	28.0	7.7		
32	4233F	MWAT044R1	6	2	15.0	9.0	28.0	7.7		
54	4272F	MWAS034R1	6	2	15.0	9.0	28.0	7.7		
59	4231F	MWAT042R1	6	2	14.9	8.9	28.0	7.7		
62	4245F	MWAT041R1	6	2	14.9	9.2	28.0	7.7		
66	4234F	MWAT047R1	6	2	14.9	9.0	28.0	7.7		
67	4235F	MWAT153R1	6	2	14.9	9.2	28.0	7.8		
69	swcontrol	swcontrol	6	2	14.8	9.3	28.0	7.9		
13	4232F	MWAT045R1	6	3	15.5	8.0	28.0	7.9	<0.02	<0.5
18	4274F	MWRC213R1	6	3	15.1	8.2	28.0	8.0	<0.02	<0.5
24	4246F	MWAT046R1	6	3	15.1	8.2	28.0	8.0	<0.02	<0.5
28	4273F	MWAS037R1	6	3	15.0	8.2	28.5	8.0	<0.02	<0.5
29	4275F	MWRC214R1	6	3	15.0	8.3	28.0	8.0	<0.02	<0.5
32	4233F	MWAT044R1	6	3	14.9	8.3	27.5	7.9	<0.02	<0.5
54	4272F	MWAS034R1	6	3	15.0	8.2	28.0	7.9	<0.02	<0.5
59	4231F	MWAT042R1	6	3	14.8	8.2	28.0	7.9	<0.02	0.5
62	4245F	MWAT041R1	6	3	14.8	8.2	28.0	7.9	<0.02	0.5
66	4234F	MWAT047R1	6	3	14.8	8.2	28.5	7.9	<0.02	<0.5
67	4235F	MWAT153R1	6	3	14.8	8.2	28.0	8.0	<0.02	<0.5
69	swcontrol	swcontrol	6	3	14.8	8.2	28.0	8.1	<0.02	<0.5

	TEMP	DO	SAL	PH	S	NH3
Mean	15.0	8.4	28.1	7.7		
SD	0.1	0.4	0.2	0.1		
n	39	39	39	39	15	15
Max	15.5	9.3	29.0	8.0	<0.02	0.5
Min	14.8	7.8	28.0	7.5	<0.02	<0.5

Data entry verified
RSE 11/23/99

16 MSR
~~15~~ 12-6-99

Project Name: P590-7, Larval % combined dead/abnormal — seawater control normalized WSR 11-24-99 — 11/24/99

Sample ID: MWAT042R1	**Replicates:** 5		**Reference ID:** MWRC213R1	**Replicates:** 5	
Alias: NAS #4231F - X1			**Alias:** NAS #4274F - X2		
Mean: 13.860	**Transform Mean:** 20.025		**Mean:** 16.160	**Transform Mean:** 20.868	
SD: 15.092	**Transform SD:** 11.485		**SD:** 13.634	**Transform SD:** 13.651	

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	8.1859
SS:	1,273.1846
K:	5.0000
b:	35.0346
Alpha Level:	0.05
Calculated Value:	0.9640
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	8.0118
Test Residual SD:	7.1892
Reference Residual Mean:	9.2070
Reference Residual SD:	8.9672
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.2325
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	-0.1056
Critical Value:	>= 1.397
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	8.0000	16.4299	13.6000	21.6404	3.5957	0.7719			-20.8685
2	2.9000	9.8048	10.3000	18.7195	10.2208	2.1490			-10.2208
3	5.7000	13.8125	0.0000	0.0000	6.2131	20.8685			-6.2131
4	40.1000	39.2898	36.7999	37.3461	19.2641	16.4776			-3.5957
5	12.6000	20.7912	20.1000	26.6365	0.7655	5.7680			-2.1490
6									0.7655
7									0.7719
8									5.7680
9									16.4776
10									19.2641
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

negative numbers entered as zeroes WSR 11-24-99

Project Name: P590-7, Larval % combined dead/abnormal normalized to seawater control MK 11-24-99. 11/24/99

Sample ID: MWAT045R1	**Replicates:** 5	**Reference ID:** MWRC213R1	**Replicates:** 5
Alias: NAS #4232F - X1		**Alias:** NAS #4274F - X2	
Mean: 8.900	**Transform Mean:** 13.323	**Mean:** 16.160	**Transform Mean:** 20.86
SD: 9.543	**Transform SD:** 12.901	**SD:** 13.634	**Transform SD:** 13.651

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	8.6186
SS:	1,411.3276
K:	5.0000
b:	36.5469
Alpha Level:	0.05
Calculated Value:	0.9464
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	10.6587
Test Residual SD:	4.9443
Reference Residual Mean:	9.2070
Reference Residual SD:	8.9672
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.3170
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	-0.8981
Critical Value:	>= 1.397
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.0000	0.0000	13.6000	21.6404	13.3234	0.7719			-20.8685
2	16.3999	23.8891	10.3000	18.7195	10.5656	2.1490			-13.3234
3	0.0000	0.0000	0.0000	0.0000	13.3234	20.8685			-13.3234
4	7.1000	15.4535	36.7999	37.3461	2.1301	16.4776			-2.1490
5	21.0000	27.2746	20.1000	26.6365	13.9511	5.7680			0.7719
6									2.1301
7									5.7680
8									10.5656
9									13.9511
10									16.4776
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-7, Larval % combined dead/abnormal normalized to seawater control MSK 11-24-99 11/24/99

Sample ID: MWAT044RT		**Replicates:** 5	**Reference ID:** MWRC213R1		**Replicates:** 5
Alias: NAS #4233F - X1			**Alias:** NAS #4274F - X2		
Mean:	10.680	**Transform Mean:** 18.205	**Mean:**	16.160	**Transform Mean:** 20.868
SD:	7.422	**Transform SD:** 6.923	**SD:**	13.634	**Transform SD:** 13.651

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	7.0232
SS:	937.2071
K:	5.0000
b:	30.0736
Alpha Level:	0.05
Calculated Value:	0.9650
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	5.3857
Test Residual SD:	3.4163
Reference Residual Mean:	9.2070
Reference Residual SD:	8.9672
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.8904
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	-0.3890
Critical Value:	>= 1.397
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	7.1000	15.4535	13.6000	21.6404	2.7520	0.7719			-20.8685
2	2.9000	9.8048	10.3000	18.7195	8.4007	2.1490			-8.4007
3	21.9000	27.9028	0.0000	0.0000	9.6971	20.8685			-2.7520
4	14.0000	21.9727	36.7999	37.3461	3.7670	16.4776			-2.3114
5	7.5000	15.8941	20.1000	26.6365	2.3114	5.7680			-2.1490
6									0.7719
7									3.7670
8									5.7680
9									9.6971
10									16.4776
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-7, Larval, % combined dead/abnormal normalized to seawater control MSR 11-24-99 11/24/99

Sample ID: MWAT047RT	**Replicates:** 5	**Reference ID:** MWRC213RT	**Replicates:** 5
Alias: NAS #4234F - X1		**Alias:** NAS #4274F - X2	
Mean: 12.760	**Transform Mean:** 20.060	**Mean:** 16.160	**Transform Mean:** 20.868
SD: 6.718	**Transform SD:** 7.104	**SD:** 13.634	**Transform SD:** 13.651

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	7.0612
SS:	947.3616
K:	5.0000
b:	29.6463
Alpha Level:	0.05
Calculated Value:	0.9277
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	5.1220
Test Residual SD:	4.2039
Reference Residual Mean:	9.2070
Reference Residual SD:	8.9672
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.9223
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: ArcSin

Experimental Hypothesis
Null: x1 <= x2
Alternate: x1 > x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	-0.1174
Critical Value:	>= 1.397
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	15.0000	22.7864	13.6000	21.6404	2.7259	0.7719			-20.8685
2	17.3000	24.5780	10.3000	18.7195	4.5175	2.1490			-11.9304
3	18.7000	25.6221	0.0000	0.0000	5.5616	20.8685			-2.1490
4	10.8000	19.1858	36.7999	37.3461	0.8746	16.4776			-0.8746
5	2.0000	8.1300	20.1000	26.6365	11.9304	5.7680			0.7719
6									2.7259
7									4.5175
8									5.5616
9									5.7680
10									16.4776
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-7. Larval % combined dead/abnormal normalized to seawater control MWR 11-24-99 11/24/99

Sample ID: MWAT153R1	**Replicates:** 5		**Reference ID:** MWRC213R1	**Replicates:** 5	
Alias: ~~NAS #4235F - X1~~			**Alias:** ~~NAS #4274F - X2~~		
Mean: 12.900	**Transform Mean:** 18.543		**Mean:** 16.160	**Transform Mean:** 20.868	
SD: 9.767	**Transform SD:** 11.705		**SD:** 13.634	**Transform SD:** 13.651	

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	8.2511
SS:	1,293.5509
K:	5.0000
b:	34.4893
Alpha Level:	0.05
Calculated Value:	0.9195
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	8.8799
Test Residual SD:	6.2007
Reference Residual Mean:	9.2070
Reference Residual SD:	8.9672
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.0670
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	-0.2891
Critical Value:	>= 1.397
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	15.9000	23.4998	13.6000	21.6404	4.9567	0.7719			-20.8685
2	25.2000	30.1320	10.3000	18.7195	11.5889	2.1490			-18.5431
3	0.0000	0.0000	0.0000	0.0000	18.5431	20.8685			-3.6566
4	6.6000	14.8864	36.7999	37.3461	3.6566	16.4776			-2.1490
5	16.8000	24.1971	20.1000	26.6365	5.6540	5.7680			0.7719
6									4.9567
7									5.6540
8									5.7680
9									11.5889
10									16.4776
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-7, Larval, % combined dead/abnormal — normalized to seawater control MSR 11-24-99 — 11/24/99

Sample ID: MWAT041R1	**Replicates:** 5	**Reference ID:** MWRC213R1	**Replicates:** 5
Alias: NAS #4245F - X1		**Alias:** NAS #4274F - X2	
Mean: 4.360	**Transform Mean:** 10.224	**Mean:** 16.160	**Transform Mean:** 20.86
SD: 4.122	**Transform SD:** 7.273	**SD:** 13.634	**Transform SD:** 13.651

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	7.0974
SS:	957.0984
K:	5.0000
b:	30.3367
Alpha Level:	0.05
Calculated Value:	0.9615
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	5.5337
Test Residual SD:	3.8240
Reference Residual Mean:	9.2070
Reference Residual SD:	8.9672
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.8425
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	-1.5386
Critical Value:	>= 1.397
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.0000	0.0000	13.6000	21.6404	10.2247	0.7719			-20.8685
2	2.9000	9.8048	10.3000	18.7195	0.4198	2.1490			-10.2247
3	9.4000	17.8540	0.0000	0.0000	7.6293	20.8685			-3.1898
4	8.0000	16.4299	36.7999	37.3461	6.2051	16.4776			-2.1490
5	1.5000	7.0349	20.1000	26.6365	3.1898	5.7680			-0.4198
6									0.7719
7									5.7680
8									6.2051
9									7.6293
10									16.4776
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-7, Larval % combined dead/abnormal — normalized to seawater control TWR 11-24-99 — 11/24/99

Sample ID: MWAT046R1	**Replicates:** 5		**Reference ID:** MWRC213R1	**Replicates:** 5	
Alias: NAS #4246F - X1			**Alias:** NAS #4274F - X2		
Mean: 5.660	**Transform Mean:** 12.809		**Mean:** 16.160	**Transform Mean:** 20.868	
SD: 4.514	**Transform SD:** 5.844		**SD:** 13.634	**Transform SD:** 13.651	

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	6.8138
SS:	882.1400
K:	5.0000
b:	29.0899
Alpha Level:	0.05
Calculated Value:	0.9592
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	4.5020
Test Residual SD:	2.9708
Reference Residual Mean:	9.2070
Reference Residual SD:	8.9672
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.1136
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	-1.2135
Critical Value:	>= 1.397
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	8.0000	16.4299	13.6000	21.6404	3.6207	0.7719			-20.8685
2	4.7000	12.5208	10.3000	18.7195	0.2882	2.1490			-7.0699
3	12.2000	20.4435	0.0000	0.0000	7.6344	20.8685			-3.8970
4	1.0000	5.7391	36.7999	37.3461	7.0699	16.4776			-2.1490
5	2.4000	8.9120	20.1000	26.6365	3.8970	5.7680			-0.2882
6									0.7719
7									3.6207
8									5.7680
9									7.6344
10									16.4776
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-7, Larval % combined dead/abnormal — normalized to seawater control — 11/24/99

Sample ID: MWAS034R1	**Replicates:** 5	**Reference ID:** MWRC213R1	**Replicates:** 5
Alias: NAS #4272F - X1		**Alias:** NAS #4274F - X2	
Mean: 18.780	**Transform Mean:** 24.669	**Mean:** 16.160	**Transform Mean:** 20.86
SD: 13.699	**Transform SD:** 9.746	**SD:** 13.634	**Transform SD:** 13.651

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	7.6964
SS:	1,125.4673
K:	5.0000
b:	32.9576
Alpha Level:	0.05
Calculated Value:	0.9651
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	7.3512
Test Residual SD:	5.2385
Reference Residual Mean:	9.2070
Reference Residual SD:	8.9672
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.3995
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: ArcSin

Experimental Hypothesis
Null: x1 <= x2
Alternate: x1 > x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	0.5067
Critical Value:	>= 1.397
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	21.9000	27.9028	13.6000	21.6404	3.2330	0.7719			-20.8685
2	15.0000	22.7864	10.3000	18.7195	1.8833	2.1490			-8.7756
3	41.0000	39.8150	0.0000	0.0000	15.1452	20.8685			-7.7192
4	7.5000	15.8941	36.7999	37.3461	8.7756	16.4776			-2.1490
5	8.5000	16.9505	20.1000	26.6365	7.7192	5.7680			-1.8833
6									0.7719
7									3.2330
8									5.7680
9									15.1452
10									16.4776
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-7, Larval % combined dead/abnormal normalized to seawater control MSR 11-24-99 11/24/99

Sample ID: MWAS037R1	**Replicates:** 5	**Reference ID:** MWRC213R1	**Replicates:** 5
Alias: NAS #4273F - X1		**Alias:** NAS #4274F - X2	
Mean: 15.100	**Transform Mean:** 19.525	**Mean:** 16.160	**Transform Mean:** 20.868
SD: 14.453	**Transform SD:** 14.431	**SD:** 13.634	**Transform SD:** 13.651

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	9.1148
SS:	1,578.5140
K:	5.0000
b:	38.3138
Alpha Level:	0.05
Calculated Value:	0.9299
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	11.4337
Test Residual SD:	6.6964
Reference Residual Mean:	9.2070
Reference Residual SD:	8.9672
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.4448
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	-0.1511
Critical Value:	>= 1.397
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	19.1000	25.9148	13.6000	21.6404	6.3894	0.7719			-20.8685
2	36.2999	37.0486	10.3000	18.7195	17.5232	2.1490			-19.5254
3	3.3000	10.4663	0.0000	0.0000	9.0590	20.8685			-9.0590
4	0.0000	0.0000	36.7999	37.3461	19.5254	16.4776			-2.1490
5	16.8000	24.1971	20.1000	26.6365	4.6717	5.7680			0.7719
6									4.6717
7									5.7680
8									6.3894
9									16.4776
10									17.5232
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-7, Larval, % combined dead/abnormal — normalized to seawater control MJR 12-6-99 — 12/ 6/99

Sample ID: MWAT042R1	**Replicates:** 5	**Reference ID:** MWRC214R1	**Replicates:** 5
Alias: NAS #4231F - X1		**Alias:** NAS #4275F - X2	
Mean: 13.860	**Transform Mean:** 20.025	**Mean:** 18.300	**Transform Mean:** 24.32
SD: 15.092	**Transform SD:** 11.485	**SD:** 9.676	**Transform SD:** 8.701

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	6.6116
SS:	830.5704
K:	5.0000
b:	28.4381
Alpha Level:	0.05
Calculated Value:	0.9737
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	8.0118
Test Residual SD:	7.1892
Reference Residual Mean:	6.2966
Reference Residual SD:	5.1146
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.4347
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: ArcSin

Experimental Hypothesis
Null: x1 <= x2
Alternate: x1 > x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	-0.6673
Critical Value:	>= 1.397
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	8.0000	16.4299	21.0000	27.2746	3.5957	2.9486			-14.5211
2	2.9000	9.8048	2.9000	9.8048	10.2208	14.5211			-10.2208
3	5.7000	13.8125	15.4000	23.1056	6.2131	1.2204			-6.2131
4	40.1000	39.2898	26.1000	30.7224	19.2641	6.3964			-3.5957
5	12.6000	20.7912	26.1000	30.7224	0.7655	6.3964			-1.2204
6									0.7655
7									2.9486
8									6.3964
9									6.3964
10									19.2641
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-7, Larval % combined dead/abnormal normalized to seawater control MSR 12-6-99 12/ 6/99

Sample ID: MWAT045R1		**Replicates:** 5	**Reference ID:** MWRC214R1		**Replicates:** 5
Alias: NAS #4232F - X1			**Alias:** NAS #4275F - X2		
Mean:	8.900	**Transform Mean:** 13.323	**Mean:**	18.300	**Transform Mean:** 24.326
SD:	9.543	**Transform SD:** 12.901	**SD:**	9.676	**Transform SD:** 8.701

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	7.1403
SS:	968.7134
K:	5.0000
b:	29.3891
Alpha Level:	0.05
Calculated Value:	0.8916
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	10.6587
Test Residual SD:	4.9443
Reference Residual Mean:	6.2966
Reference Residual SD:	5.1146
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.3711
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	-1.5809
Critical Value:	>= 1.397
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.0000	0.0000	21.0000	27.2746	13.3234	2.9486			-14.5211
2	16.3999	23.8891	2.9000	9.8048	10.5656	14.5211			-13.3234
3	0.0000	0.0000	15.4000	23.1056	13.3234	1.2204			-13.3234
4	7.1000	15.4535	26.1000	30.7224	2.1301	6.3964			-1.2204
5	21.0000	27.2746	26.1000	30.7224	13.9511	6.3964			2.1301
6									2.9486
7									6.3964
8									6.3964
9									10.5656
10									13.9511
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Negative values entered as zeroes - MSR 12-6-99

Project Name: P590-7, Larval, % combined dead/abnormal normalized to seawater control Mtk 12-6-99 12/ 6/99

Sample ID: MWAT044R1	**Replicates:** 5	**Reference ID:** MWRC214R1	**Replicates:** 5
Alias: NAS #4233F - X1		**Alias:** NAS #4275F - X2	
Mean: 10.680	**Transform Mean:** 18.205	**Mean:** 18.300	**Transform Mean:** 24.32
SD: 7.422	**Transform SD:** 6.923	**SD:** 9.676	**Transform SD:** 8.701

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	5.1020
SS:	494.5929
K:	5.0000
b:	21.6377
Alpha Level:	0.05
Calculated Value:	0.9466
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	5.3857
Test Residual SD:	3.4163
Reference Residual Mean:	6.2966
Reference Residual SD:	5.1146
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.3311
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic: Student T
Balanced Design: Yes
Transformation: ArcSin

Experimental Hypothesis
Null: x1 <= x2
Alternate: x1 > x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	-1.2307
Critical Value:	>= 1.397
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	7.1000	15.4535	21.0000	27.2746	2.7520	2.9486			-14.5211
2	2.9000	9.8048	2.9000	9.8048	8.4007	14.5211			-8.4007
3	21.9000	27.9028	15.4000	23.1056	9.6971	1.2204			-2.7520
4	14.0000	21.9727	26.1000	30.7224	3.7670	6.3964			-2.3114
5	7.5000	15.8941	26.1000	30.7224	2.3114	6.3964			-1.2204
6									2.9486
7									3.7670
8									6.3964
9									6.3964
10									9.6971
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-7, Larval, % combined dead/abnormal normalized to seawater control MSR 12-6-99 12/ 6/99

Sample ID: MWAT047R1	**Replicates:** 5	**Reference ID:** MWRC214R1	**Replicates:** 5
Alias: NAS #4234F - X1		**Alias:** NAS #4275F - X2	
Mean: 12.760	**Transform Mean:** 20.060	**Mean:** 18.300	**Transform Mean:** 24.326
SD: 6.718	**Transform SD:** 7.104	**SD:** 9.676	**Transform SD:** 8.701

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	5.1541
SS:	504.7474
K:	5.0000
b:	20.1569
Alpha Level:	0.05
Calculated Value:	0.8049
Critical Value:	<= 0.842
Normally Distributed:	No
Override Option:	

Levene's Results:

Test Residual Mean:	5.1220
Test Residual SD:	4.2039
Reference Residual Mean:	6.2966
Reference Residual SD:	5.1146
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.3967
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	ArcSin

Experimental Hypothesis

Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	5,5
Degrees of Freedom:	
Experimental Alpha Level:	0.1
Calculated Value:	6.0000
Critical Value:	>= 20.0
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	15.0000	4.0000	21.0000	8.0000	2.7259	2.9486	1.0000		-14.5211
2	17.3000	6.0000	2.9000	2.0000	4.5175	14.5211	2.0000		-11.9304
3	18.7000	7.0000	15.4000	5.0000	5.5616	1.2204	3.0000		-1.2204
4	10.8000	3.0000	26.1000	9.5000	0.8746	6.3964	4.0000		-0.8746
5	2.0000	1.0000	26.1000	9.5000	11.9304	6.3964	5.0000		2.7259
6							6.0000		2.9486
7							7.0000		4.5175
8							8.0000		5.5616
9							9.5000		6.3964
10							9.5000		6.3964
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-7, Larval, % combined dead/abnormal — normalized to seawater control TKK 12-6-99 — 12/ 6/99

Sample ID: MWAT153R1	**Replicates:** 5	**Reference ID:** MWRC214R1	**Replicates:** 5
Alias: NAS #4235F - X1		**Alias:** NAS #4275F - X2	
Mean: 12.900	**Transform Mean:** 18.543	**Mean:** 18.300	**Transform Mean:** 24.320
SD: 9.767	**Transform SD:** 11.705	**SD:** 9.676	**Transform SD:** 8.701

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	6.6922
SS:	850.9367
K:	5.0000
b:	27.2507
Alpha Level:	0.05
Calculated Value:	0.8726
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	8.8799
Test Residual SD:	6.2007
Reference Residual Mean:	6.2966
Reference Residual SD:	5.1146
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.7186
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	-0.8865
Critical Value:	>= 1.397
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	15.9000	23.4998	21.0000	27.2746	4.9567	2.9486			-18.5431
2	25.2000	30.1320	2.9000	9.8048	11.5889	14.5211			-14.5211
3	0.0000	0.0000	15.4000	23.1056	18.5431	1.2204			-3.6566
4	6.6000	14.8864	26.1000	30.7224	3.6566	6.3964			-1.2204
5	16.8000	24.1971	26.1000	30.7224	5.6540	6.3964			2.9486
6									4.9567
7									5.6540
8									6.3964
9									6.3964
10									11.5889
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Negative number entered as zero — TKK 12-6-99

Project Name: P590-7, Larval, % combined dead/abnormal normalized to seawater control MSR 12-6-99 12/ 6/99

Sample ID:	MWAT041R1	**Replicates:**	5	**Reference ID:**	MWRC214R1	**Replicates:**	5
Alias:	NAS #4245F - X1			**Alias:**	NAS #4275F - X2		
Mean:	4.360	**Transform Mean:**	10.224	**Mean:**	18.300	**Transform Mean:**	24.326
SD:	4.122	**Transform SD:**	7.273	**SD:**	9.676	**Transform SD:**	8.701

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	5.2036
SS:	514.4842
K:	5.0000
b:	21.2779
Alpha Level:	0.05
Calculated Value:	0.8800
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	5.5337
Test Residual SD:	3.8240
Reference Residual Mean:	6.2966
Reference Residual SD:	5.1146
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.2671
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin

Experimental Hypothesis

Null:	x1 <= x2
Alternate:	x1 > x2

Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	-2.7802
Critical Value:	>= 1.397
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.0000	0.0000	21.0000	27.2746	10.2247	2.9486			-14.5211
2	2.9000	9.8048	2.9000	9.8048	0.4198	14.5211			-10.2247
3	9.4000	17.8540	15.4000	23.1056	7.6293	1.2204			-3.1898
4	8.0000	16.4299	26.1000	30.7224	6.2051	6.3964			-1.2204
5	1.5000	7.0349	26.1000	30.7224	3.1898	6.3964			-0.4198
6									2.9486
7									6.2051
8									6.3964
9									6.3964
10									7.6293
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Negative number entered as zero - MSR 12-6-99

Project Name: P590-7, Larval, % combined dead/abnormal — normalized to seawater control MSR 12-6-99 — 12/ 6/99

Sample ID: MWAT046R1	**Replicates:** 5	**Reference ID:** MWRC214R1	**Replicates:** 5
Alias: NAS #4246F - X1		**Alias:** NAS #4275F - X2	
Mean: 5.660	**Transform Mean:** 12.809	**Mean:** 18.300	**Transform Mean:** 24.3[illegible]
SD: 4.514	**Transform SD:** 5.844	**SD:** 9.676	**Transform SD:** 8.701

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	4.8096
SS:	439.5258
K:	5.0000
b:	20.0724
Alpha Level:	0.05
Calculated Value:	0.9166
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	4.5020
Test Residual SD:	2.9708
Reference Residual Mean:	6.2966
Reference Residual SD:	5.1146
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.6784
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	-2.4567
Critical Value:	>= 1.397
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	8.0000	16.4299	21.0000	27.2746	3.6207	2.9486			-14.5211
2	4.7000	12.5208	2.9000	9.8048	0.2882	14.5211			-7.0699
3	12.2000	20.4435	15.4000	23.1056	7.6344	1.2204			-3.8970
4	1.0000	5.7391	26.1000	30.7224	7.0699	6.3964			-1.2204
5	2.4000	8.9120	26.1000	30.7224	3.8970	6.3964			-0.2882
6									2.9486
7									3.6207
8									6.3964
9									6.3964
10									7.6344
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-7, Larval, % combined dead/abnormal

normalized to seawater control MdR 12-6-99

12/ 6/99

Sample ID: MWAS034R1	**Replicates:** 5	**Reference ID:** MWRC214R1	**Replicates:** 5
Alias: NAS #4272F - X1		**Alias:** NAS #4275F - X2	
Mean: 18.780	**Transform Mean:** 24.669	**Mean:** 18.300	**Transform Mean:** 24.326
SD: 13.699	**Transform SD:** 9.746	**SD:** 9.676	**Transform SD:** 8.701

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	5.9949
SS:	682.8531
K:	5.0000
b:	25.8334
Alpha Level:	0.05
Calculated Value:	0.9773
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	7.3512
Test Residual SD:	5.2385
Reference Residual Mean:	6.2966
Reference Residual SD:	5.1146
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.3221
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	0.0588
Critical Value:	>= 1.397
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	21.9000	27.9028	21.0000	27.2746	3.2330	2.9486			-14.5211
2	15.0000	22.7864	2.9000	9.8048	1.8833	14.5211			-8.7756
3	41.0000	39.8150	15.4000	23.1056	15.1452	1.2204			-7.7192
4	7.5000	15.8941	26.1000	30.7224	8.7756	6.3964			-1.8833
5	8.5000	16.9505	26.1000	30.7224	7.7192	6.3964			-1.2204
6									2.9486
7									3.2330
8									6.3964
9									6.3964
10									15.1452
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Project Name: P590-7, Larval % combined dead/abnormal — normalized to seawater control MSR 12-6-99 — 12/6/99

Sample ID: MWAS037R1	**Replicates:** 5	**Reference ID:** MWRC214R1	**Replicates:** 5
Alias: NAS #4273F - X1		**Alias:** NAS #4275F - X2	
Mean: 15.100	**Transform Mean:** 19.525	**Mean:** 18.300	**Transform Mean:** 24.32
SD: 14.453	**Transform SD:** 14.431	**SD:** 9.676	**Transform SD:** 8.701

Shipiro-Wilk Results:

Residual Mean:	0.0000
Residual SD:	7.7320
SS:	1,135.8998
K:	5.0000
b:	32.4554
Alpha Level:	0.05
Calculated Value:	0.9273
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	11.4337
Test Residual SD:	6.6964
Reference Residual Mean:	6.2966
Reference Residual SD:	5.1146
Degrees of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.3632
Critical Value:	>= 1.86
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student T
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Mann-Whitney N1, N2:	N/A
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	-0.6370
Critical Value:	>= 1.397
Failed to Reject Null Hypo:	Yes
Power:	
Significant Diff for Power:	

Replicate Number	Test Data	Transformed Test Data	Reference Data	Transformed Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	19.1000	25.9148	21.0000	27.2746	6.3894	2.9486			-19.5254
2	36.2999	37.0486	2.9000	9.8048	17.5232	14.5211			-14.5211
3	3.3000	10.4663	15.4000	23.1056	9.0590	1.2204			-9.0590
4	0.0000	0.0000	26.1000	30.7224	19.5254	6.3964			-1.2204
5	16.8000	24.1971	26.1000	30.7224	4.6717	6.3964			2.9486
6									4.6717
7									6.3894
8									6.3964
9									6.3964
10									17.5232
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Negative number entered as zero - MSR 12-6-99

Chain of Custody Record & Laboratory Analysis Request

Date: 9/21/99

Page 1 of 1

Number of coolers: 1

ANALYTICAL RESOURCES INCORPORATED
333 Ninth Ave. North
Seattle, WA 98109-5187
(206) 621-6490
(206) 621-7523 (FAX)

Client: Foster Wheeler Phone #: 425 688 3700

Client Contact: Gary Braun

Client Project ID: Middle Waterway IB

Samplers: GB, BJ, PS, KL, BMcD

	Sample ID	Date	Time	Matx	No Cont	Lab ID	Analysis Required: BIOASSAYS Amphipod	Larval	Neanthes						Notes/Comments
1	MWAT042 R1	9/21	1225	sed	5		2	2	1			NAS # 4231F			Cool to 4°C
2	MWAT045 R1	9/21	1240	Sed	5		2	2	1			NAS # 4232F			" " "
3															
4															
5															
6															
7	all intact; 4.0°C					MR 9-23-99									
8															

Comments/Special Instructions:

Relinquished by: (Signature)	Relinquished by: (Signature)	Relinquished by: (Signature)
Printed Name: Bruce McDonald	Printed Name: GARY M BRAUN	Printed Name:
Company: Anchor	Company: FWENC	Company:
Date: 9/21/99 Time: 1400	Date: 9/22/99 Time: 5:00	Date: Time:
Received by: (Signature)	**Received by: (Signature)**	**Received by: (Signature)**
Printed Name: GARY M BRAUN	Printed Name: Michele S. Redmond	Printed Name:
Company: FWENC	Company: NAS	Company:
Date: 9/22/99 Time: 5:00	Date: 9-23-99 Time: 13:30	Date: Time:

FedEx. USA Airbill Tracking Number 4185416675

FedEx Retrieval Copy

1161148 00155/00500

1 From

Date 9/22/99 Sender's FedEx Account Number 1776-5771-9

Sender's Name Gary Braun Phone (425) 688-3700

Dept/Floor/Suite/Room

Company FOSTER WHEELER ENVIRONMENTAL

Address 10900 NE 8TH ST STE 1300

City BELLEVUE State WA Zip 98004

2 Your Internal Billing Reference Information

3 To

Recipient's Name Dick Caldwell Phone (541) 265-7225

Dept/Floor/Suite/Room

Company Northwest Aquatics

Address 3514 Yaquina Bay

(To "HOLD" at FedEx location, print FedEx address here)

City Newport State OR Zip 97365

For HOLD at FedEx Location check here

1 [ ] Hold Weekday (Not available with FedEx First Overnight) 3 [ ] Hold Saturday (Not available at all locations) (Not available with FedEx First Overnight or FedEx Standard Overnight)

For Saturday Delivery check here

3 [ ] (Extra Charge. Not available to all locations) (Not available with FedEx First Overnight or FedEx Standard Overnight)

4 1 8 5 4 1 6 6 7 5

4a Express Package Service *Packages under 150 lbs.* Delivery commitment may be later in some areas.

1 [ ] FedEx Priority Overnight 5 [X] FedEx Standard Overnight 3 [ ] FedEx 2Day* (Second business day)

6 [ ] NEW FedEx First Overnight

*FedEx Letter Rate not available. Minimum charge: One-pound FedEx 2Day rate

4b Express Freight Service *Packages over 150 lbs.* Delivery commitment may be later in some areas.

1 [ ] FedEx Overnight Freight 3 [ ] FedEx 2Day Freight 3 [ ] FedEx Express Saver Freight

(Call for details on the contents of freight products.)

5 Packaging 1 [ ] FedEx Letter 2 [ ] FedEx Pak 3 [ ] FedEx Box 4 [ ] FedEx Tube 1 [X] Other or Pkg

6 Special Handling

Does this shipment contain dangerous goods? 4 [ ] Yes

1 [ ] Dry Ice 6 [ ] Cargo Aircraft Only

7 Payment [ ] Obtain Recipient FedEx Account No.

Bill to 1 [X] Sender 2 [ ] Recipient 3 [ ] Third Party 4 [ ] Credit Card 5 [ ] Cash/Check

FedEx Account No.

Credit Card No. Exp Date

Total Packages 1 Total Weight 72 Total Charges $

When declaring a value higher than $100 per shipment, you pay an additional charge. See SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY section for further information.

8 Release Signature

Your signature and agree to deliver this shipment without obtaining a signature and agrees to indemnify Fedex Express from any resulting claims.

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[ ] Check here if package was dropped off

WCSL 0187 Rev. Date 8/98 PART #147958 ©1994-98 FedEx PRINTED IN U.S.A.

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MultiChem ANALYTICAL SERVICES

560 Naches Ave. SW Suite [illegible] Renton, WA 98055
(800) 609-0580 • (425) 228-8[illegible] • FAX (425) 228-8336

[redacted]

DA[illegible] 9/22/99
PAGE: 1 of 1

COMPANY: Foster Wheeler
ADDRESS: 10900 NE 8th St, Ste 1300
Bellevue WA 98004

PHONE: (425) 688-3700 FAX (425) 688-3952
PROJ. MGR / CONTACT: Gary Braun
PROJECT NUMBER: 1699.0014.0000
PROJECT NAME: Middle WW 1B
DISPOSAL: ☐ MAS ☐ HOLD ☐ RETURN

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	FUELS: TPH-HCID	BETX / TPH-G BETX / AK101	BETX (by 8021)	TPH-G	TPH-D TPHD-extended	8015 modified	418.1	413.2	AK-GRO AK101	AK-DRO AK102 / 103	ORGANIC COMPOUNDS: 8240 / 8260 GCMS Volatiles	8270 GCMS Semivolatiles	8081 Pesticides / PCBs	PCB only (by 8081) STD / LL	8021 Halogenated VOCs	8021 Aromatic VOCs	8310 HPLC PAHs	8041 Phenols	8151 OC Herbicides	METALS: Metals indicate below*	Total / Dissolved Lead	RCRA Metals (8)	PP Metals (13)	TAL Metals (23)	TCLP: TCLP 8240 (ZHE)	TCLP 8270 Semivolatiles	TCLP 8081 Pesticides	TCLP 8151 Herbicides	TCLP Metals	OTHER: Amphipod	Larval	~~Neanthes~~ Bioassay	Neanthes		Total # of Containers
MWAT153R1	9/22	1035	Sed			NAS # 4233F																												2	2				4
MWAT047R1	9/22	1150	Sed			NAS # 4234F																												2	2		1		5
MWAT044R1	9/22	0910	Sed			NAS # 4233F																												2	2				4

All intact; 4.0°C MSR 9-23-99

SAMPLE RECEIPT			TAT:
TOTAL # OF CONTAINERS	☐ YES	☐ NO	☐ 24 HOURS
CUSTODY SEALS PRESENT?	☐ YES	☐ NO	☐ 48 HOURS
CUSTODY SEALS INTACT?	☐ YES	☐ NO	☐ 72 HOURS
RECEIVED COLD?	☐ YES	☐ NO	☐ 7 DAYS
RECEIVED INTACT?	☐ YES	☐ NO	☐ SP
RECEIVED VIA:			☒ STANDARD

SPECIAL INSTRUCTIONS/COMMENTS:

*METALS NEEDED:

RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:
SIGNATURE: Gary M Braun	SIGNATURE:	SIGNATURE:
PRINT NAME: GARY M BRAUN	PRINT NAME:	PRINT NAME:
DATE: 9/22/99 TIME: 5:00 pm	DATE: TIME:	DATE: TIME:
COMPANY: FWENC	COMPANY:	COMPANY:

RECEIVED BY:	RECEIVED BY:	RECEIVED BY:
SIGNATURE: Michele S. Redmond	SIGNATURE:	SIGNATURE:
PRINT NAME: Michele S. Redmond	PRINT NAME:	PRINT NAME:
DATE: 9-23-99 TIME: 13:30	DATE: TIME:	DATE: TIME:
COMPANY: NAS	COMPANY:	COMPANY:

MAS USE ONLY SUBC/INTRAC FLAB PO #:

-37-

FedEx. USA Airbill

Tracking Number **4185416664**

FedEx Retrieval Copy

1161148 00156/00500

1 From

Date 9/22/99 Sender's FedEx Account Number 1776-5171-9

Sender's Name Gary Braun Phone (425) 688-3700

Dept/Floor/Suite/Room

Company FOSTER WHEELER ENVIRONMENTAL

Address 10900 NE 8TH ST STE 1300

City BELLEVUE State WA Zip 98004

2 Your Internal Billing Reference Information

3 To

Recipient's Name Dick Caldwell Phone (541) 265-7225

Dept/Floor/Suite/Room

Company Northwest Aquatics

Address 3414 Yaquina Bay Rd

If "HOLD" at FedEx location, print FedEx address here

City Newport State OR Zip 97365

For HOLD at FedEx Location check here

1 ☐ Hold Weekday (Not available with FedEx First Overnight)

31 ☐ Hold Saturday (Not available at all locations) (Not available with FedEx First Overnight or FedEx Standard Overnight)

For Saturday Delivery check here

3 ☐ (Extra Charge. Not available for some ZIP codes. Not available with FedEx First Overnight or FedEx Standard Overnight)

4a Express Package Service *Packages under 150 lbs.* Delivery commitment may be later in some areas.

1 FedEx Priority Overnight 2 X FedEx Standard Overnight 3 FedEx 2Day* (Second business day)

5 NEW FedEx First Overnight (Earliest next business morning delivery) (Higher rates apply) FedEx Letter Rate not available. Minimum charge. Not guaranteed FedEx 2Day rate.

4b Express Freight Service *Packages over 150 lbs.* Delivery commitment may be later in some areas.

20 FedEx Overnight Freight 21 FedEx 2Day Freight 22 FedEx Express Saver Freight (Third business day. Service varies by zip code and distance)

For hazardous goods (including dry ice), dangerous goods and restricted articles (including certain perishables, batteries, drugs, explosives), see the current FedEx Service Guide or call your FedEx location for assistance.

5 Packaging 1 FedEx Letter 2 FedEx Pak 3 FedEx Box 4 FedEx Tube 5 ☐ Other Pkg.

Declared value limit $100

6 Special Handling

Does this shipment contain dangerous goods? 1 No 2 ☐ Yes (Shipper's Declaration not required)

15 Dry Ice (Dry Ice, UN 1845, x kg) 16 Cargo Aircraft Only

7 Payment ☐ Obtain Recipient FedEx Account No.

Bill to: X 1 Sender 2 Recipient 3 Third Party 4 Credit Card 5 ☐ Cash/Check

FedEx Account No. Exp. Date

Credit Card No. Exp. Date

Total Packages 1 Total Weight 78 Total Charges $

LIMITATIONS, DECLARED VALUE AND LIMIT OF LIABILITY. See reverse for SERVICE Credit Card Auth.

8 Release Signature

By signing you authorize delivery of this shipment without obtaining a signature and agree to indemnify and hold harmless FedEx from any resulting claims.

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☐ Check here if you have additional FedEx shipments.

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4185416664

1-88-

Chain of Custody Record
Request for Analysis

FOSTER WHEELER ENVIRONMENTAL CORPORATION
10900 NE 8th Street • Bellevue, WA 98004
(425) 688-3700 • Fax (425) 688-3952

Page ____ of ____ Lab. Ref. No. ____

Project Name: Middle WW 1B
Project Address: Tacoma, WA
FW Project No.: 1699.00144.0000

Sampling Date: 9/23/99
Shipping Date:
Shipping Ref.:

Analysis Laboratory: Northwest Aquatics
Laboratory Contact: Dick Caldwell
P.O. No.:
Reports to be Sent to:
Address/Phone No.: 3814 Yaquina Bay Rd; Newport, OR 97365

Sampler(s): *(printed name)*
Sampler(s): *(signature)*
Special Instructions:

Hazard ID:
- ☐ Nonhazardous
- ☐ **Hazardous:**
  - ☐ Reactive
  - ☐ Toxic
  - ☐ Flammable
  - ☐ Irritant
  - ☐ Infectious
  - ☐ Radioactive

Sample Disposal Instructions:
- ☐ Lab disposal
- ☐ Return to FWENC
- ☐ Hold for pickup (will call)

ANALYSES REQUEST (circle appropriate method number)

SAMPLE IDENTIFICATION	TIME COLLECTED	NO. OF CONTAINERS, SIZE & TYPE	PRESERVATIVE	MATRIX: Soil	MATRIX: Water	SAMPLE TYPE: Composite	SAMPLE TYPE: Grab	Method Standard (EPA # ____)	TCLP (1311) ____ Other ____	CLP Data Pkg.; Other ____	Halogenated Volatiles 8010B, 8121, 601, 502.1, CLP	Aromatic Volatiles 8020A, 8021B, 602, 502.2, 503.1, CLP	BETX Only 8020A, 602, CLP	GC/MS VOAs 8260B, 624, 524.1, 524.2, CLP	GC/MS SVOAs 8270C, 625, 525, CLP	Pesticides (Organochlorine) 8081A, 608, 505, CLP	PCBs 8082 (Aroclors, Full Congeners)	HPLC PNA/PAHs 8310,610	Organophosphorus Comps. (Pest. & Herbs) 8141A	Chlorinated Herbicides 8151A	Dioxins 8290, CLP, 1613	Nitroaromatics and Nitramines(Ordnance) 8330	TPH-HCID AK, NWHCID	TPH-Gx AK101, NWTPHGx	TPH-Dx AK102,103, NWTPHDx	Lead 6010, 7420, 7421	Priority Poll. Metals (13) 6010B & 7000 Series, 6020 CLP	TCL Metals (23) 6010B & 7000 Series, 6020 CLP	TCLP 1311 (metals, VOAs, SVOAs, Pest., Herb.)	Inorganic Anions (Cl, F, No_3, No_2, PO_4, SO_4) 300.__	Total Organic Carbon (TOC) 9060.____	BIOASSAY	REMARKS
[illegible]	[illegible]	[illegible] glass		Sediment						Amphipod and larval and Neanthes																					5	NAS [illegible]F
MW BT 041 R1	1030	32 oz glass		Sediment						Amphipod and larval																					4	NAS 4245F
One of the four jars labelled "MWBT041R1", [illegible] MWAT041R1" - MIRedmond 9-25-99																																	
Correct sample number on MWAT041R1 for all jars, as per client 9-27-99 MIR																																	

Turnaround Time:
- ☐ Standard
- ☐ 1 Week
- ☐ 4 Work Day
- ☐ 3 Work Day
- ☐ 2 Work Day
- ☐ 24 Hour

Sample Receipt:
Total # Containers Recvd.: ____
COC Seals Present? ____
COC Seals Intact? ____
Received Cold? ____
Received Intact? ____
Received Via: ____

Relinquished by: *(signature)*	Relinquished by: *(signature)*	Relinquished by: *(signature)*	Relinquished by: *(signature)*
Gary M Brown		Total Organic Carbon (TOC 9060.____	
Date: 9/23/99 Time: 6:10	Date: Time:	Date: Time:	Date: Time:
Received by: *(signature)*	**Received by:** *(signature)*	**Received by:** *(signature)*	**Received by:** *(signature)*
			[signature]
Date: Time:	Date: Time:	Date: Time:	Date: 9-25-99 Time: 1000

Rev 7/25/99

-39-

Gary Braun [gbraun@fwenc.com]
Monday, September 27, 1999 8:48 AM
Michele
Re: samples received

[illegible]trhe note. The correct sample number should be MWAT041R1 for [illegible]rs you received. We will be collecting two more test stations on [illegible] additional reference stations (Carr Inlet) for Middle Waterway [illegible]ay. These sample will likely be shipped out Monday night but it [illegible]d slip
[illegible]Tuesday. I'll keep you posted.
[illegible]

"Michele Redmond" <mredmond@nwaquatic.com> on 09/25/99 01:18:46 PM

Please respond to mredmond@nwaquatic.com

To: Gary Braun/Bellevue/FWENC@FWENC
cc:

Subject: samples received

Hi Gary,

We received one cooler of samples today (Sat.), with samples MWAT046R1 and
MWBT041R1. Everything was cold and intact.
There was one discrepancy: the chain of custody lists sample MWBT041R1, and
one of the jars was labelled that way, but the other three were labelled
MWAT041R1. When you get a chance, please send documentation as to which is
the correct sample number. And of course, let us know if for some reason we
have the wrong ones!

Hope you have good weather for your field work!

Michele S. Redmond
Northwestern Aquatic Sciences
P.O. Box 1437
Newport, OR 97365
541-265-7225
541-265-2799 fax
e-mail: mredmond@nwaquatic.com

CUSTODY SEAL

Person Collecting Sample Gary W Braun (Signature) Sample No.

Date Collected 9/24/99 Time Collected 1530

UPS Next Day Air
UPS Worldwide Express
Shipping Document

WEIGHT | WEIGHT 58 | DIMENSIONAL WEIGHT 58 | 403

UPS DRIVER
- RECORD 6-DIGIT UPS SHIPPER NUMBER FROM BOX 1.
- IF BOX 1 IS BLANK OR THE NUMBER IS MORE THAN 6 DIGITS, RECORD THE NUMBER FROM BOX 2.

[X] NEXT DAY AIR [ ] WORLDWIDE EXPRESS (INTERNATIONAL) [ ] DOCUMENTS ONLY

[ ] SATURDAY PICKUP [X] SATURDAY DELIVERY

SHIPMENT FROM

UPS SHIPPER NO. 1 719-08W 2

REFERENCE NUMBER

GARY BRAUN TELEPHONE 425 668 3840

FWENC

10700 NE 8th St

Bellevue WA 98004

DELIVERY TO

Dick Caldwell TELEPHONE (541) 265-7225

NW Aquatics

3814 Yaquina Bay Rd

Newport, OR 97365

J033 277 407 5 DELIVERY 1

J033 277 407 5 EXPORT 2

J033 277 407 5 EXPORT 1

[ ] BILL RECEIVER

ups **UPS Next Day Air** EXTREMELY URGENT 1

J033 277 407 5 DELIVERY 2

J033 277 407 5

DATE OF SHIPMENT 9/24/99

010191120 1/99 S United Parcel Service, Louisville, KY

MultiChem ANALYTICAL SERVICES — 550 Nichols Ave. SW Suite 101 Renton, WA 98055 (800) 695-0330 ◇ (425) 228-8335 ◇ FAX (425) 228-8336

[redacted]

DATE: 9/28
PAGE: 1 of 1

COMPANY: Foster Wheeler
ADDRESS: 10900 NE 4th St Ste 300
Bellevue WA 98004
PHONE: (425) 688 3700 FX: (425) 688 3952
PROJ. MGR./CONTACT: Gary Braun
PROJECT NUMBER: 1697.034.0000
PROJECT NAME: Middle MW 16
DISPOSAL: ☐ HOLD ☐ RETURN

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	FUELS: TPH-HCID	BETX / TPH-G BETX / AK101	BETX (by 8021)	TPH-G	TPH-D TPHD-extended	8015 modified	418.1	413.2	AK-GRO AK101	AK-DRO AK102 / 103	ORGANIC COMPOUNDS: 8240 / 8260 GCMS Volatiles	8270 GCMS Semivolatiles	8081 Pesticides / PCBs	PCB only (by 8081) STD / LL	8021 Halogenated VOCs	8021 Aromatic VOCs	8310 HPLC PAHs	8041 Phenols	8151 OC Herbicides	METALS: Metals indicate below*	Total / Dissolved Lead	RCRA Metals (8)	PP Metals (13)	TAL Metals (23)	TCLP: TCLP 8240 (ZHE)	TCLP 8270 Semivolatiles	TCLP 8081 Pesticides	TCLP 8151 Herbicides	TCLP Metals	OTHER: Bottles Amber/Lead Vials Vials	Total # of Containers
MW16SOBTR1	9/27	1035	Sed	NAS #42732F																													2 2 1	5
MW16C37R1	9/27	1009	Sed	NAS #42738F																													2 2 1	5
MW16C33R1	9/27	1030	Sed	NAS #42734F																													2 2 1	5
MW16C21R1	9/27	0900	Sed	NAS #42735F																													2 2 1	5
samples placed under N2 upon receipt																																			
All intact; 9.0°C MLL																																			
9-29-99																																			

" MW16SOBTR1 " is correct as per client 9-30-99 MLL

-42-

TAT:
☐ 24 HOURS
☐ 48 HOURS
☐ 72 HOURS
☐ 7 DAYS
☐ SP
☐ STANDARD

SPECIAL INSTRUCTIONS/COMMENTS:

*METALS NE [illegible]:

RELINQUISHED BY	RECEIVED BY	RELINQUISHED BY	RECEIVED BY
SIGNATURE: Gary M Braun	SIGNATURE:	SIGNATURE:	SIGNATURE:
PRINT NAME: GARY M BRAUN	PRINT NAME:	PRINT NAME:	PRINT NAME:
DATE: 9/28/99 TIME: 1400	DATE: TIME:	DATE: TIME:	DATE: TIME:
COMPANY: FWENC	COMPANY:	COMPANY:	COMPANY:
SIGNATURE: Michele S. Redmond	SIGNATURE:	SIGNATURE:	SIGNATURE:
PRINT NAME: Michele S. Redmond	PRINT NAME:	PRINT NAME:	PRINT NAME:
DATE: 9-28-99 TIME: 14:30	DATE: TIME:	DATE: TIME:	DATE: TIME:
COMPANY: NAS	COMPANY:	COMPANY:	COMPANY:

Michele

From: Gary Braun [gbraun@fwenc.com]
Sent: Thursday, September 30, 1999 9:06 AM
To: Michele
Subject: Re: samples

Glad to hear all samples arrived. Sample Nmber discrepency should be resolved
by using the sample number on the bottles; The "S" was inadvertantly left out of
the name. Hope this helps, if you need any other information, call or email me.
I should be out of the field by Monday.
Gary

"Michele Redmond" <mredmond@nwaquatic.com> on 09/29/99 05:06:45 PM

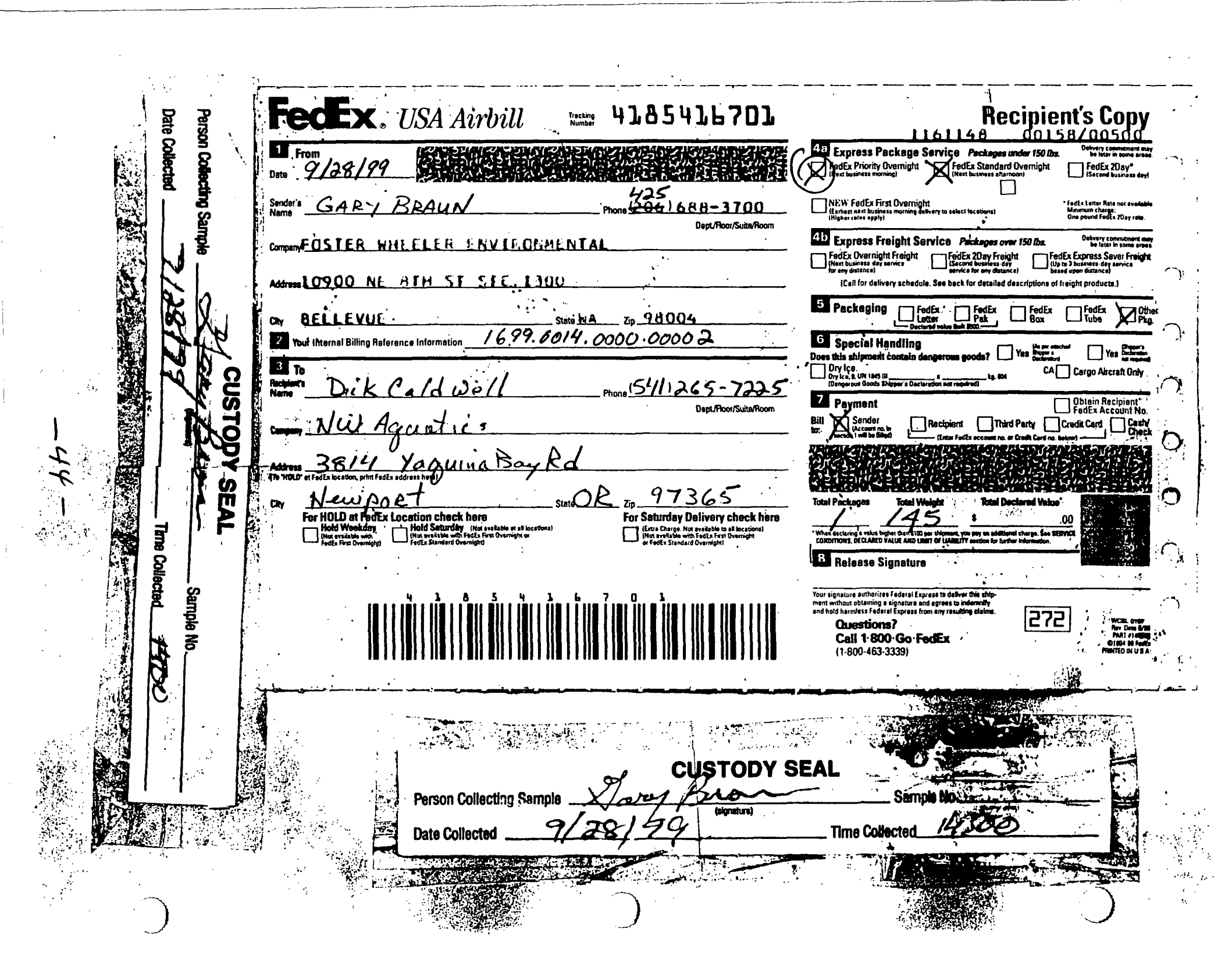
Please respond to mredmond@nwaquatic.com

To: Gary Braun/Bellevue/FWENC@FWENC
cc:

Subject: samples

Last batch of samples received, all intact. Sample number discrepancy: chain-of-custody says "MWA037R1", but jars are labelled "MWAS037R1". Please
advise.

Michele S. Redmond
Northwestern Aquatic Sciences
P.O. Box 1437
Newport, OR 97365
541-265-7225
541-265-2799 fax
e-mail: mredmond@nwaquatic.com



FedEx USA Airbill — Tracking Number 4185416701 — **Recipient's Copy**

1161148 00158/00500

1 From

Date 9/28/99 [redacted]

Sender's Name GARY BRAUN — Phone ~~(206)~~ 425 688-3700 — Dept./Floor/Suite/Room

Company FOSTER WHEELER ENVIRONMENTAL

Address 10900 NE 8TH ST SEC. 1300

City BELLEVUE — State WA — Zip 98004

2 Your Internal Billing Reference Information 1699.0014.0000.00002

3 To

Recipient's Name Dick Caldwell — Phone (541) 265-7225 — Dept./Floor/Suite/Room

Company NW Aquatics

Address 3814 Yaquina Bay Rd
(To "HOLD" at FedEx location, print FedEx address here)

City Newport — State OR — Zip 97365

For HOLD at FedEx Location check here
- [ ] Hold Weekday (Not available with FedEx First Overnight)
- [ ] Hold Saturday (Not available at all locations) (Not available with FedEx First Overnight or FedEx Standard Overnight)

For Saturday Delivery check here
- [ ] (Extra Charge. Not available to all locations) (Not available with FedEx First Overnight or FedEx Standard Overnight)

4 1 8 5 4 1 6 7 0 1

4a Express Package Service *Packages under 150 lbs.* — Delivery commitment may be later in some areas.
- [x] FedEx Priority Overnight (Next business morning)
- [x] FedEx Standard Overnight (Next business afternoon)
- [ ] FedEx 2Day* (Second business day)
- [ ] NEW FedEx First Overnight (Earliest next business morning delivery to select locations) (Higher rates apply)

* FedEx Letter Rate not available. Minimum charge: One pound FedEx 2Day rate.

4b Express Freight Service *Packages over 150 lbs.* — Delivery commitment may be later in some areas.
- [ ] FedEx Overnight Freight (Next business day service for any distance)
- [ ] FedEx 2Day Freight (Second business day service for any distance)
- [ ] FedEx Express Saver Freight (Up to 3 business day service based upon distance)

(Call for delivery schedule. See back for detailed descriptions of freight products.)

5 Packaging
- [ ] FedEx Letter
- [ ] FedEx Pak (Declared value limit $500)
- [ ] FedEx Box
- [ ] FedEx Tube
- [x] Other Pkg.

6 Special Handling

Does this shipment contain dangerous goods?
- [ ] Yes (As per attached Shipper's Declaration)
- [ ] Yes (Shipper's Declaration not required)
- [ ] Dry Ice. Dry Ice, 9, UN 1845 III ____ x ____ kg. 904 (Dangerous Goods Shipper's Declaration not required)
- CA [ ] Cargo Aircraft Only

7 Payment
- [ ] Obtain Recipient* FedEx Account No.

Bill to:
- [x] Sender (Account no. in section 1 will be billed)
- [ ] Recipient
- [ ] Third Party
- [ ] Credit Card
- [ ] Cash/Check

(Enter FedEx account no. or Credit Card no. below)

[redacted]

Total Packages	Total Weight	Total Declared Value*
1	145	$ .00

* When declaring a value higher than $100 per shipment, you pay an additional charge. See SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY section for further information.

8 Release Signature

Your signature authorizes Federal Express to deliver this shipment without obtaining a signature and agrees to indemnify and hold harmless Federal Express from any resulting claims.

Questions?
Call 1·800·Go·FedEx
(1-800-463-3339)

272

WCSL 0197 Rev. Date 5/98 PART #1[illegible] ©1994-98 FedEx PRINTED IN U.S.A.

CUSTODY SEAL

Person Collecting Sample Gary Braun (signature) — Sample No. ____

Date Collected 9/28/99 — Time Collected 14:00

CUSTODY SEAL

Person Collecting Sample Gary Braun (signature) — Sample No. ____

Date Collected 9/28/99 — Time Collected 14:00

-44-

APPENDIX III

RAW DATA – REFERENCE TOXICANT TEST

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-SP/DE/WC2
ECHINODERM LARVAE TEST BASED ON EPA/600/R-95/136

Test No. 999-1086 Client QC TEST Investigator reviewed pgs. 1-9 MSR 12-9-99

STUDY MANAGEMENT

Client: QC TEST
Client's Study Monitor: NA
Testing Laboratory: Northwestern Aquatic Sciences
Test Location: Newport Laboratory
Laboratory's Study Personnel:
Proj. Man./Study Dir. / G.A. Buhler
QA Officer L.K. Nemeth
1. Erin Coffey 2. Robert Singleton RMS
3. M.S. Redmond MSR 4.
Study Schedule:
Test Beginning: 10-8-99 1530 Test Ending: 10/11/99 10:00

TEST MATERIAL

Description: Cadmium as: $CdCl_2 \cdot 2\frac{1}{2} H_2O$ Mallinkrodt Lot#TNZ 1.0 mg/mL stock prod: 7-24-99

NAS Sample No.:				
Date of Collection:				
Date of Receipt:				
Temperature (°C):				
Conductivity (umhos/cm):				
pH:				
Hardness (mg/L):				
Alkalinity (mg/L):				
Salinity (ppt):				
Dissolved oxygen (mg/L):				
:				

DILUTION WATER

Source: Yaquina Bay, OR
Date of Collection: 10-8-99 Salinity (ppt) 30.0 pH 7.7
Treatments: Filtered to 0.40 um, aerated,

TEST ORGANISMS

Species: Dendraster excentricus Date Purchased: 10-7-99
Source: Manns Inc, Long Beach, CA
Acclimation Data: None spawned from box

Date	Temp (°C)	DO (mg/L)	pH	Sal (ppt)	Comments
Mean					
S.D.					
(N)					

Holding and Acclimation Description:

6/97

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-SP/DE/WC2
ECHINODERM LARVAE TEST BASED ON EPA/600/R-95/136

Test No. 999-1086 Client QC TEST Investigator _____

SPAWNING AND GAMETE HANDLING

Spawning: Initial 1700 AM/PM, Final 1400 AM/PM. Fertilization 1430 AM/PM
Number of Organisms Used: females 63 ; males 4
Egg Dilution (1 ml diluted to 100 ml):
Count/ml of dilution: 1. 29 ; 2. 31 ; 3. 32 ; Mean 30.7
DF (mean x 100/2500) = 1.2

TEST PROCEDURES AND CONDITIONS

Test concentrations: (50% series recommended) 30, 15, 8, 4, 2, 1, 0 mg/L

Test chambers (30mL vials): 30 mL vials
Replicates/treatment: (4) 4
Test water changes: None
Feeding: None
Salinity: 34 ± 2 ppt; 1 um filtered.
30 ± 2 ppt for WA State
Acceptability: ≥80% norm. controls
Beaker placement: Stratified randomization

Test volume (10 mL): 10 mL
Zero Times: 6, with CV <15%
Aeration during test: None
Photoperiod: 16:8, L:D
Temperature: 15 ± 1°C
Duration: 72 ± 2 hr

Randomization chart:

A	15	2	Ø	4	30	8	1			
B	2	Ø	8	1	30	4	15			
C	30	2	15	Ø	1	8	4			
D	15	4	Ø	2	8	30	1			

PREPARATION OF TEST SOLUTIONS

This test uses a brine control ____; a salinity control ____
If a brine control is used, follow SOP# G-3 to prepare test solutions
Date of brine prep'n: _____; Brine salinity (ppt): _____
Source of Seawater: _____

$$VB = VE \frac{(TS - SE)}{(SB - TS)} = VE \frac{(\quad - \quad)}{(\quad - \quad)} = VE (\quad)$$

In making up either a brine control or a salinity control, use salinity adjusted deionized water in place of the effluent.

Test Conc (%)(mg/L)	Effluent (ml/100 ml)	Brine (ml/100 ml)	Dilution Water (ml/100 ml)
30	3.0	3.0	97.0
15	1.5	1.5	98.5
8	0.80	0.80	99.2
4	0.40	0.40	99.6
2	0.20	0.20	99.8
1	0.10	0.10	99.9
Ø	Ø	Ø	100.0

10.8.99 M

NORTHWESTERN AQUATIC SCIENCES — PROTOCOL NO. NAS-XXX-SP/DE/WC2

ECHINODERM LARVAE TEST BASED ON EPA/600/R-95/136

Test No. 999-1086 Client QC TEST Investigator _____

WATER QUALITY DATA

10.8.99 — 0-Hour — 10-11-99 — 72-Hour

Conc. (mg/L)	0-Hour Temp. (°C)	0-Hour DO (mg/L)	0-Hour Sal. (ppt)	0-Hour pH	72-Hour Temp. (°C)	72-Hour DO (mg/L)	72-Hour Sal. (ppt)	72-Hour pH
30	15.4	7.8	30.0	7.8	14.8	8.2	30.0	8.1
15	15.4	7.8	30.5	7.8	14.9	8.2	30.0	8.1
8	15.4	7.8	31.0	7.8	14.9	8.2	30.0	8.1
4	15.3	7.8	30.5	7.8	14.8	8.2	30.5	8.1
2	15.4	7.8	31.0	7.8	14.8	8.2	30.5	8.1
1	15.4	8.0	31.0	7.7	14.9	8.2	30.5	8.1
Control	15.4	8.2	30.5	7.7	14.9	8.5	30.0	8.1
Brine Cont.	—	—	—	—	—	—	—	—

WATER QUALITY:

	Mean	S.D.	N
Temperature (°C):	15.1	0.3	20
DO (mg/L):	8.1	0.2	14
Salinity (ppt):	30.4	0.4	14
pH:	7.9	0.2	14

BB

WATER BATH TEMPERATURE (°C):

Day 0:	15.4	Day 0:	15.3
Day 1:	15.2	Day 1:	
Day 2:	14.6	Day 2:	
Day 3:	14.9	Day 3:	14.8

LARVAL COUNT DATA

Conc. (mg/L)	Replicate 1 N	Replicate 1 A	Replicate 2 N	Replicate 2 A	Replicate 3 N	Replicate 3 A	Replicate 4 N	Replicate 4 A
1.								
2.								
3.								
4.								
5. 30	0	238	0	228	0	216	0	244
6. 15	6	197	0	234	4	228	0	234
7. 8	224	12	175	53	192	35	198	41
8. 4	217	1	212	14	235	7	232	4
9. 2	237	4	218	7	229	8	240	5
10. 1	230	3	227	12	245	4	252	6
Control	183	3	205	0	203	6	245	3
Brine								
Zero time	233	241	207	271	224	254		

$\bar{X}_{zero\text{-}time} = 238$

Remarks:

MARINUS, INC.
1500 PIER C St.
LONG BEACH, CA. 90813

Ph 562-435 6522 Fx 562-495 3120

MARINUS, INC.
1500 Pier C Street
Long Beach, CA 90813
(310) 435-6522

PACKINGSLIP

DATE

10/6/99

SHIP TO

North West Aquatic Sciences
Gary Buhler
3814 Yaquina Bay Rd.
Newport, OR 97365

P.O. NUMBER	TERMS	REP	SHIP	VIA	F.O.B.	PROJECT
G.Buhler	**Net 30**	**GK**	**10/6/99**	**Federal Exp...**	**origin**	

QUANTITY	ITEM CODE	DESCRIPTION
200 ~~175~~	**Sand Dollar**	**Dendraster excentricus**
2	**B900**	**Styro,crdbrd**

Echinoderm Larval Survival and Development Proportion Alive

Start Date:	10/8/99 15:30	Test ID: 999-1086	Sample ID: REF-Ref Toxicant
End Date:	10/11/99 10:00	Lab ID: ORNAS-Northwestern Aquati	Sample Type: CDCL-Cadmium chloride
Sample Date:		Protocol: PTI 94-PTI Echinoderm/Bival	Test Species: DE-Dendraster excentricus
Comments:			

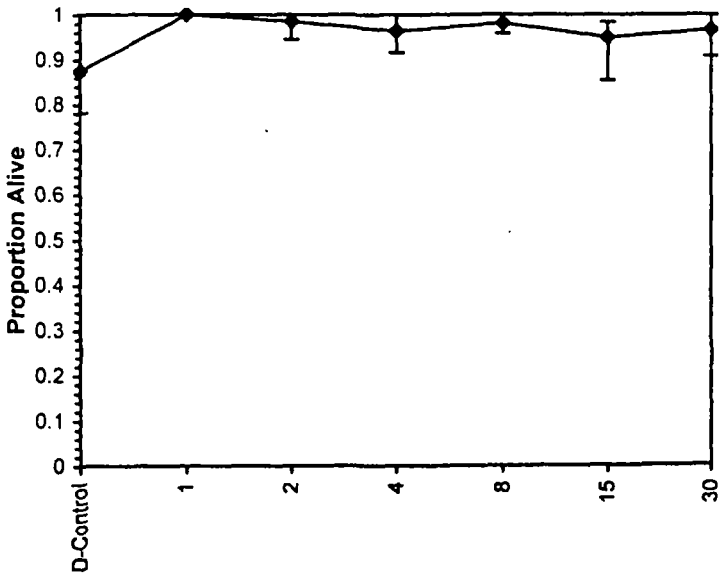
Conc-mg/L	1	2	3	4
D-Control	0.7815	0.8613	0.8529	1.0000
1	1.0000	1.0000	1.0000	1.0000
2	1.0000	0.9454	0.9958	1.0000
4	0.9160	0.9496	1.0000	0.9916
8	1.0000	0.9580	0.9664	1.0000
15	0.8529	0.9832	0.9748	0.9832
30	1.0000	0.9580	0.9076	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed		
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical		
D-Control	0.8739	1.0000	1.2473	1.0844	1.5384	16.004	4			120	952
1	1.0000	1.1442	1.5384	1.5384	1.5384	0.000	4	24.00	10.00	0	952
2	0.9853	1.1274	1.4794	1.3349	1.5384	6.593	4	23.00	10.00	14	952
4	0.9643	1.1034	1.4096	1.2767	1.5384	8.526	4	22.50	10.00	34	952
8	0.9811	1.1226	1.4569	1.3644	1.5384	6.489	4	23.00	10.00	18	952
15	0.9485	1.0853	1.3675	1.1772	1.4408	9.333	4	20.50	10.00	49	952
30	0.9664	1.1058	1.4257	1.2619	1.5384	9.583	4	23.00	10.00	32	952

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9579	0.896	0.2802	0.39089
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	30	>30		

Dose-Response Plot



LC50 > 30 mg/L, by data inspection
MLR
11-5-99

Echinoderm Larval Survival and Development-Proportion Normal

Start Date:	10/8/99 15:30	Test ID: 999-1086	Sample ID: REF-Ref Toxicant
End Date:	10/11/99 10:00	Lab ID: ORNAS-Northwestern Aquati	Sample Type: CDCL-Cadmium chloride
Sample Date:		Protocol: PTI 94-PTI Echinoderm/Bival	Test Species: DE-Dendraster excentricus
Comments:			

Conc-mg/L	1	2	3	4
D-Control	0.7689	0.8613	0.8529	1.0000
1	1.0000	0.9538	1.0000	0.9748
2	0.9958	0.9160	0.9622	1.0000
4	0.9118	0.8908	0.9874	0.9748
8	0.9412	0.7353	0.8067	0.8319
15	0.0252	0.0000	0.0168	0.0000
30	0.0000	0.0000	0.0000	0.0000

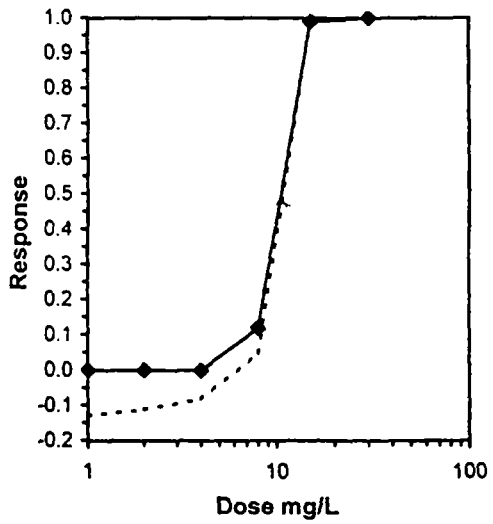
			Transform: Arcsin Square Root						1-Tailed		Number	Total
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Resp	Number
D-Control	0.8708	1.0000	1.2435	1.0693	1.5384	16.390	4				123	952
1	0.9821	1.1279	1.4606	1.3541	1.5384	6.357	4	-2.422	2.410	0.2159	17	952
2	0.9685	1.1122	1.4240	1.2767	1.5384	8.494	4	-2.014	2.410	0.2159	30	952
4	0.9412	1.0808	1.3432	1.2339	1.4583	8.076	4	-1.112	2.410	0.2159	56	952
8	0.8288	0.9517	1.1550	1.0304	1.3258	10.756	4	0.988	2.410	0.2159	163	952
*15	0.0105	0.0121	0.0886	0.0324	0.1595	74.458	4	12.890	2.410	0.2159	942	952
30	0.0000	0.0000	0.0324	0.0324	0.0324	0.000	4				952	952

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94353	0.884	0.72129	0.46885
Bartlett's Test indicates equal variances (p = 0.58)	3.77408	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	8	15	10.9545		0.16383	0.18271	1.07084	0.01606	5.6E-11	5, 18

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0.0%	10.201	10.054	10.351
5.0%	10.395	10.220	10.573
10.0%	10.524	10.277	10.777
20.0%	10.536	10.444	10.629
Auto-0.0%	10.201	10.054	10.351



Echinoderm Larval Survival and Development-Proportion Normal

Start Date:	10/8/99 15:30	Test ID: 999-1086	Sample ID: REF-Ref Toxicant
End Date:	10/11/99 10:00	Lab ID: ORNAS-Northwestern Aquati	Sample Type: CDCL-Cadmium chloride
Sample Date:		Protocol: PTI 94-PTI Echinoderm/Bival	Test Species: DE-Dendraster excentricus
Comments:			

Conc-mg/L	1	2	3	4
D-Control	0.7689	0.8613	0.8529	1.0000
1	1.0000	0.9538	1.0000	0.9748
2	0.9958	0.9160	0.9622	1.0000
4	0.9118	0.8908	0.9874	0.9748
8	0.9412	0.7353	0.8067	0.8319
15	0.0252	0.0000	0.0168	0.0000
30	0.0000	0.0000	0.0000	0.0000

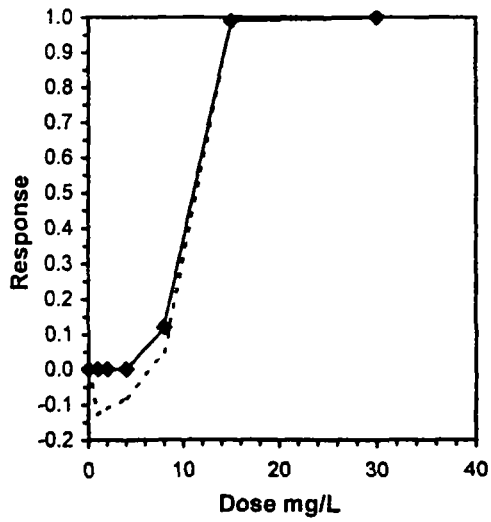
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.8708	1.0000	1.2435	1.0693	1.5384	16.390	4				0.9407	1.0000
1	0.9821	1.1279	1.4606	1.3541	1.5384	6.357	4	-2.422	2.410	0.2159	0.9407	1.0000
2	0.9685	1.1122	1.4240	1.2767	1.5384	8.494	4	-2.014	2.410	0.2159	0.9407	1.0000
4	0.9412	1.0808	1.3432	1.2339	1.4583	8.076	4	-1.112	2.410	0.2159	0.9407	1.0000
8	0.8288	0.9517	1.1550	1.0304	1.3258	10.756	4	0.988	2.410	0.2159	0.8288	0.8811
*15	0.0105	0.0121	0.0886	0.0324	0.1595	74.458	4	12.890	2.410	0.2159	0.0105	0.0112
30	0.0000	0.0000	0.0324	0.0324	0.0324	0.000	4				0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94353	0.884	0.72129	0.46885
Bartlett's Test indicates equal variances (p = 0.58)	3.77408	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	8	15	10.9545		0.16383	0.18271	1.07084	0.01606	5.6E-11	5, 18

Linear Interpolation (200 Resamples)

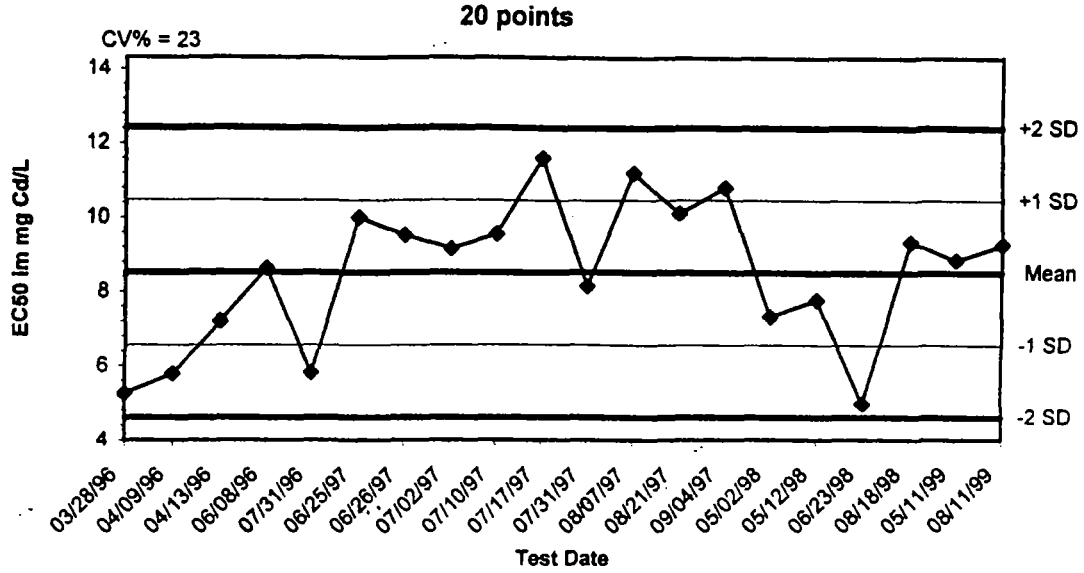
Point	mg/L	SD	95% CL(Exp)		Skew
IC05	5.682	0.956	2.563	9.468	0.4502
IC10	7.363	0.859	4.727	9.048	-0.4492
IC15	8.250	0.465	6.066	9.109	-1.3157
IC20	8.652	0.310	7.610	9.465	-0.5662
IC25	9.055	0.279	8.079	9.821	-0.2638
IC40	10.262	0.224	9.484	10.889	-0.2657
IC50	11.066	0.187	10.421	11.601	-0.2666



Test: EL-Echinoderm Larval Survival and Development					Test ID: 999-1086			
Species: DE-Dendraster excentricus					Protocol: PTI 94-PTI Echinoderm/Bivalve			
Sample ID: REF-Ref Toxicant					Sample Type: CDCL-Cadmium chloride			
Start Date: 10/8/99 15:30				End Date: 10/11/99 10:00	Lab ID: ORNAS-Northwestern Aquatic Sciences			
Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
	1	1	D-Control	238	186	238	183	
	2	2	D-Control	238	205	238	205	
	3	3	D-Control	238	203	238	203	
	4	4	D-Control	238	245	238	245	
	5	1	1.000	238	241	238	238	
	6	2	1.000	238	239	238	227	
	7	3	1.000	238	249	238	245	
	8	4	1.000	238	238	238	232	
	9	1	2.000	238	241	238	237	
	10	2	2.000	238	225	238	218	
	11	3	2.000	238	237	238	229	
	12	4	2.000	238	245	238	240	
	13	1	4.000	238	218	238	217	
	14	2	4.000	238	226	238	212	
	15	3	4.000	238	242	238	235	
	16	4	4.000	238	236	238	232	
	17	1	8.000	238	246	238	224	
	18	2	8.000	238	228	238	175	
	19	3	8.000	238	230	238	192	
	20	4	8.000	238	239	238	198	
	21	1	15.000	238	203	238	6	
	22	2	15.000	238	234	238	0	
	23	3	15.000	238	232	238	4	
	24	4	15.000	238	234	238	0	
	25	1	30.000	238	238	238	0	
	26	2	30.000	238	228	238	0	
	27	3	30.000	238	216	238	0	
	28	4	30.000	238	244	238	0	

Comments:

Dendraster excentricus larval test, reference toxicant control chart - last 20 points



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
03/28/96	5.2400	8.5085	6.5550	4.6015	10.4620	12.4155
04/09/96	5.7800	8.5085	6.5550	4.6015	10.4620	12.4155
04/13/96	7.1900	8.5085	6.5550	4.6015	10.4620	12.4155
06/08/96	8.6100	8.5085	6.5550	4.6015	10.4620	12.4155
07/31/96	5.8100	8.5085	6.5550	4.6015	10.4620	12.4155
06/25/97	10.0000	8.5085	6.5550	4.6015	10.4620	12.4155
06/26/97	9.5100	8.5085	6.5550	4.6015	10.4620	12.4155
07/02/97	9.1400	8.5085	6.5550	4.6015	10.4620	12.4155
07/10/97	9.5500	8.5085	6.5550	4.6015	10.4620	12.4155
07/17/97	11.6000	8.5085	6.5550	4.6015	10.4620	12.4155
07/31/97	8.1300	8.5085	6.5550	4.6015	10.4620	12.4155
08/07/97	11.2000	8.5085	6.5550	4.6015	10.4620	12.4155
08/21/97	10.1000	8.5085	6.5550	4.6015	10.4620	12.4155
09/04/97	10.8000	8.5085	6.5550	4.6015	10.4620	12.4155
05/02/98	7.3200	8.5085	6.5550	4.6015	10.4620	12.4155
05/12/98	7.7800	8.5085	6.5550	4.6015	10.4620	12.4155
06/23/98	4.9600	8.5085	6.5550	4.6015	10.4620	12.4155
08/18/98	9.3400	8.5085	6.5550	4.6015	10.4620	12.4155
05/11/99	8.8500	8.5085	6.5550	4.6015	10.4620	12.4155
08/11/99	9.2600	8.5085	6.5550	4.6015	10.4620	12.4155

MSR
11-5-99

Appendix G

Attachment 1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, WA 98101

Reply To
Attn of: ECL 111

MAY - 8 2000

RECEIVED
BY TS DATE 5-10-00

SENT BY CERTIFIED MAIL
RETURN RECEIPT REQUESTED

David Templeton
Anchor Environmental
1411 4th Avenue, Suite 1210
Seattle, WA 98101

-and-

Kim Maree Johannessen
Johannessen & Associates, P.S.
5413 Meridian Avenue North, Suite C
Seattle, WA 98103-6138

Re: EPA Comments on the Middle Waterway Draft Round 1B Data Report Volumes I and II (dated February 17, 2000)

Dear ~~Mr. Templeton~~ David and ~~Ms. Johannessen~~ Kim:

After reviewing the above documents, EPA is providing comments by this letter. Other reviewers included EPA technical consultants at Roy F. Weston, Inc. and URS Greiner Woodward Clyde.

The Draft Round 1B Data Report summarized field sampling activities and reported the chemical, physical, and biological data results of these pre-design activities. Overall, the quality of the data and reporting appeared consistently high. However, EPA did note a few errors in analysis that are described in the enclosed comments.

Assuming that the enclosed modifications are made by MWAC and EPA does not find substantial errors in the revised information, EPA approves the Round 1B Data Report. Considering the limited revisions required, EPA requests that MWAC submit replacement pages and other noted information within thirty (30) days of MWAC receipt of this letter.

Printed on Recycled Paper

Please contact Ted Yackulic at (206) 553-1218 or me at (206) 553-6511 if you have any questions regarding this letter.

RECEIVED
BY
DATE

Sincerely,

Angela Chung
Project Manager

cc: Ted Yackulic (EPA)
Allison Reak (Weston)
Steve Hoffman (URS)
Russ McMillan (Ecology)
Helen Hillman (NOAA)
Bob Taylor (NOAA)

EPA Comments on MWAC's Draft Round 1B Data Report

Benthic Community Results:

1) MWAC notes that the Round 1B benthic samples were collected at high tide (wet), which differed from the Round 1A benthic samples that were collected at low tide (dry). Please describe the possible data bias between samples collected at high tide versus low tide. Also, how might the difference between Round 1A and 1B be reflected in abundance or diversity? These issues should be addressed in the Draft Pre-Design Data Evaluation Report.

2) EPA's evaluation of the overall community structure, based on the species level data, shows a high degree of similarity between the reference location and the three Middle Waterway stations (41, 44, and 153), except for the number of individuals present. Given that the chemistry and bioassays do not indicate impacts at stations 41, 44, and 153 and the community composition is very similar between reference and waterway stations, it is likely that the source of the differences is an ecological phenomena, rather than a contaminant effect. Therefore, EPA determined that the benthic adverse effects criteria "hits" in Middle Waterway should not be viewed as a response to contaminant stresses.

3) MWAC should delete the statement that the "Hylebos reference sediment would fail the no adverse effects criteria"(section 5.3.2, p. 5-5). The benthic community, not reference sediment, is the subject of the analysis. In addition, it is inappropriate to attribute differences between the reference site (located in an area without evidence of chemical contamination) and Middle Waterway test sites to adverse effects at the *reference site* without data to substantiate this speculation (i.e., disproving the null hypothesis does not prove an alternative hypothesis).

Revisions to Tables:

1) Table 12 indicates that the reference station for MW034 is MWRC214. However, statistical summary sheets in Appendix F indicate that station MWRC213 (instead of MWRC214) was used in the statistical analysis of amphipod mortality results identified for station MW034 sediment. The statistical analysis for MW034 should be revised using the correct reference station and Table 12 should be corrected

2) Table 14 indicates that reference station MWRC214 should have been used for stations MW034 and MW037. However, statistical summary sheets from Appendix F indicate that reference station MWRC213 was used for comparison to these stations. Table 14 also indicates that MWRC213 should have been used for comparison to stations MW042 and MW045. Yet statistical summary sheets from Appendix F indicate that MWRC214 was used for comparison to these stations. The statistical analyses should be re-conducted using the correct reference stations and Table 14 should be corrected.

3) EPA could not complete a QA/QC review of Table 15 due to the absence of statistical summary tables from the report. MWAC should provide EPA copies of these statistical summary tables.

4) In Table 18, *Pseudopolydora kempi* was incorrectly ranked as the 7th numerically abundant taxa for station MW044. *Polydora cornuta* was also assigned this ranking. A review of the raw data indicated that *P. kempi* should have been ranked the 3rd most abundant taxa. Table 18 should be revised to depict the correct ranking.

Attachment 2

MWAC Response to

EPA Comments on MWAC's Draft Round 1B Data Report

Benthic Community Results:

EPA Comment 1) MWAC notes that the Round IB benthic samples were collected at high tide (wet), which differed fr6m the Round IA benthic samples that were collected at low tide (dry). Please describe the possible data bias between samples collected at high tide versus low tide. Also, how might the difference between Round IA and IB be reflected in abundance or diversity? These issues should be addressed in the Draft Pre-Design Data Evaluation Report.

> **MWAC Response:** *This comment was addressed in the Draft Pre-Design Data Evaluation Report with insertion of the following text to Section 4:*
>
> *...As discussed above, Round 1A benthic data were collected at low tide (dry) while Round 1B benthic data were collected at high tide (wet). It is unlikely that the differences in the collection methods resulted in any significant biases in terms of abundance or diversity between the Round 1A and 1B benthic data sets (personal communication with H. Jones, Marine Taxonomic Services, May 25, 2000). Possible differences may be found in the number of crustaceans because crustaceans are more mobile than most other benthic infauna. At low tide crustaceans tend to be less mobile and are likely distributed fairly evenly at the sediment surface. At high tide, they may have a more patchy distribution due to the location of food sources and their abundances may vary. Comparison of abundance data between Round 1A and 1B does not show clear differences....*

EPA Comment 2) EPA's evaluation of the overall community structure, based on the species level data, shows a high degree of similarity between the reference location and the three Middle Waterway stations (41, 44, and 153), except for the number of individuals present. Given that the chemistry and bioassays do not indicate impacts at stations 41, 44, and 153 and the community composition is very similar between reference and waterway stations, it is likely that the source of the differences is an ecological phenomena, rather than a contaminant effect. Therefore, EPA determined that the benthic adverse effects criteria "hits" in Middle Waterway should not be viewed as a response to contaminant stresses.

> **MWAC Response** *MWAC concurs with EPA assessment. Tables 15 and 17 have been modified to reflect this determination.*

EPA Comment 3) MWAC should delete the statement that the "Hylebos reference sediment would fail the no adverse effects criteria"(section 5.3.2, p.5-5). The benthic community, not reference sediment, is the subject of the analysis. In addition, it is inappropriate to attribute differences between the reference site (located in an area without evidence of chemical contamination) and Middle Waterway test sites to adverse

effects at the *reference site* without data to substantiate this speculation (i.e., disproving the null hypothesis does not prove an alternative hypothesis).

MWAC Response *The subject text has been deleted.*

Revisions to Tables

EPA Comment 1) Table 12 indicates that the reference station for MW034 is MWRC214. However, statistical summary sheets in Appendix F indicate that station MWRC213 (instead of MWRC214) was used in the statistical analysis of amphipod mortality results identified for station MW034 sediment. The statistical analysis for MW034 should be revised using the correct reference station and Table 12 should be corrected.

MWAC Response *In Table 12, the reference for station MW034 was MWRC214 and the appropriate statistical summary sheet was included as part of Appendix F (see page 68). Therefore, no new statistical analyses were performed and no changes were made to Table 12.*

EPA Comment 2) Table 14 indicates that reference station MWRC2 14 should have been used for stations MW034 and MW037. However, statistical summary sheets from Appendix F indicate that reference station MWRC213 was used for comparison to these stations. Table 14 also indicates that MWRC213 should have been used for comparison to stations MW042 and MW045. Yet statistical summary sheets from Appendix F indicate that MWRC214 was used for comparison to these stations. The statistical analyses should be re-conducted using the correct reference stations and Table 14 should be corrected.

MWAC Response *Reference station MWRC214 was used as the reference station for MW034 and MW037. Statistical summary sheets were included as part of Appendix F (see pages 63 and 64. In addition, MWRC213 was used as the reference station for MW042 and MW045. Statistical summary sheets were included as part of Appendix F (see pages 53 and 54). Therefore, no new statistical analyses were performed and no changes were made to Table 14.*

EPA Comment 3) EPA could not complete a QAIQC review of Table 15 due to the absence of statistical summary tables from the report. MWAC should provide EPA copies of these statistical summary tables.

MWAC Response *Statistical summary tables of the benthic comparisons have been included in Appendix F following the rest of the benthic data.*

EPA Comment 4) In Table 18, *Pseudopolydora kempi* was incorrectly ranked as the 7th numericallly abundant taxa for station MW044. *Polydora cornuta* was also assigned this ranking. A review of the raw data indicated that *P. kempi* should have been ranked the 3rd most abundant taxa. Table 18 should be revised to depict the correct ranking.

MWAC Response *Table 18 has been modified to show that P. kempi is the 3rd most abundant taxa at station MW044.*