Washington State Department of Ecology's Quality System for Fiscal Year 2006

System Structure, Activities, and Assessment

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System Structure, Activities, and Assessment

by
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and
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(see Appendix D)

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Table of Contents

Purpose of this Document

The Washington State Department of Ecology is required to produce this quality system report, as specified in the agency's *Quality Management Plan.*

The quality system is a structured and documented management system that provides the framework for planning, implementing, documenting, and assessing environmental data operations, as well as for carrying out required quality assurance and quality control activities.

The quality system encompasses both management and technical activities, and it requires the active participation of all employees.

The intended audience for this report is the agency's deputy director, executive management team, and other interested parties.

Executive Summary

Quality initiatives at the Washington State Department of Ecology (Ecology) continue apace. The noted progress and events during Fiscal Year 2006 (FY06) include:

Ecology Quality System on the Internet

A new Ecology quality internet site has been released. This website, which can be found at www.ecy.wa.gov/programs/eap/quality.html, provides one-stop shopping for quality reference documents including Ecology quality policies, Standard Operating Procedures (SOPs), the Ecology *Quality Management Plan*, and periodic reports on the quality system.

Standard Operating Procedures (SOPs)

For the first time, an Environmental Assessment (EA) Program policy for SOP development and formatting was approved for the EA Program headquarters (HQ) and Lab Accreditation groups. The policy, which was approved in March 2006, details documentation requirements for EA Program technical activities including field sampling and analytical work. As of May 2007, 13 SOPs have been completed for the EA Program HQ, and several others are in development. The Lab Accreditation Unit at Manchester is also developing SOPs for auditing environmental labs. See Appendix A for a list of all agency SOPs.

Assessments

Ecology is actively involved in both internal and external assessments related to data quality. An ongoing internal assessment program at Manchester Environmental Laboratory (MEL) audited 24 different analytical techniques and associated SOPs for conformance; Appendix B documents MEL parameters audited in FY06. The Lab Accreditation Unit conducted on-site assessments of 98 labs submitting data to Ecology; Appendix D contains a detailed listing of labs assessed in FY06. The Lab Accreditation Unit also accredited over 450 laboratories, including MEL, for data submittal to Ecology. Provisions for quality audits for data submitted to Ecology by external entities were included in the new Credible Data and 303(d) data submittal policy.

Finally, all Quality Assurance (QA) Project Plans developed by Ecology now include a required section detailing data assessment criteria for the project.

Training - Data Quality Assessment

This was a joint presentation by the U.S. Environmental Protection Agency (EPA) and Ecology highlighted by the participation of John Warren, an entertaining and brilliant statistician from the EPA HQ. The training was very well received, with over 200 participants over the two-day event.

Quality System Training for Internal and External Data Generators

This training was presented in late October 2006 at Ecology HQ and the Southwest Regional Office as well as Ecology's other three regional offices: Northwest, Central, and Eastern. The training was designed to be an introduction to the Ecology quality system, agency quality policies and procedures, data submittal processes, and advanced tools for data analysis. Final enrollment was over 175 participants. See Appendix F for the agenda for this training.

Credible Data Policy

A new Credible Data policy was developed and released by Ecology. Both the Water Quality (WQ) Program and the EA Program were key participants in this effort, which is designed to improve and standardize quality requirements for data generated by and submitted to Ecology in support of water quality standards. It also includes enhanced emphasis on requirements for QA Project Plans from grant and loan recipients and other external organizations. See Appendix E for the Credible Data policy.

Review of Grant/Loan Quality Assurance (QA) Project Plans

Another joint EA/WQ policy on review of grant/loan QA Project Plans was developed and released in late 2005. This policy notes new processes designed to standardize the QA Project Plan review processes for grants and loans awarded by the WQ Program.

WQ Program Policy on Clean Water Act (303d)

The recently approved WQ Program policy on the federal Clean Water Act 303(d) data submittals has new quality requirements for the submittal of data in support of 303(d) listings.

Quality System Staffing

Quality system staffing in the EA Program was increased to three positions, from 1.75 positions in the last biennium. The positions are one full-time agency QA Officer, one full-time QA Coordinator at Manchester Environmental Laboratory, and one full-time QA Coordinator at headquarters.

Regionalization

Regionalization of the agency quality system is being implemented by the WQ Program, Toxics Cleanup Program, Water Resources Program, and the EA Program. As the EA Program moves into an enhanced regional presence, it plans on using written and video SOPs and other quality documentation for standardization of regional activities.

EPA Quality Systems Audit

This audit was conducted in late September by EPA Region 10 quality staff. The audit outcomes were very favorable to Ecology. No findings were reported, and EPA staff was complimentary regarding several aspects of the quality program.

Introduction

The Washington State Department of Ecology (Ecology) is actively involved in the management of quality improvement processes in the agency. Foremost among these activities is the quality system that EPA requires as a part of Ecology's participation in EPA's grant system. The quality system is also required by Ecology's role in submitting data to EPA in support of various delegated regulatory programs.

Ecology maintains a *Quality Management Plan* which describes that quality system and the roles and responsibilities of system participants. Ecology's *Quality Management Plan* provides that the Quality Assurance (QA) Officer periodically prepare a status report on the agency quality system.

This report was prepared with input from the Ecology program and Manchester Environmental Laboratory QA Coordinators, who provided information for their respective programs and the laboratory. A list of the program and lab QA Coordinators is given in Appendix D, and the information they provided is included below.

This report is for the period of July 1, 2005 through June 30, 2006.

The report is structured as follows:

1. Discussion of the implementation of previous quality recommendations.
2. Listing of new quality initiatives.
3. Details for quality systems for Ecology programs and Manchester Environmental Laboratory.

Implementation of Previous Quality Recommendations

Several recommendations for action were made in the 2005 Quality Assurance Report. The significant recommendations are given below, along with the findings regarding implementation.

1. Ecology should prepare for EPA's system audit by initiating implementation of the recommendations in this report and confirming that all aspects of the Quality Management Plan are being correctly implemented.

Finding: EPA Region 10 did a quality system review of Ecology during November 3-6, 2003. The results of the review were transmitted to Ecology in a letter to the then Deputy Director, Linda Hoffman. The review found no major deficiencies with regard to Ecology's overall quality system, and made only a few observations. The most significant observation was that *The Quality Assurance Report of May 2003 prepared by Ecology's Quality Assurance Officer is an excellent assessment of the agency's quality system progress, and the recommendations described in the report should be seriously considered and implemented by program managers where appropriate*.

2. The Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies should be revised.

Finding: The Ecology document *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* was revised in July 2004 (www.ecy.wa.gov/biblio/0403030.html). This finding has been resolved and should be removed from the list.

3. Training in project planning and implementation should be continued but emphasis should be given to providing training on assessment, since this area has been neglected in the past.

Finding: Training on use of the *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* was provided in 2004. Training on Data Quality Assessment was provided by EPA/Ecology in December 2005, in a two-day session covering both assessment techniques and statistics related to assessment. The training was well received, with over 110 attendees both days.

4. In order to help ensure that the QA Policy and *Quality Management Plan* are implemented, it is recommended that a QA section be included in the plans of all programs with responsibilities for environmental data/information. These QA sections taken as a whole would constitute a QA work plan for the agency.

Finding: Some programs included QA sections in their biennial program plans, but current implementation of quality plans in biennial and strategic planning documents is not uniform across the agency. Continued work on this area is needed.

5. Sometimes there has not been enough time available for planning before the project must be implemented, and this is being addressed by identifying project needs early, allowing more time for planning, and simplifying the guidelines for preparing QA Project Plans.

Finding: Considerable work has been performed by Ecology to streamline the QA Project Plan development process. A QA Project Plan template/development tool has been developed by the EA Program in conjunction with the WQ Program; training on this tool will be[2] presented at the E-Quest quality training in October 2006. This quality system training is intended to help standardize the QA Project Plan development and review processes. New policies on QA Project Plans for grant and loan projects have been approved and are being implemented. Video training on Ecology's quality system will be developed this fall and will be available to all agency staff.

6. There has been a significant increase in the number of QA Project Plans prepared by local governments receiving grants and loans for conducting water quality studies, and submitted to Ecology for review and approval. There has been a problem in predicting the demand for these reviews, which would allow better scheduling of work load.

Finding: The new Credible Data policy is in part an effort to address quality issues related to grant and loan processes. The policy sets out detailed requirements for QA Project Plan development, agency review, project assessment, and determination of data usability for data related to water quality standards. Implementation of these requirements will eventually result in better-planned and timelier projects. Additionally, the EA and WQ programs developed a joint policy for review of grant/loan QA Project Plans to help address workload scheduling. Finally, the fall 2006 E-Quest training is targeting Ecology grant/loan managers for better integration into the quality system.

7. Publications corresponding to Standard Operating Procedures (SOPs) are widely dispersed, and should be compiled and made available in one or a few locations on the Intranet. There is also a need to establish a process for field SOP preparation, review, approval and document control, as well as a standard format for field SOPs.

Finding: Significant progress has been made on SOPs in the agency. The EA Program developed and approved a new SOP policy, which standardized content and formatting for SOPs. The new agency quality internet site provides easy access to SOPs for Ecology staff and external users. An intensive SOP development process has been initiated in 2006; 13 new SOPs have been completed for field sampling and analytical activities. Several others are in process. There are currently a minimum of 180 SOPs in the agency. A listing of all agency SOPs is provided in Appendix A of this document.

Two SOP-related initiatives are planned: (1) video SOPs based on approved documents, and (2) a harmonization effort which will unify SOPs based on the same topic, but performed by different groups within Ecology.

[2] This report was written during the fall of 2006

8. There is a need for increased attention to assessment for data collected by or reported to Ecology. This should include increases in: third party validation of data and technical assistance in data validation and data quality assessment for projects managed or overseen by Ecology.

Finding: Fields to describe the level of assessment (i.e., data verification, data validation, and data quality assessment) have been added to the Environmental Information Management System (EIM). The level of assessment must now be specified for all data entered in EIM. However, confusion still exists regarding definitions of assessment levels for environmental data. An upcoming effort for Ecology will be to reach agreement on global definitions for various levels of quality assessment, data review, and data usability.

9. To meet the requirement for an external audit every three years, Manchester Laboratory should coordinate with the Laboratory Accreditation Section to arrange for the next on-site system audit.

Finding: An audit of Manchester Laboratory by Ecology's Lab Accreditation Section was done on February 10-11, 2004, and the report of the audit was completed on March 15, 2004**.** The next audit was scheduled to be completed before the end of February 2007. This finding has been resolved and should be removed from the finding list.

10. Coordination with EPA on quality assurance/quality control (QA/QC) matters is important to make certain that Ecology meets all requirements, including those for approval of QA Project Plans, and to take full advantage of the resources available from EPA for ensuring the quality of the data. Ecology management needs to keep informed of developments in the implementation of EPA's Information Quality Guidelines and be prepared to respond to any challenges to the quality of data reported by Ecology.

Finding: Coordination with EPA is an ongoing effort. The winter 2005 training on data-quality assessment was a joint Ecology/EPA effort. Close planning and coordination has occurred with EPA regarding the 2006 quality system review. Ecology and EPA co-chaired the Quality Session at the June 2006 Association of Analytical Communities meeting. This finding should be considered part of routine quality operations and should be removed from the finding list.

11. Ecology should determine the scope and implementation plan (specific activities by program, cost analysis, and timeline) to adopt a method to validate all data it uses for decision-making, not just field and laboratory data that it directly collects. This method should include proper validation of new data and examination of existing data to determine if there is sufficient information to ensure that the quality of the data is adequate for its intended use.

Finding: In response to the legislature's passing of the Water Quality Data Act in 2004, Ecology has developed and approved a *Credible Data* policy, which sets out quality requirements for review and determination of usability for data submitted to Ecology. This policy also proposed various levels of review for submitted data, including a full data audit of the project. However, full implementation of the policy will require additional agency resources. A report to the legislature is due by December 31, 2006, which will advance the new resources required for full implementation of the policy.

Ecology Quality System - Issues and Initiatives

The following Ecology quality system quality issues and initiatives have been developed by Ecology's Quality Assurance Officer. These are determined to be significant to the agency, and require continued investment to achieve the goals of the Ecology quality system.

SOPs (Standard Operating Procedures)

Completion of Environmental Assessment Program (EA Program) SOP Project
Key to full implementation of the Ecology quality system is completion of all necessary SOPs to document field sampling, field analyses, and other technical activities at headquarters and the regional offices. The target date for completion was June 30, 2007, the end of the current biennium.

Agency-Wide SOPs
Once all EA Program SOPs are completed, implementation across the various Ecology programs needs to occur. All programs performing field activities must perform those activities in a standardized, uniform manner.

Video SOPs
The final step recommended in SOP documentation is the production of video SOPs for field activities. Preliminary work at one regional office has demonstrated the utility of this approach.

Field Audits for Sampling and Field Analytical SOPs
A field SOP audit program is envisioned to assess the degree of standardization and effectiveness of SOP usage throughout the user community. The extent to which field audits can be carried out will be determined by the availability of staff resources.

Regionalization of Quality System

As the EA Program regionalizes field activities, approaches to effectively manage them are increasingly important. The EA Program staff and managers have rightful concerns about uniform quality practices in a distributed operation. Workgroups in the EA Program have advanced a series of recommendations for incorporation into the planning and implementation of a distributed, regional quality system. Foremost among these is the required use of SOP-controlled techniques for all field activities.

Uniform Implementation of Quality System in all Environmental Programs - Grant/Loan Issues

This effort will require continued outreach and training. The fall 2006 E-Quest training is an example of Ecology quality system outreach to Ecology staff and external data generators. The designation of a QA Coordinator for the Water Resources Program was an important next step for quality implementation. Finally, efforts must be undertaken to ensure that all Ecology grant and loan processes that generate environmental data are associated with an agency-approved QA Project Plan, and that minimum requirements for the approval of quality documents associated

with the grant/loan process are uniformly understood and followed, across all environmental programs.

Data Verification and Validation – Resolution of Issues

Data verification and validation processes were addressed in the previous report, but questions remain inside and outside the agency regarding verification and validation practices. The effort here will be to standardize data review practices across the agency, and implement the agreed-upon practices. Because of resource limitations regarding data validation, the current thinking is to focus on data *verification*, which is commonly performed in Ecology, and data *usability* determinations, also commonly performed on many Ecology projects.

Better Integration of Laboratory Accreditation Unit into the Ecology Quality System

The integration of the EA Program's Lab Accreditation Unit into the Ecology quality system should be enhanced. An initial improvement would be to have someone from the group designated as the Lab Accreditation Unit QA Coordinator. This would help inform Lab Accreditation Unit about QA initiatives, and provide a point of contact for quality issues as they occur.

SEA (Shorelands and Environmental Assistance) Program/ Ecology Quality System Integration

The SEA program lab at the Padilla Bay reserve should be accredited by Ecology for any work submitted to Ecology. The SEA Program's quality coordinator needs a better linkage to program data generation activities (2514 grants, in particular), QA Project Plan review and grant and loan data assessment activities.

Resource Requirements for the Quality System

EPA's quality requirements continue to evolve and become more rigorous. More resources dedicated to quality are needed to maintain the same level of service, as the volume of quality planning documents and reports both submitted to EPA and developed in-house continues to increase. As stated above, needed audit programs for field activities also are dependent on enhanced resources. Additionally, implementation of the Credible Data policy's audit provisions will also require more staff resource. Initial resource estimates follow:

- One FTE for credible data audit/assessment (as per Credible Data policy)
- One FTE for EA Program field audit program (internal projects)
- One shared FTE for WR/SEA program quality coordination, planning, review, and assessment.

The Watershed Advancement Group is currently examining the resource needed for quality tasks in the WR Program/SEA Program. A final number may not be available until June 2007.

Program Quality Reports

1. Environmental Assessment Program

Description of Quality Structure

The quality structure in the EA Program is determined by its role in the overall quality structure of the agency, which is described in the *Quality Management Plan* (QMP) (www.ecy.wa.gov/biblio/0503031.html). See Appendix C of the QMP for an organization chart for the QA management structure. The QMP also includes descriptions of QA/QC responsibilities.

The Quality Assurance Officer is located in the EA Program; therefore, the EA Program plays a key role in implementing the agency's quality system. The agency Director is responsible for designating the QA Officer, and the QA Officer reports to both the EA Program Manager and the Deputy Director. With respect to the quality structure, a key responsibility of the QA Officer is to inform management of QA/QC issues and problems. Other key responsibilities related to the quality structure include (1) acting as the liaison between Ecology and other agencies on QA/QC matters, (2) providing technical support to Ecology programs, and (3) working with Ecology's QA Coordinators to provide this support.

The various Program Managers designate the QA Coordinators, and there are two QA Coordinators in the EA Program: a Program QA Coordinator and a Manchester Environmental Laboratory QA Coordinator. The Program QA Coordinator acts as point of contact within the EA Program for data quality issues.

The Program Manager is responsible for allocating the resources to implement the QA Policy and the QMP, for ensuring that Ecology's QA Policy (Executive Policy 1-21) and QMP are implemented, and for delegating responsibilities for implementing a quality system at appropriate levels of the organization. Other EA Program employees with QA/QC responsibilities described in the QMP include project managers, project leads, field staff, laboratory director, laboratory staff, and laboratory accreditation staff.

FTE Designated to Quality

The QA Officer, the Program QA Coordinator, and the Manchester Laboratory QA Coordinator are all full-time positions, so three FTEs are designated to these key QA positions. Laboratory accreditation staff positions are also full time and dedicated to QA/QC and there are seven FTEs working in the Laboratory Accreditation Unit. As already mentioned, other managers and staff also have QA/QC responsibilities, although the total FTEs dedicated to quality in the program are difficult to quantify.

Specific Staff Quality Responsibilities

The EA Program staff with quality responsibilities includes project managers, project leads, field staff, laboratory staff, and laboratory accreditation staff. The specific responsibilities are given in the QMP. For project managers and project leads, key responsibilities include preparing and implementing QA Project Plans and assessing and reporting the quality of data obtained. Field staff is responsible for ensuring that samples are properly collected according to the QA Project Plan and the SOPs, and that all field data are carefully recorded.

Manchester Laboratory staff is responsible for analyzing environmental and quality control samples according to the specifications in the QA Project Plans and the SOPs.

The Laboratory Accreditation Unit staff is responsible for administering the Laboratory Accreditation Program, assessing laboratories to determine if they have a demonstrated capability to accurately analyze environmental samples, and determine if they should be granted accreditation.

QA Project Plan and SOPs Existent

QA Project Plans – Since November 2003, 53 QA Project Plans have been developed, approved, and implemented by Ecology. A list of QA Project Plans generated by the EA Program since January 2000 is available at www.ecy.wa.gov/biblio/qapp.html.

SOPs – As of September 1, 2006, the EA Program headquarters has prepared 13 SOPs that are in final (approved) or provisional status. There are several other draft SOPs in preparation, on various field activities. Manchester Environmental Laboratory SOPs number 120+. There are two draft SOPs at the Lab Accreditation Unit.

Other Program-Specific Quality Documentation

Quality Assurance Monitoring Plan: Streamflow Gaging Network (www.ecy.wa.gov/biblio/0503204.html). This QA Monitoring Plan is similar to a QA Project Plan, except it is intended to be used for planning many projects of a similar nature, not just one.

A revised *Quality Management Plan* (www.ecy.wa.gov/biblio/0503031.html) was published in September 2005. This is the agency plan to implement, document, and assess the effectiveness of the quality system supporting environmental data operations.

Staff Training on Quality

The EA Program collaborated with EPA Region 10 to offer a two-day training course which included an *Introduction to Data Quality Assessment* (day 1) and *Data Quality Assessment: Statistical Tools* (day two). Instructors were provided by EPA's Office of Environmental Information. The number of participants (from Ecology, EPA Region 10, and outside organizations) in the course was 132 on the first day and 119 on the second day

The EA Program is coordinating with Ecology's Water Quality Program and Toxics Cleanup Program to offer a one-day training course on Ecology's quality system. This course is being prepared in response to (1) a request from the WQ Program (Monitoring Request 06-32) to help meet the requirements of Credible Data policy, including the assessment of requirements of *suitability for use* in water quality data sets, and (2) a request from the TC Program for training in the use of the Environmental Information Management System (EIM). Course topics include an Introduction to the Ecology Quality System, Systematic Planning, EIM requirements for grant and loan recipients, the EIM data submittal process, and the new EIM EnviroQual toolset. Preliminary plans are to offer the training course at Ecology's four regional offices, with a maximum enrollment of 50, except for headquarters where up to 210 participants may be admitted.

Current QA Activities

The EA 2005-2007 Biennial Plan aww.ecology/programs/eap/Program%20Plans/05-7%20Biennial%20Plan.pdf includes a Quality Assurance Plan that describes the activities that were given priority for implementation during July 1, 2005 to June 30, 2007.

One of those priority activities is to prepare for EPA's quality system review of Ecology, which is scheduled for September 2006. The QA Officer, with the assistance of the Program QA Coordinators and the Laboratory QA Coordinator, have been making preparations for the review, including this report on activities, since the last audit.

The EA Program has also supported the Water Quality Program's work on developing a policy for ensuring that credible data are used for assessing the quality of surface water, serving on the advisory committee for the Water Quality Data Act, and reviewing the draft Credible Data policy (WQP Policy 1-11).

A policy has been prepared and approved (EA Program Policy 1-08) on the *Development, Use, Adoption, and Revision of Technical Standard Operating Procedures (SOPs)*. Several SOPs have been completed or are in draft form, using the SOP format specified in Policy 1-08. SOP preparation has included new SOPs, the conversion of existing procedures into the SOP format, and the conversion of procedures in Ecology *protocols* publications into the SOP format. A list of approved and draft SOPs is attached.

The EA Program's Biennial Plan includes the establishment of an agency training program for quality systems. As reported above, the EA Program helped present a training course on data quality assessment in 2005. The Program organized another training course on quality systems (quality assurance and data management) that was offered in October 2006. These trainings covered three of the six training topics mentioned in the Biennial Plan.

There is a need to have an on-going agency training program for quality systems, such as that described in EPA QA/G-10, *Guidance for Developing a Training Program for Quality Systems*, and work may be done on this in the remainder of the biennium (June 30, 2007). It may also be possible to organize a training course by the end of the biennium on one of the other priority topics mentioned in the Biennial Plan (i.e., data verification and validation, procedures for field sampling and measurement, or laboratory control charting).

The Laboratory Accreditation Unit is planning to complete the required on-site assessment of the Manchester Laboratory by February 7, 2007, which is the third year anniversary of the last assessment. Accredited laboratories must be given an on-site assessment every three years in order to meet accreditation requirements.

2. Environmental Assessment Program - Manchester Lab

Description of Quality System

Since November 2003, Ecology's Manchester Environmental Laboratory (MEL) has maintained accreditation for all parameters requested, as is required by the *Quality Management Plan* and Ecology Executive Policy I-22.

An on-site assessment of laboratory systems and quality assurance audit was conducted by Ecology's Laboratory Accreditation Unit. Analysts were noted to be knowledgeable, conscientious, and strongly committed to quality. Recommendations from the assessment final report have been implemented. SOPs have been reviewed and updated to comply with the recommendations.

The goal of MEL is to support the agency by producing reliable, scientifically valid, and legally defensible data so informed decisions can be made regarding the health and safety of our environment.

An effective quality assurance (QA) program is essential for the credibility of any data gathering effort from field sample collection to data interpretation. Sample collection and data interpretation are functions organizationally separate from the laboratory and are, therefore, not covered by this report. Other quality management documents cover those functions. For activities conducted at MEL, it is the policy of MEL that QA shall be maintained at a level that will ensure that all environmental data generated and processed are scientifically valid and legally defensible, and of acceptable precision and bias, representativeness, completeness, and comparability. To that end, the quality management steps and procedures are used throughout the entire analytical process from sample receipt to data reporting.

Accuracy

Data will meet quantitative measurement quality objectives (MQOs) for precision and minimization of bias described in the SOP for each analytical procedure. MQOs are defined in Ecology's *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* (www.ecy.wa.gov/biblio/0403030.html).

Representativeness

The degree to which analytical data represent the environment from which the field sample is taken depends on factors involved in sampling, transportation, and analysis. The laboratory may be responsible for all of these factors for some studies, and for analysis only for others. MEL follows the following practices to ensure data are representative:

- Supply clean sample containers of the appropriate type with preservatives when required by the associated QA Project Plans.
- When necessary, homogenize samples prior to taking aliquots for analysis.

- Use appropriate digestion procedures.
- Control laboratory contamination.
- Assure that reported data are correctly associated with the corresponding sample received by the laboratory.

Completeness

MEL endeavors to provide accurate, representative, and defensible data for 100% of the tests requested by the data user.

Comparability

Comparability is measure of the confidence with which one data set or method can be compared to another.

Legal Defensibility

To be able to defend data in a court of law, records are kept to demonstrate that samples were not tampered with after being received in the laboratory. Proper use of chain-of-custody procedures and proper security are followed while the samples are in the laboratory. The data are recorded, handled, and reported in such a way that prevents tampering. Observations are recorded in indelible ink, and good laboratory practices are followed in using the LIMS to record data and generate reports.

MEL's quality management program has the following requirements to ensure that an effective laboratory QA is maintained:

- All environmental data are of the right type and quantity for its intended use. Generation of data that does not meet data quality objectives is minimized. The data quality information acquired with all environmental data are kept on file at the laboratory for ten years.
- Quality assurance activities are carried out in the most cost-effective fashion possible, without compromising data quality objectives.
- Facilities, equipment, and services that directly, or indirectly, impact on data quality or integrity are routinely inspected and maintained, where appropriate. Each laboratory unit has a facilities plan identifying the responsible parties for conducting routine inspections and the methods of documenting these activities.
- Data processing is documented, reviewed, and revised as required by Ecology and EPA mandates and guidelines. Data are validated according to specific criteria, which follow EPA guidelines and regulations.
- Quality control (QC) limits for data generation and evaluation processes are monitored by the analysts performing that process. If data falls outside acceptable QC limits, corrective action necessary to bring the process back into control is performed, or the data are qualified as appropriate. If the analyst has a question about implementation of corrective action, that question is brought to the attention of the appropriate supervisor. If necessary, resolution of

the QC problem may be sought from the laboratory QA Coordinator and laboratory management.

- QC is a part of every process involved in the generation of laboratory data. QC limits for a specific process of data generation are set by EPA guidelines or historical MEL data generated by the same or a similar process. These limits may originate from, but are not limited to, EPA regulations, EPA approved methods, and method performance data in support of laboratory SOPs.

Performance-Based Measurement Systems (PBMS)

On October 6, 1997, the EPA provided public notification (62 FR 52098) of a plan to implement PBMS for *environmental monitoring in all of its media programs to the extent feasible*. The EPA defined PBMS as *a set of processes wherein the data quality needs, mandates, or limitations of a program or project are specified, and serve as criteria for selecting appropriate methods to meet those needs in a cost-effective manner*. The notice indicated that the regulated community would be able to select any appropriate analytical test method for use in complying with EPA's regulations. It further indicated that implementation of PBMS would improve data quality and encourage the advancement of analytical technologies.

Modifications to MEL methods are considered acceptable if they meet the criteria described below:

- Legal standing – Data generated in compliance with the PBMS framework must have the same legal standing as data generated using a promulgated EPA method.
- Scientifically sound and relevant validation process – Both the method validation and the PBMS documentation requirements should be based on principles that are widely accepted in the scientific community and on the intended use of the data.
- Clearly articulated and appropriate performance criteria – Performance criteria are the sensitivity, selectivity, and accuracy of the data.
- Documentation – Must be sufficient for independent verification (i.e.,, auditing) and reproduction by another laboratory which is skilled in the art.
- Careful implementation – Implementation of PBMS should consider how requirements of project officers will be affected.

Alternate determinative techniques or changes that degrade method performance are not allowed. If an analytical technique other than the techniques specified in the method is used, that technique must have a specificity equal to, or better than, the specificity of the techniques in the referenced method for the analytes of interest.

Each time a method is modified, the laboratory is required to repeat the procedures for Initial Demonstration of Capability (IDC). In addition, each analyst must demonstrate the ability to generate acceptable results by performing an IDC before analyzing samples for a parameter. Analysts must also perform semi-annual demonstrations of capability by satisfactorily analyzing performance evaluation samples.

FTE Designated to Quality at Laboratory

One FTE is designated as the QA Coordinator, but all staff have responsibility to monitor and control the quality of their work.

Specific Staff Quality Responsibilities

QA and QC Responsibilities – Each employee of the laboratory has responsibility for the implementation of the QA program, according to their technical, supervisory, and administrative responsibilities. Refer to Ecology's *Quality Management Plan*. The general responsibilities are summarized below:

- Contribute to the preparation of the Quality Assurance Manual, the Lab Users Manual, and SOPs in their area of expertise.
- Implement QA/QC activities specified in the laboratory QA plan, SOPs, methods, and the QA Project Plan.
- Provide complete and accurate data reports in a timely manner.
- Analyze QC samples according to the guidance provided in the laboratory's Quality Assurance Manual.
- Initiate actions to correct QC problems that might arise during the performance of a process.
- Alert the supervisor, the laboratory QA Coordinator, and the laboratory management to questions and concerns pertaining to performing or developing QC for a process.

Laboratory Management

- MEL management consists of the Laboratory Director and Unit Supervisors. Management has the responsibility for overall administration and implementation of the QA program with responsibilities delegated as appropriate down through the laboratory's personnel. Ultimate responsibility for the quality of data produced at MEL lies with the Laboratory Director.

Laboratory Director

- Communicates with clients on all phases of project, from QA Project Plan to final report, as appropriate.
- Works with QA Coordinators, project managers, and appropriate personnel.
- Reviews progress reports, analytical reports, and QC reports.
- Monitors problems and reviews recommended solutions.

Laboratory QA Coordinator

- Assists laboratory personnel in production of accurate, precise, and scientifically and legally defensible and complete analytical data that are representative of the environment from which the corresponding sample was taken. Evaluates data quality.

- Ensures the implementation of QA policy, reviews QA/QC data, and verifies that corrective action was taken when necessary.
- Prepares periodic reports to management documenting the QA data and performance of the laboratory.
- Identifies the need for, and coordinates revisions to, the Quality Assurance Manual and other QA documents.
- Initiates review of SOPs and coordinates necessary revisions.
- Administers inter-laboratory QA efforts. Coordinates Performance Evaluation program and reporting to Ecology's Quality Assurance Section for accreditation purposes. Recommends corrective actions, where necessary.
- Has stop-work authority in the event of a major QC deviation, where conditions severely compromise the quality of results.
- Has access to highest level of management at which decisions are made on lab policy or resources.
- Should it be necessary to appoint a temporary QA Coordinator, the Laboratory Director or the QA Coordinator will designate an appropriate employee or employees to act on the QA Coordinator's behalf. Upon the QA Coordinator's return to normal duties, the temporaries shall inform this appointee of any actions that occurred during the absence. Agency and program QA personnel may be used as resources.

Supervisors

Supervisors provide a single point of contact for clients. They should have the technical knowledge and experience of the processes that are performed within their respective unit.

The quality responsibilities of supervisors include:

- Organization and direction of technical activities within their assigned areas.
- Evaluation of data quality or delegation to an appropriate analyst: final review for clarity, accuracy, validity, defensibility, representativeness, and completeness. Organization data for timely delivery to clients' specifications. Provision of assistance to the analysts in formulating appropriate QC and resolution of QC problems.
- Monitoring day-to-day and individual project performance. Verification that QC and analytical procedures are followed as specified for each project. Reviewing Performance Evaluation results. Investigation of failed Performance Evaluation samples and reporting corrective actions taken to the laboratory QA Coordinator.
- Informing the laboratory QA Coordinator or laboratory management of unresolved QC concerns.

The Ecology QA Officer and EA Program QA Coordinator support MEL by providing interpretation, assistance, and guidelines for QA/QC; preparing and reviewing documents; and providing technical assistance and administrative oversight through audits and training.

QA Project Plan and/or SOPs Existent

- See Appendix A for a list of MEL SOPs.

Other Program-Specific Quality Documentation

- Manchester Environmental Laboratory Quality Assurance Manual.
- SOPs document QC/QA procedures to be followed.
- Case narratives and laboratory logbooks document the results of QC.

Staff Training on Quality

All new MEL staff receive a standard orientation that includes review of all quality documents and pertinent SOPs. In addition, all analysts must perform an IDC and perform satisfactorily (within specified QC limits) on an unknown sample for each parameter they work with.

The Laboratory Director and QA Coordinator attended an EPA training course on Data Quality Assessment on December 13 and 14, 2005.

The QA Coordinator is scheduled to attend an upcoming Quality Conference sponsored by the EPA.

3. Hazardous Waste and Toxics Reduction Program

Overview of Data-Generating Events

The Hazardous Waste and Toxics Reduction (HWTR) Program conducts few sampling events that generate environmental data. Sampling within the program typically falls into two categories:

1. Compliance sampling, consisting of samples of opportunity and pre-planned sampling events.

   Compliance sampling occurs only when a compliance inspector has concerns about a generator's waste management activities. The inspector can take samples immediately without any pre-planning, return to the office, and plan a sampling event for a later occasion or do a combination of the two activities.

   An example was a recent explosion at one of our Treatment, Storage and Disposal Facilities (TSDFs). The compliance staff who responded took a few samples immediately in order to capture information on waste releases to the environment which may have caused the explosion. The staff subsequently planned a second and more detailed sampling event and has decided to continue to sample at the TSDF on a regular basis. QA Project Plans were prepared for the second sampling event (which included a review of the initial samples) and are planned for each subsequent event.

   Historically, because of these types of sampling events conducted by the program, little QA/QC documentation was created. Considerable success has occurred over recent years in familiarizing compliance inspectors with the benefits of pre-planning including the creation of a QA Project Plan. Work continues in this area.

2. Data for programmatic activities and possible regulation change.

   The second type of sampling, obtaining data for programmatic activities and possible regulation changes, is done very infrequently. One appropriate example was sampling done to support possible changes to Washington's used oil regulations. The used oil team decided that information was needed on how adequately used oil was being managed in the state. A second need was identified concerning the impacts of burning used oil for energy recovery in space heaters and boilers. Based upon these needs, a QA Project Plan was written and the data obtained. Since the last EPA audit, however, the program has conducted only three of these types of sampling activities.

As an indication of the amount of sampling done within the HWTR Program, our yearly sampling budget is currently $35,000. This number reflects a long-term decrease in programmatic sampling expenditures. However, as inspectors are being trained on better sampling techniques and are becoming more accustomed to the benefits of pre-planning and of what a QA Project Plan can provide, we are experiencing an increase in sampling and an improvement of data quality obtained for use by the program.

FTEs Designated to Quality

The HWTR Program has not allocated specific percentages of FTEs to QA/QC activities other than work done by the HWTR QA/QC Coordinator. Ten percent of this individual's FTE is dedicated to QA/QC activities including training, QA Project Plan review, QA Project Plan preparation, providing QA/QC advice and recommendations to staff and making the creation of QA Project Plan a routine and beneficial practice among compliance inspectors. In addition, the program has included in its Inspector's Manual (the primary document outlining inspector requirements and training) a commitment to QA/QC activities and expects staff to provide, where appropriate, QA Project Plans for their sampling events.

Specific Staff Quality Responsibilities

As indicated above, the only quality responsibilities in the HWTR Program are those assigned to the QA Coordinator. Because of the limited amount of sampling done by the program, QA/QC responsibilities are included in the staff's job duties but are not assigned a specific value.

QA Project Plans and SOPs

The HWTR Program has no specific QA/QC SOPs. However, the program has worked on formulating a draft QA Project Plan to be used by compliance inspectors. This document grew out of a major training event at which all of the HWTR compliance inspectors from across the state were pulled together for sampling training. The training included information on the different types of QA/QC samples, the importance and benefits to a QA Project Plan. The training attempted to streamline pre-planning activities to minimize impact to staff workload while working to overcome staff resistance to perceived QA/QC complexity. The draft QA Project Plan will undergo extensive revisions as input is received from staff and management. However, it is expected this document will become a boilerplate QA Project Plan for use during HWTR sampling events.

Other Program-Specific Quality Documentation

As noted earlier, the HWTR Program conducts few sampling events, and no additional quality needs have been identified. Therefore, no additional quality documentation exists for the program.

Staff Training on Quality

As indicated earlier, the HWTR Program has committed considerable time and money to improve staff familiarity with sampling and to increase the quality of data obtained during sampling events. There are three activities which demonstrate the program's commitment:

- *Hands-on Sampling Training*

  All compliance inspectors from across the state, along with other program staff commonly involved in sampling events, were pulled together for a two-day training event held at the HAMMER Facility on the Hanford Nuclear Reservation in Richland, Washington. The first

day of the training was spent in typical classroom activities which described the complexities of sampling and provided tools to be used by the inspectors either during, or prior to, sampling events. QA/QC was an integral part of this training. Inspectors were informed about the different types of QA/QC samples, the benefits of pre-planning and writing a QA Project Plan, and were given tools to help in the pre-planning efforts. The second day was spent with actual hands-on mock sampling events and included the requirement of staff to use the QA/QC tools to outline the sampling event and to provide justification for the samples obtained. The presentations given during this training are available upon request.

- *Training Refresher*

  As part of the yearly retreat for compliance, related staff (not limited solely to compliance inspectors but including all staff involved in regulatory compliance throughout the state), prepared two presentations.

  - One dealt with how to conduct a book designation as required by the Washington dangerous waste regulations (WAC 173-303). The training was part of a pre-planning exercise to assist compliance staff in determining if samples were needed based upon information available both from the generator and from specific toxicity databases.
  - The second was a presentation on QA/QC which included the review of data obtained from a sampling event. The intent was to refresh compliance staff with information presented at the previous training and to begin the process of educating staff on reviewing data results. Specific sampling results used by compliance staff in an enforcement and penalty case earlier in the year were used to provide staff with a concrete example. The data package also had several problems which made it perfect as a training aid.

  These presentations are available upon request.

- *Sampling Assistance*

  As part of the duties of the QA/QC coordinator, the QA Coordinator works closely with staff discussing possible compliance sampling and, by working with staff on a one-on-one basis, have made them more comfortable with the QA/QC process. The staff have begun to acknowledge the benefits of writing a QA Project Plan and have begun requesting assistance in writing a QA Project Plan prior to conducting sampling. As the staff comfort level increases, the use of QA Project Plans as a standard sampling requirement increases.

Current QA Activities

As indicated earlier, the HWTR Program continues to work on two major QA endeavors. They are (1) working on a boilerplate QA Project Plan which can be used by compliance inspectors on a routine basis and (2) working to improve staff comfort with QA/QC requirements and proving the benefits to them of pre-planning and writing a QA Project Plan for compliance sampling events. No other QA/QC activities are planned within the program.

4. Nuclear Waste Program

This section is the Nuclear Waste (NW) Program *blueprint* for applying QA and QC to the program goals. It defines the program scope of work for ensuring proper sampling and data usability, verification, and validation. This plan is periodically reviewed to determine if the approved quality management practices continue to be both suitable and effective.

This plan is modeled after Ecology's HQ *Quality Management Plan* with information added that is pertinent to the NW Program mission at Hanford. The NW Program is tasked with ensuring that all radiochemical and chemical data are defensible and can be used in regulatory decision making. The NW Program has contracted laboratories that are able to test mixed waste samples with methods that meet regulatory detection levels, precision, and accuracy limits.

Introduction

The EPA requires Ecology to document its QA in an approved *Quality Management Plan*. This plan is available on Ecology's internet site at www.ecy.wa.gov/biblio/0503031.html.

The requirement is communicated by EPA through several mechanisms including:

- 48 CFR Part 46, Federal Acquisition Regulations, for contractors.
- 40 CFR Parts 30, 31, and 35 for assistance agreement recipients.
- EPA order 5360.1 CHG 1, which establishes a mandatory agency-wide quality system.
- Hanford Federal Facility Agreement and Consent Order 89-10 Rev. 6.

This *Quality Management Plan* has been prepared to meet EPA requirements described in document QA/R-2; EPA requirements for *Quality Management Plan*s, November 1999; and the Ecology Agency's *Quality Management Plan*, June 2000.

The NW Program *Quality Management Plan* outlines the principles and practices that lead to effective planning and execution of environmental studies and Hanford oversight. It applies to all work performed by the NW Program that involves the acquisition of data from sampling activities, U.S. Department of Energy contractor-generated data, information systems, databases, permitted facilities, and all documentation used in regulatory decision making.

Management and Organization

The mission of Ecology is to protect, preserve, and enhance Washington's environment and promote the wise management of our air, land, and water for the benefit of current and future generations**.** Our *goals* are to prevent pollution, clean up pollution, and support sustainable communities and natural resources.

Ecology's Executive Policy 1-21, *Establishing Quality Assurance*, was adopted on August 25, 1993 and revised in October 1999 and May 2006. The policy applies to environmental data collection studies conducted or funded by Ecology. It is the responsibility of the NW Program and the agency's management to promote the consistent application of QA and QC principles to

the planning and execution of these activities. A copy of this policy is included at the end of this report.

It is the intent of the policy that all data are of documented quality, satisfies the requirements of its intended use, and are legally defensible. The policy is implemented by Ecology management and staff. Appropriate QA and QC practices are used in all phases of environmental activities. All plans are developed with sampling, measurement, assessment, and use of data in mind. The QA/QC requirements should be commensurate with the importance of the work, available resources, the unique needs of Ecology, and the consequences of potential decision errors.

The NW Program has one chemist designated as the Quality Assurance Coordinator. The three other staff chemist positions are also required to implement the Quality Assurance Management Plan.

Quality System Components

The quality system is a structured and documented management system that provides the framework for planning, implementing, documenting, and assessing environmental data operations, as well as for carrying out required QA and QC activities.

The quality system encompasses both management and technical activities, and it requires the active participation of all employees.

The principal components of Ecology's quality system and the corresponding tools for implementing them include:

- Quality assurance policy (Ecology Executive Policy 1-21).
- Quality system documentation (Quality Management Plan).
- Annual reviews and planning (QA Report to Management and Performance Plans).
- Training in QA and QC (Training Plans).
- Systematic planning of projects (Data Quality Objectives Process).
- Project-specific quality documentation (QA Project Plans).
- Project and data assessments (Data Verification/Validation and Data Quality Assessment).
- Management assessments (Quality Systems Audits).

Other Tools for Implementing Ecology's Quality System Within the NW Program

- *Ecology Lab Users Manual*

- *Hanford Analytical Services Quality Assurance Requirements Documents*
  Volume 1: Administrative Requirements
  Volume 2: Sampling Technical Requirements
  Volume 3: Field Analytical Technical Requirements
  Volume 4: Laboratory Technical Requirements
  DOE/RL-96-68, Revision 2 (HASQARD), U.S. Department of Energy, Richland Operations Office, Richland, Washington.

- *Laboratory Quality Assurance Manual*, 2001, Paragon Analytics, Inc., Fort Collins, Colorado.
- *222-S Laboratory Quality Assurance Plan***,** 2002, Hanford Analytical Services, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- *Waste Sampling and Characterization Facility Quality Assurance Plan*, HNF-SD-CP-QAPP-017, Rev 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- *Data Validation Procedures for Chemical Analyses*, 1993, WHC-SD-EN-SPP-002, Rev. 2, Westinghouse Hanford Corporation, Richland, Washington.
- *Data Validation Procedures for Radiochemical Analyses*, 1993, WHC-SD-EN-SPP-001, Rev. 1, Westinghouse Hanford Corporation, Richland, Washington.
- *Data Validation Procedures for Radiochemical Analyses*, 2000, BHI-01433 Bechtel Hanford Inc. Rev. 0, Richland, Washington.
- *Data Validation Procedures for Chemical Analyses*, 2000, BHI-01435 Bechtel Hanford Inc. Rev. 0, Richland, Washington.
- *Hanford Federal Facility Agreement and Consent Order*, 89-10 Rev.6, 2003, Sections 6.5 and 7.8 on Quality Assurance, Washington State Department of Ecology, United States Environmental Protection Agency, United States Department of Energy.
- *Field and laboratory Standard Operating Procedures (SOPs).*
- *Guidelines for Preparing QA Project Plans for Environmental Studies.*

QA/QC Responsibilities

It is the responsibility of all technical staff to emphasize teamwork in achieving the quality of data required for good decision making.

QA Coordinator's Responsibilities

- Act as point of contact for the Nuclear Waste Program data quality issues.
- Coordinate with the agency QA Officer to identify needs related to QA Project Plan preparation, QA/QC training, and agency QA issues that may differ from Hanford QA issues.
- Assist project managers with the review and approval of all QA-related documentation. (e.g., project plans, sampling and analysis plans, waste analysis plans).
- Provide technical assistance in the review, preparation, usability, and verification of the quality of data results on all NW Program environmental projects.
- Ensure QA/QC requirements are met in laboratory and risk assessment contracting.
- Provide information to the agency QA Officer for the QA Report to Management.
- Communicate with federal and other state agencies regarding QA issues.
- Provide and oversee training to NW Program technical staff on QA/QC fundamentals.

Field Staff

The NW Program staff collecting samples will follow standardized procedures for sampling and other data-generating processes. Included are the following elements:

- Understand and following the QA Project Plan.
- Check all equipment and supplies before field operations.
- Ensure sample integrity. Proper collection, preservation, labeling, packaging, shipping, and chain-of-custody procedures must be followed.
- Use the NW Program shipping and sampling checklists.

Personnel Qualifications and Training

The QA Coordinator and training staff are responsible for QA/QC training of Ecology personnel in the Nuclear Waste Program. The QA Coordinator and other chemists shall maintain competence in QA/QC principles and practices through (1) the literature, (2) training offered by outside sources, and (3) participating in relevant regional and national conferences.

The NW Program personnel shall have sufficient education and training to carry out assigned responsibilities. Training is designed to raise the awareness of and competence in good QA/QC practices and is provided on subjects such as sampling; statistics; and the EPA 7-Step Data Quality Objective process for preparation of QA Project Plans, Waste Analysis Plans, Sampling Analysis Plans, field testing, and analytical instrumentation/quality control.

The NW Program QA Coordinator shall identify and make use of resources from inside and outside of Ecology in providing training. Many Ecology staff have extensive experience in their areas of specialization that can be incorporated into QA/QC training.

The NW Program has unique requirements for Radiological QA/QC training. The QA Coordinator helps identify the training needs. These needs are met by arranging for the necessary assistance from the Washington State Department of Health and trainings sponsored by the U.S. Department of Energy.

Procurement of Items and Services

Equipment, supplies, and limited use services are obtained by the purchase order process. The NW Program has contracted Paragon Analytics, Inc. of Fort Collins, Colorado, for low-level, mixed- waste analysis. Data from analyses performed are reviewed by the QA Coordinator and trained chemistry staff. The laboratory is audited every three years.

Laboratory Quality Assurance/Quality Control

All analytical work is defined and controlled by a statement of work, work order, or other work authorizing document. Samples are handled according to approved laboratory procedures. The accuracy, precision, and limitations of analytical data are determined by QC performance. Data validation can be performed by the NW Program QA Coordinator, upon request.

Nuclear Waste Program Database Information

The NW Program is currently using two databases:

1. WPLCS – Water Quality Permit Life Cycle System (state database)

- Designed to manage information about National Pollutant Discharge Elimination System (NPDES) and state waste discharge permits.
- Run by a regional WPLCS coordinator who is responsible for operations and maintenance of the database.
- Training sessions are available.

2. RCRA – Resource Conservation and Recovery Act Information System (EPA database)

- Manage information regarding RCRA inspections and permit modifications.
- Ecology HQ is responsible for operations and maintenance of database.
- QA review of the database occurs quarterly.
- EPA Region 10 performs mid-year and end-of-year reviews.

5. Spills Program

Quality Assurance Coordinator

Dale Davis is the QA Coordinator of the Spill Prevention, Preparedness, and Response Program (Spills Program). He also acts as the program Sampling Specialist. The two positions are one in the same; the primary objective for both is improvement of sampling data quality. The person in this position is responsible for developing all Spills Program specific sampling policies, procedures, guidelines, forms, and other related tools. This person also develops and conducts sampling training for program staff, ensures that sampling related tools are made available to staff, and acts as the lead Sampling Specialist during spill responses.

A program QA Plan is included as part of the Program's biennial planning and is posted on the Spills Program intranet site (Section VIII).

Present Status of Plan Implementation

- Spills are emergencies, and advanced planning is necessarily limited. In light of this, the Spills Program has developed policies and procedures (in cooperation with NOAA, the U.S. Coast Guard, and EPA) that ensure that high quality samples and data are collected in a manner that is legally defensible.
- Program staff use a *Sampling Plan Template* to develop a plan for any sampling associated with an incident. The template prompts the user to define the sampling objective(s); sketch out the area impacted by the spill; and identify sampling sites, the number and type of samples to be collected, and the appropriate containers. The template also refers the user to *Sampling Guidelines* that have been developed specifically for collection of samples associated with spills (primarily oil spills). A *Sampling Documentation Form* is available to record sampling related information.
- Once samples have been collected, program staff is encouraged to use an *Oil Spill Chain-of-Custody/Request for Analysis Form* developed specifically for oil spill related samples. Guidelines on the back of the form help the user select the appropriate analyses and provide associated information such as sample size and container.
- For larger spills, a Sampling Specialist develops a *Comprehensive Sampling Plan* that coordinates all sampling activities associated with the incident. Again, a template is used but the information included in the template is much more detailed and includes QA guidelines.
- Comprehensive sampling plans, called *Ephemeral Data Collection Plans*, are being developed for large oil facilities located near waterbodies. These plans are similar to a QA Project Plan and are designed to direct sampling in the early hours of an oil spill in a specific location until another plan can be developed that is specific to the incident. The plans are developed in association with representatives from the facilities. The plans identify sampling sites, types and numbers of samples to collect, sampling procedures, analytical methods, and the laboratory that will analyze the samples. The plans are designed to satisfy Natural Resource Damage Assessment (NRDA) needs.

- State, federal, and oil corporation NRDA representatives meet regularly as an informal group called the *Joint Assessment Team* (JAT). This group has developed a comprehensive guidance document for cooperative NRDAs that include guidelines for developing a sampling plan with similar components of the Ephemeral Data Collection Plans. If there is an oil spill, the document identifies nationally recognized and accepted procedures that would be used by Spills Program staff and others to develop and implement a NRDA.
- All forms, guidelines, and procedures are available to Spills Program staff at X:\Spills_IMAT\Planning\Environmental Unit\Sampling Specialist.
- A QA\QC chapter for the Spills Program SOP Manual has been prepared but is still in draft form. This chapter (Chapter 9) should be added to the manual sometime in 2006.

QA/QC Training

- Received by Program Staff

  All Spills Program staff is required to complete DrillTrac training associated with various positions within the Incident Command System (ICS). Sampling training is one of the required elements of DrillTrac. All program staff is required to take basic sampling training, which includes information necessary to collect qualitative samples associated with oil spills. All full-time spill responders are required to take intermediate sampling training that adds to the basic training by providing information necessary to collect quantitative samples. A select group of people are required to take advanced sampling training. Staff at the advanced level fill the Sampling Specialist position within the ICS and develop comprehensive sampling plans, direct sampling teams, and coordinate laboratory analyses.

- Provided by Program Staff

  The basic and intermediate sampling training described above is provided by Spills Program staff. Advanced sampling training is obtained through workshops where participants are specialists within the oil spill industry/community, and discussions result in consensus on various sampling issues.

Technical Assistance and QA/QC

- The sampling training described above includes sections on developing sampling plans and specific QA/QC requirements. Program staff is instructed to contact either Dale Davis (Spills Program QA Coordinator) or Dan Doty (Washington Department of Fish & Wildlife Oil Spill NRDA Sampling Specialist) with *any* questions regarding sampling (one is always available 24/7 by pager). Staff is also encouraged to contact Ecology's Manchester Environmental Laboratory with questions related to oil spill sampling.

QA/QC Issues

- After significant spills, staff involved in the response attend a debrief to discuss lessons learned, where sampling related issues are reviewed. Any problems identified are immediately corrected. In addition, debriefs often result in procedural improvements, such

as the Early Assessment Team concept, that help to ensure that data collected are of the highest quality.

Planned QA/QC Activities

- SOPs are being developed for all program field sampling procedures.
- Spills Program sampling results from Manchester Environmental Laboratory need to be entered into Ecology's EIM system.

6. Toxics Cleanup Program

Description of Quality Structure - FTEs Designated to Quality

David Sternberg is the QA Coordinator for the Toxics Cleanup (TC) Program. He heads a program-wide team consisting of:

- Headquarters (HQ) Aquatic Lands Cleanup Unit (ALCU) – Fu-Shin Lee.
- Headquarters (HQ) Land Cleanup Unit (LCU) – Chung Ki Yee.
- Central Regional Office (CRO) – Valerie Drew.
- Eastern Regional Office (ERO) – Phil Leinart.
- Northwest Regional Office (NWRO) – Joe Hickey.
- Southwest Regional Office (SWRO) – Joyce Mercuri.

Specific Staff Quality Responsibilities

HQ QA Coordinator: Serves as focal point to disseminate information from agency QA Officer regarding new QA initiatives (e.g., QA Project Plan template development), applicable training opportunities, etc., to TC Program QA team; represents TC Program at agency-wide QA Coordinators meetings; reviews and signs off on certain QA Project Plans that are produced for Ecology-funded projects (e.g., Brownfields Assessments); and performs other duties as spelled out in the agency *Quality Management Plan.*

SWRO QA team member: QA responsibility is to review sampling and analysis plans (SAPs) or QA Project Plans that are produced in-house for Ecology-funded projects. This amounts to about one per year at this time; however, there may be more as we move toward the Puget Sound Initiative sites. Other responsibilities include keeping staff informed of new initiatives or requirements for QA, and updates from the lab about methods or issues they have encountered. The SWRO QA team member is also available for staff questions on QA.

There was no response from CRO and ERO.

QA Project Plans and SOPs Existent

- HQ-ALCU – Sediment Sampling and Analysis Plan Appendix (SAPA).
- Puget Sound Dredged Disposal Analysis Guidance Manual.
- Data Quality Evaluation for Proposed Dredged Material Disposal Projects (QA-1).
- Data Validation Guidance Manual for Selected Sediment Variables (QA-2).

Staff Training on Quality

- Data Quality Assessment and Statistical Tools (2 Days) HQ, HQ-ALCU, and SWRO.
- Uniform Federal Policy for QA Project Plans (2 Days) HQ.

Current QA Activities

- HQ – Review of contractor-prepared QA Project Plans for Brownfield Site Assessments.

Current Quality Issues

Ecology management support for program QA Coordinators: Emphasis on having all the regional offices play a role in TC Program's QA team needs attention, as very little was provided for this report from ERO and NWRO.

SOPs are in the development stage, or existing ones are used. Also, see Chapters 3–6 in SAPA 2003 (above – 2c).

Data verification (per SWRO): If the TC Program receives data from Manchester Environmental Laboratory, the program is under the understanding that the data have been verified and validated, so the program believes this is not a shortfall. The data validation for cleanup sites is usually done by the consultants for the potentially liable party (PLP). EPA has QA/QC people to oversee and spot check the data validation done by the PLP consultants for their cleanup sites.

7. Water Quality Program

Description of Quality Structure, Current QA Activities, and Specific Staff Quality Responsibilities

- The Water Quality (WQ) Program has a Quality Coordinator tracking the quality activities within the program with the assistance of designated quality representatives from each of seven sections. The main goal of the Quality Coordinator and the sectional representatives is to implement the Credible Data policy in all pertinent program activities.
- Information systems are designed and maintained by the Information Systems Unit at headquarters providing a structure for uniform business practices.
- The Financial Assistance Section awards grants and low interest loans for projects intended to improve water quality. Monitoring of water quality is usually required to gauge the effectiveness of the project. Monitoring must be in accordance with a QA Project Plan approved by the grant and loan officer with technical assistance from the EA Program. The monitoring data are then input to Ecology's Environmental Information Management System (EIM) database.
- The WQ Program EIM data coordinator provides QA checks of projects and data submitted by grant and loan recipients. The QA check includes confirmation that:
    - Data have been collected according to an Ecology-approved QA Project Plan.
    - Field data have been collected with properly calibrated field instrumentation.
    - Nutrient samples were sent to Ecology-accredited labs within the proper holding times for analysis.
    - Data analysis calculations are correct.
    - Data are comparable to other data from the watershed.
    - When questions arise from data review, the WQ Program EIM data coordinator consults with the data submitter to clarify the information. Best professional judgment is employed when assessing data for their use for input into EIM. Data that were not collected in accordance with an approved QA Project Plan are not entered into EIM with a high level of QA designation. Once data sets are reviewed for completeness and accuracy, the data are input into the EIM database. The QA Project Plan may be amended so that future data submittals can meet QA checks for input into EIM.

Specific documents that are used for QA/QC purposes (all are EA Program documents):

- *Guidelines for Preparing QA Project Plans for Environmental Studies.*
- *Field Sampling and Measurement Protocols for the Watershed Assessments Section, 1993.*
- *Determination of Instantaneous Flow Measurements of Rivers and Streams.*
- *Manchester Environmental Laboratory Lab Users Manual, Eighth Edition.*

Credible Data Policy – Assessing Water Quality Data

This policy describes the QA measures, guidance, regulations, and existing policies that help ensure the credibility of data and other information used in agency actions based on the quality of state surface waters. Agency actions include determinations of whether surface water is supporting its designated use. These actions include the 303(d) and 305(b) assessment processes, establishment of a Total Maximum Daily Load (TMDL) and the associated load allocations and waste load allocations, and revisions to water quality standards. This policy is required by the *Water Quality Data Act* (WQDA) codified in RCW 90.48.570 through 90.48.590. See Appendix E for the Credible Data policy.

The policy applies when evaluating data and information for use in agency decisions when the quality of a surface water of the state is at issue. The policy is also intended as guidance for all parties interested in submitting data for consideration in decisions related to water quality

Calculating TMDLs in Accordance with the Credible Data Policy

All TMDLs are conducted with a QA Project Plan.

Screening Data to Determine Appropriate QA Levels for EIM

All data used in water quality assessment updates and TMDLs are required to meet specific QA requirements. Sampling and analysis must be conducted under a documented QA Project Plan or other plan that Ecology determines to be equivalent.

For purposes of identification of impaired and unimpaired waters or development of TMDLs, any entity submitting monitoring data to Ecology must provide Ecology with documentation that the data collection, planning, implementation, and assessment was consistent with the concurrent version of Ecology's *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies.* Documentation should address each of the 14 elements described in the guidelines or provide an explanation for omitted elements. Other pertinent factors that enhance data quality should also be addressed in the project plan document.

The monitoring entity providing water quality data for water quality assessment updates and TMDLs must collect, preserve, and analyze data using methods of sample collection, preservation, and analysis. These methods are prescribed in procedures (where available) published by Ecology, EPA, U.S. Geological Survey, American Public Health Association, U.S. Army Corps of Engineers, American Society for Testing and Materials, or in the Code of Federal Regulations. New and revised methods will be added as deemed appropriate according to the exemption policy under accreditation. Accreditation for the new methods will be acquired by the supporting lab as soon as practical thereafter.

The monitoring entity must ensure that chemical, microbiological, physical, radiological, and toxicological samples (excluding data generated by field methods) are analyzed in a laboratory accredited by Ecology or obtain a waiver to this requirement in accordance with Ecology Executive Policy 1-22.

Documentation must be provided with all water quality data submitted for consideration in water quality assessment updates and TMDLs indicating that the objectives of the QA Project Plan or equivalent QA procedures were met. Documentation must also be provided that indicates whether the data are suitable for water quality-based actions. Data suitable for use in water quality-based actions must include an adequate number of measurements in the total data set for a waterbody. The assessment of the data must consider whether the data, in total, fairly characterize the quality of the waterbody at that location at the time of sampling. The QA Project Plan must address the adequacy of the number of samples and explain procedures to assure that the sample set yields data that are representative of the waterbody.

Data collectors submitting information to Ecology for an impaired water identification or TMDL decision must document the planning, implementation, and assessment strategies used to collect the information. The document, or QA Project Plan, is expected to clearly state the original intended use of the information gathered (e.g., chemical/physical data for TMDL analyses) and any limitations on the use of the data (e.g., these measurements only represent storm event conditions).

Credible Data Audit Process

Contingent on available resources, Ecology may take one or more of the following actions to determine whether data collected by internal or external parties meet the requirements of this policy:

- Review of quality documentation submitted for completeness (presence/absence checklist).
- Review of QA Project Plans and monitoring reports for adequacy of QA evaluation.
- Detailed audit of quality assurance documentation provided by data submitters.
- Independent validation of submitted data for quality/credibility.

FTE Designated to Quality

We have approximately three FTEs including EIM work, whole effluent toxicity (WET) testing, QA Coordinator, permit writers group, TMDL redesign group, information technology support, and regional QA Project Plan work. This number may go up as we implement the Credible Data policy, and expand use of QA Project Plans by externals.

QA Project Plan and/or SOPs Existent

SOP documentation is in place for WPLCS data entry and reporting, wastewater discharge permit writing, TMDL reports, guidance for permit applications, 401 Certification for dams, enforcement and compliance, reclaimed water, Underground Injection Control Program guidance, TMDL priority-setting, and 303(d) listing policy. We have no programmatic QA Project Plans, but much of our work is performed by the EA Program, and QA Project Plans are always associated with the EA Program-generated data.

Staff Training on Quality Topics

Many staff attended the December 2005 training on Data Quality Assessment.

Other Program-Specific Quality Documentation

1. The following was excerpted from the 2005-07 WQ Program's Biennial Plan:

Key Principles

Quality Data and Information

It is important that the information we share be of sufficient quality to accurately define and prioritize water quality problems along with cost-effective solutions. Therefore, the Program is committed to improving our information management systems and the quality of the data in them. This will be accomplished by incorporating recommendations from the agency's Quality Assurance Report (May 2003); completing the interface between our permit database (WPLCS) and EPA's database (PCS); implementing the Credible Data Bill; developing a web-based WPLCS application; increasing e-data submission opportunities and providing timely response to our public disclosure and information requests. Success in this area will enhance our ability to explain and share water quality data with other stakeholders.

A1. Regulatory Support (operation certification, Growth Management Act, State Environmental Policy Act, technical support, non-grant/loan engineering review, general facility management) (16.3 FTEs)

Actions

Permitting Support

- Maintain Permit Writer's manual, including annual updates, working with program on policy development.
- Develop permit-related policy, as assigned.
- Provide Permit 101 training internally and externally. Provide technical and policy assistance to permit writers in the agency.
- Facilitate and participate on Permit Writers Group to provide recommendations on permit writer's issues.
- Support whole effluent toxicity (WET) test regulatory system, data management, eliminate WET test backlog, implement test reviews using CETIS.

Quality Assurance Coordination

- Educate WQ Program staff on QA issues as needed.
- Serve as intermediary between WQ staff and the EA Program staff on QA issues.
- Implement QA report recommendations as appropriate.
- Work with all involved parties to develop or assist in the development of QA Project Plans.

Information Systems

- Maintain the Water Quality Permit Life Cycle System (WPLCS).
- Perform quality assurance and quality control for WPLCS.
- Correct mathematical errors and apprise professional staff of incomplete, inaccurate, or anomalous data.

2. The following was excerpted from the 2005-07 Performance Partnership Agreement (PPA) between EPA and Ecology:

Section Four – Quality Assurance

PPA Quality Assurance and Assessment Process

At the end of Fiscal Year 2006 (June 30, 2006) and the end of Fiscal Year 2007 (June 30, 2007) for this Performance Partnership Agreement, Ecology and EPA Region 10 will assess progress, as well as identify adjustments and additional actions that need to be taken, to assure compliance with the terms of this Agreement. This assessment will include the following elements:

- Effectiveness: how readily the Agreement enables Ecology and EPA to direct resources to improve environmental outcomes.
- Public credibility: how credible and reliable the public finds the measures used to report environmental outcomes.
- Fiscal soundness and program accountability: how well this Agreement enables Ecology and EPA to manage public funds in an efficient, effective and economical manner.

The findings from these assessments will be used to develop any further refinements to the Agreement that might be needed.

Quality Assurance Requirements for Grants, Cooperative Agreements, and Assistance

Ecology needs data about the condition of the air, water, and land in order to achieve its goals of preventing pollution, cleaning up pollution and supporting sustainable communities and natural resources. Accurate environmental data are critical for understanding problems and taking corrective actions. Data quality assurance is important to ensure that the millions of dollars spent on environmental sampling and analysis provide the quality of data needed for decision-making. Additionally, most of EPA's grant money to Ecology requires certification that Quality Assurance Plans are developed and implemented. Quality assurance requirements for Grants and Cooperative Agreements to State and Local Governments are contained in 40 CFR Part 31 and quality assurance requirements for State and Local Assistance are contained in 40 CFR Part 35.

The following paragraphs describe how Ecology has been meeting those requirements.

Ecology's *Quality Management Plan* (QMP) was revised in June 2000 (revised again in September 2005), to conform to the EPA's format and requirements and to align Ecology's plan with EPA's approach to environmental data quality. This QMP was approved by EPA Region

10's Quality Assurance Manager and, based on that approval, Ecology was delegated the authority to review and approve QA Project Plans based on procedures documented in the QMP.

The QMP specifies that the Director is responsible for designating the QA Officer and that Program Managers are responsible for designating QA Coordinators. Guidelines for preparation of the QA Project Plans were revised and published as the *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* (Publication No. 04-03-030, July 2004). These revised guidelines incorporated improvements from EPA's guidance and from Ecology's experience in preparing and reviewing QA Project Plans.

Ecology's QMP specifies that Ecology's QA Officer must prepare a status report for management every two years; this status report should also include recommendations for improvements in the QMP and its implementation.

The EPA Region 10 Quality Assurance and Management Unit perform audits of delegated state environmental programs. EPA headquarters is currently developing national guidance for when and how often state program performance audits/reviews should be done; Region 10 will follow this guidance in carrying out its performance audits of Ecology programs. The purpose of these audits will be to verify that the QMP is being correctly implemented and that Ecology is meeting all other EPA quality assurance requirements for grants, cooperative agreements, and assistance.

Water Cleanup Plans (TMDLs)

Ecology and EPA will jointly implement Ecology's TMDL redesign for streamlining and standardizing our TMDL production work. This will include EPA staff time helping to produce standardized language to use in TMDLs, performing peer review of draft TMDLs, revising the format and content of TMDLs, participating in TMDL database development, and evaluating cost effective TMDL technical study alternatives.

8. Air Quality Program

The Air Quality (AQ) Program has a rigorous and well-defined QA program. The QA Coordinator for the program is Stan Rauh, who has wide-ranging experience in managing the AQ Program quality system. Their quality relationship with EPA predates the implementation of the Ecology quality system.

Training

AQ Program staff did not attend any specific QA training during this calendar year. However, QA staff has received extensive training over the years and typically attend every available training opportunity when the training is air-specific. The least senior QA staff member has a minimum of five years of experience, with the most senior having 20+ years experience. The AQ Program management is very supportive of allowing staff to seek training anywhere it's available in the United States.

The AQ Program QA staff has provided one-on-one training to Ecology regional and HQ staff, as well as state, federal, tribal, and local air agency staff, on numerous types of air monitoring equipment and initial data validation techniques. No formal classroom training was offered this year.

Quality Management Plan

The AQ Program operates under an approved comprehensive Air Monitoring Quality Assurance Plan and prepares SOPs that can be found at: www.ecy.wa.gov/programs/air/other/Air_Monitoring_Procedures.htm.

This plan has been approved by both EPA and Ecology management.

Quarterly and Annual Data Quality Assessment Reports are prepared and are available upon request.

Quality Assessment Activities

All QA/QC problems and corrective actions are identified in the Quarterly and Annual Data Quality Assessment Reports.

During the 2005 calendar year, the AQ Program operated 72 ambient air monitoring stations (131 parameters) as well as 15 Prevention of Significant Deterioration quality meteorological stations (49 parameters). Ninety-two percent of the monitored parameters met the AQ Program's objectives for precision, accuracy, and data completeness.

The AQ Program is committed to a robust QA program and provides adequate resources to implement the program.

9. Shorelands and Environmental Assistance Program

Description of Quality Structure in the SEA Program

QA plans determined on a case-by-case basis.

FTE Designated to Quality

One person tasked with being a QA manager but not specific time assigned for task; actual time spent approximately 0.02 FTE.

Specific Staff Quality Responsibilities

Established project-by-project on a case-by-case basis.

QA Project plan and/or SOPs Existent

One QA Project Plan developed for the mitigation compliance project.

Other Program-Specific Quality Documentation

Coastal Monitoring staff developed Federal Geographic Data Committee (FGDC) metadata for various data collected through their beach morphology monitoring program. The metadata describes collection methods and levels of accuracy.

Staff Training on Quality

No training done specific to quality.

Current QA Activities

Projects address QA individually as needed to meet grant requirements. Additionally, the Ecology QA Officer is coordinating training for SEA Program watershed leads responsible for oversight of data-generating monitoring activities resultant from the watershed grant process.

10. Solid Waste and Financial Assistance Program

The Solid Waste and Financial Assistance (SWFA) Program interacts with the quality system primarily through their Industrial Section, which focuses on three major industries of Washington State: aluminum smelters, oil refineries, and pulp and paper mills. The section's staff is trained to handle the complexities of these industries and is responsible for environmental permitting, site inspections, and compliance issues. They regulate air, water, hazardous waste, and cleanup management activities at pulp and paper mills and aluminum smelters. They also regulate water, hazardous waste, and cleanup management activities at state oil refineries.

Quality Activities of the Industrial Section

The Industrial Section conducts Class II NPDES water inspections with sampling and quality assurance plans for regulated facilities. QA Project Plans are prepared for inspections for facilities regulated by the Industrial Section.

The section also reviews and uses boiler plates for fact sheets and permits for facilities in the Industrial Section's renewal of NPDES permits.

Training

One staff member attended EPA QA Project Plan training.

Appendices

Appendix A. Ecology Standard Operating Procedures (SOPs)

Table A-1. SOPs for Manchester Environmental Laboratory (part of the EA Program)

Index Number	Title of SOP
Microbiology	
710001	%KES Membrane Filter Technique, G. Jay Vasconcelos, EPA Region 10 Microbiologist, "The Detection and Significance of *Klebsiella* in Water", Modified
710005	Autoclave Operations
710013	Microbiology Dishwasher Operation
710014	*Escherichia coli* Detection by Most Probable Number, EPA 1104
710015	*Escherichia coli* Detection Membrane Filter Technique, EPA 1105
710017	Enterococcus in Water by Most Probable Number, Standard Method (SM) 9230 B
710018	Fecal Coliforms Membrane Filter Technique, Standard Method 9222 D, Modified
710021	Fecal Coliforms in Water by Most Probable Number, Standard Method 9221 E
710022	Fecal Streptococcus Membrane Filter Technique, Standard Method 9230 C
710039	Total Coliforms Membrane Filter Technique, Standard Method 9222 B, Modified
710042	Total Coliforms in Water by Most Probable Number, Standard Method 9221 B, Modified
710073	Fecal Coliforms in Water by Most Probable Number Using A-1 Media, Standard Methods 9221 E-2
710075	Heterotrophic Plate Count & Nuisance Organisms Iron & Sulfate
710076	EPA Method 1600: Membrane Filter Test Method for Enterococci in Water
710079	Total Nonvolatile Solids (Fixed) and Volatile Solids ignited at 550^{O}C, Standard Method 2540 E
710081	pH for Microbiology section
710083	Membrane Filter Test Method for Escherichia coli in Water (mTEC2), EPA Method 1103.1
710084	Microbiology Quality Assurance Procedures
General and Physical Chemistry	
710002	Alkalinity, SM 2320B
710004	Ash Free Weight, SM 10300 C, Modified
710007	Biochemical Oxygen Demand Using the Dissolved Oxygen Probe EPA Method 415.1
710008	Fluoride/Chloride/Sulfate by Ion Chromatography, EPA Method 300.0
710009	Conductivity, SM 2510B
710012	Fluorometric Determination of Chlorophyll *a* in Saltwater and Freshwater Samples, Standard Method 10200 H, Modified
710028	Total Organic Carbon and Dissolved Organic Carbon EPA Method 415.1 (Combustion and NDIR Detection)
710029	Ammonia (phenolate) Method by Colorimetric Flow Injection Analysis, Standard Methods 4500-NH3 H

Index Number	Title of SOP
710030	Nitrogen, Nitrate-Nitrite, SM 4500-NO3 I, Modified (Colorimetric, Automated, Cadmium Reduction)
710031	Nitrogen, Nitrite, SM 4500-NO_3 I, Modified (Colorimetric, Automated)
710032	Oil and Grease EPA Method 1664: N-Hexane Extractable Material (HEM; Oil and Grease), by extraction and Gravimetry, Modified
710033	Orthophosphate in Waters by Colorimetric Flow Injection Analysis, SM 4500 P G
710034	pH (Electrometric), EPA Method 150.1
710038	Settleable Solids (Settleable Matter), SM 2540 F
710043	Total Dissolved Solids (Residue, Filterable), SM 2540 G
710045	Total Non-Volatile Solids and Percent Total Volatile Solids, SM 2540E, Modified
710046	Total Non-Volatile Suspended Solids (Residue, Volatile), SM 2540E, Modified
710047	Total Solids and Total Percent Solids (Total Residue, Sediment or Water Samples), SM 2540B
710048	Total Nitrogen in Waters by Colorimetric Flow Injection Analysis, Standard Method 4500-N B.
710050	Total Phosphorus, SM 4500 P I, Modified (Colorimetric, Automated, Ascorbic Acid Two Reagent)
710052	Total Suspended Solids (Residue, Non-Filterable), SM 2540D, Modified
710054	Turbidity, SM 2130 B, Modified
710055	Ultimate Biochemical Oxygen Demand (UBOD)
710056	Analysis of Bulk Asbestos, Federal Register, 40 CFR 763, Appendix A to Subpart F, Modified
710057	Asbestos Fiber Counting by the NIOSH 7400 Method, Modified
710058	Gravimetric Analysis of High Volume Air Filters, Federal Register, 40 CFR 50, Appendix J, Modified
710059	Metal Analysis of Air Filters, Federal Register, 40 CFR 50, Appendix G, Modified
710060	Spiking Filter Strips with Lead
710068	Soil and Waste pH Electrometric SW846 Method 9045C
710070	Total Organic Carbon in Soil/Sediment, PSEP-TOC
710071	Determination of Salinity by Refractometer
710078	Gravimetric Analysis of $PM_{2.5}$ Fine Particulate Air Filters, Federal Register, 40 CFR 50, Appendix L, Modified
710080	Percent Total Solids for TOC PSEP samples at 70 °C and 104 °C
710085	Suspended Sediment Concentration; ASTM Method D3977-97 (re-approved 2002), Test Method B - Filtration
710086	Alkalinity in Seawater; Fisheries Research Board of Canada; Bulletin 167, Second Edition, 1.4.1.2
Metals	
720002	Metals Water Sample Preparation, EPA Method 200.2
720004	ICP: TJA Solutions IRIS Advantage, EPA Method 200.7
720009	Determination of Mercury in Water by Cold Vapor Atomic Absorbance, U.S. EPA Methods 245.1, Modified and SW846 7470, Modified
720011	Metals Low Level Cold Vapor Mercury Analysis of Water Samples Using Bromine Oxidation, U.S. EPA Method 245.7, Modified

Index Number	Title of SOP
720012	Metals Sediment Sample Preparation by Hotblock Digestion, SW846 Method 3050B, Modified
720013	Metals Water Sample Preparation, EPA Method 200.2
720015	Sediment Preparation by Microwave Digestion, SW846 Method 3051
720016	Toxicity Characteristic Leaching Procedure for Metals SW846 Method 1311
720017	Metals Data Review
720018	ICP Mass Spectrometer VG PQ ExCell, EPA Method 200.8
720021	Determination of Mercury by Cold Vapor Atomic Absorbance in Sediment, SW846 7471 Modified, and EPA Method 245.5, Modified
720022	Solid Preparation by Microwave Digestion, SW846 Method 3052
720024	Low Level Phosphorus by ICP-MS, EPA Method 200.8
720025	Metals Water Sample Preparation, EPA method 3010A
720026	Metals Water and Aqueous Waste Sample Preparation for Analysis by ICP/MS, SW-846 Method 3020
720027	Determination of Mercury by Cold Vapor Atomic Absorbance in Tissues US EPA SW846 7471B Modified, and 245.6, Modified (Tissue)
Organics	
730002	Analysis of Water/Soil/Sediment/Fish Tissue Samples for Organochlorine Pesticides and Polychlorinated Biphenyls by GC/ECD SW846, Methods 8081 and 8082
730003	Analysis of EDB (Ethylene Dibromide), DBCP (Dibromochloropropane) and Trichloropropane in Drinking Water and Waste Water by Liquid/Liquid Extraction, EPA 504 and 504.1, Modified
730005	Butyltin Analysis
730006	N-Methylcarbamate Extraction, EPA Method 531.1 and SW-846 Method 8318, mod.
730009	Determination of Percent Lipids in Tissue
730011	Extraction of Semi-volatile Organic Analytes (BNAs), Dinoseb and PCP in Water
730012	Extraction of BNAs/Pesticides/PCBs/Op-Pesticides in Soils, Sediments and Sludges, SW-846 Method 3540
730013	Analysis of Chlorinated Acid Herbicides from Soils and Sediments (EPA Method 8151B)
730018	Florisil® Column Cleanup
730021	Semi-volatile Base/Neutral/Acid (BNA) Organic Compounds by Gas Chromatograph Mass Spectrometer (GC/MS): Capillary Column
730022	GC/MS Data Final Review
730024	Gel Permeation Chromatography Treatment
730028	Hydrocarbon Identification
730049	Silica Gel Column Cleanup (SW846 Method 3630B)
730061	Volatile Organic Analysis – Method 8260A
730065	Water, Sludge, Sediment, Soil WTPH-D_x Extraction, Oil Preparation Methods [Total Petroleum Hydrocarbons as Diesel in Soil]
730066	Analysis of WTPH-D_x Semi-volatile Petroleum Products in Environmental Soil, Sediment and Water Extracts

Index Number	Title of SOP
730067	Analysis of NWTPH-G_x and BTEX Analysis Methods for Soil and Water
730069	Water, sludge, Sediment, Soil NWTPH-HCID Analysis Methods
730070	Polynuclear Aromatic Hydrocarbons (PAH) by Gas Chromatography/Selective Ion Monitoring Mass Spectroscopy (GC/SIM-MS)
730072	Extraction of Fish Tissue for Semi-Volatile Analytes, including Pesticides, PCBs and BNAs by GC/AED, GC/ECD and/or GC/MS
730073	Fish Tissue Florisil Column and Acetonitrile Back Extraction Cleanup
730080	Extraction and GC/MS Analysis of 1-Naphthol and Carbaryl in Soil/Sediment
730081	Accelerated Solvent Extraction of Solid Samples
730082	Determining Flash Point by Pensky – Martens Closed Cup Tester
730083	Isotopic Dilution Polynuclear Aromatic Hydrocarbons (PAH) by Gas Chromatography/Selective Ion Monitoring Mass Spectrometry (GC/ID-SIM-MS)
730085	Extraction of PAH only, Pesticides and/or PCBs in Water
730087	Butyltin in Tissue Analysis
730088	Sulfur Removal by SW-846 Method 3660B
730091	Micro-Florisil® Column Cleanup
730092	Micro-Florisil® Cleanup for Phthalate Esters, by Method 3620B
730093	Acid-Base Partition Cleanup, by Method 3650B
730095	Herbicide Analysis by Gas Chromatography/Mass Spectrometry (GC/MS)
730096	PBDE Tissue Analysis by GC/MS/MS
730097	Analyzing Chlorinated, Organo-phosphorus, and Nitrogenous Pesticides by GC/MS, Method 8270
730098	Methoprene by GC/MS, USGS Method O-2134-01
730099	Solid Phase Extraction (SPE) of Semi-Volatile Petroleum Products (NWTPH-Dx) in Water by EPA SW-846 Method 3535
730100	Solid Phase Extraction (SPE) of Herbicides in Water by EPA SW-846 Method 3535
730101	Extraction of BNA's/Pesticides/PCB's/Op-Pesticides in Soils, Sediments and Sludges by Soxtherm, SW 846 Method 3541
730102	Solid Phase Extraction of Carbamates for High Performance Liquid Chromatography Mass Spectrometer Analysis (HPLCMS), EPA SW 846 Method 3535M
730103	Micro-acetonitrile Back Extraction Cleanup
730104	PBDE Analysis by GC/MS Selective ion Monitoring (SIM)
730105	Fish Tissue Florisil Column and Acetonitrile Back Extraction Clean-up (Micro)
730106	Carbamate Analysis by EPA Method 8321A, Modified
Sample and Data Management	
770001	Sample Check-In
770003	Purchasing Analytical Services
770005	Reviewing Contract Laboratory Data

Index Number	Title of SOP
770009	Filling Sample Container Orders
770014	Processing Purchases for Payment
770016	Radiation Screening of Samples Entering the Manchester Laboratory
770017	Sample Data Filing System
770018	Documentation of Administrative Standard Operating Procedures
770019	Documentation of Analytical Standard Operating Procedures
770020	Use of the OHS Material Safety Data Sheets on CD/ROM Software
770023	Waste Collection, Storage and Pickup
770026	Sample Disposal
770027	Construction and Use of Precision Control Charts
770028	LIMS Log in of Samples
770029	Cleaning Sample Containers with a Laboratory-Grade Dishwasher
770030	Laboratory Balances in the General Chemistry Section

SM = Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998.

Table A-2. SOPs for the Environmental Assessment Program (EAP), Headquarters and Regional

Index Number	Title of SOP	Status of SOP
EAP001	Use of Semi-Permeable Membrane Devices	Final
EAP002	Determination of Total Dissolved Gas	Final
EAP003	Pesticide Sampling in Fresh Water	Final
EAP004	Weekly/Monthly Procedures at the EAP Operations Center	Final
EAP005	New Employee Orientation at the EAP Operations Center	Final
EAP006	Daily and Emergency Procedures at the EAP Operations Center	Final
EAP007	Fish DNA Aging Structure Processing	Final
EAP008	Resecting Finfish Whole Body, Body Parts or Tissue Samples	Final
EAP009	Collection, Processing and Preservation of Finfish Samples	Final
EAP010	Field Measurement of Conductivity/Salinity	Provisional
EAP011	Instantaneous Measurement of Temperature in Water	Provisional
EAP012	Sampling Bacteria in Water	Provisional
EAP013	Assigning Global Positioning System Coordinates	Final
EAP014	Surveying Morphology and Surface Flow of Headwaters Channels	Final
EAP015	Grab Sampling – Fresh Water	Final
EAP016	Freshwater Drift Collection, Processing and Analysis	Final
EAP017	Litterfall Collection, Processing, and Analysis	Final
EAP018	Turbidity Threshold Sampling	Final
EAP019	Estimating Stream Flows Using a Flume	Final
EAP020	Bedload Collection, Processing and Analysis	Final
EAP021	Estimating Large Woody Debris Loads Intersecting Headwaters	Final
EAP022	Estimating and Delineation of Headwaters Wetlands	Final
EAP023	Winkler Determination of Dissolved Oxygen (Bill Ward)	Draft
	Time of Travel Dye Studies	Needed
	Collection of Sediment Cores	Needed
	Measurement of Streamflow	Draft
	Field Determination of Dissolved Oxygen	Draft
	Metals Sampling	Draft
	Stream Sampling	Draft
	Turbidity Sampling	Draft
	Stream Stage Height Determination	Draft
	Benthic Infaunal Rescreening, Tracking, Sorting and Taxonomic Identification	Draft
	Determination of Dissolved Oxygen by Dosimat Technology	Draft
	Standard Operating Procedures for Temperature TMDLs	Draft

Index Number	Title of SOP	Status of SOP
	Hydrolab Calibration and Deployment	Draft
	Field Manual for Groundwater Sampling Operations - Monograph	Draft

Table A-3. SOPs for the Laboratory Accreditation Unit (part of the EA Program)

Index Number	Title of SOP	Status of SOP
LAU001	Assessment (Audit) of Environmental Laboratories	Draft
LAU002	Accreditation of Environmental Laboratories	Draft
	Generation of Renewal Applications	Needed
	PrintScopes Backup Procedures	Needed

Table A-4. SOPs for other Ecology programs

Index Number	Title of SOP	Status of SOP
Air Program		
	Ozone Monitoring	Final
	Carbon Dioxide Monitoring	Final
	Nitrogen Dioxide Monitoring	Final
	Nephelometer Operations	Final
	Aethalometer Operations	Final
	PM 2.5 Single Channel Sampler Operations	Final
	PM 2.5 Tapered Element Oscillation Microbalance	Final
	PM 10 Tapered Element Oscillation Microbalance	Final
	Automated Method Data Documentation and Validation	Final
Nuclear Waste Program		
	Shipping samples to NW Program Contracted Analytical Labs	Draft
Spills Program		
	Spill Response Procedures	Draft

Appendix B. Internal Parameter Audits by Manchester Environmental Laboratory – Fiscal Year 2006

Manchester Environmental Laboratory performed audits for the following parameters during FY06:

- Alkalinity
- Ammonia
- Anions (F, CL, SO_4)
- BNA
- BOD
- Carbamates; To be completed by September 30, 2006
- Hexane Extractable Materials (Oil & Grease); July 2005
- ICP/MS; completed September 2006
- Mercury
- Microbiology (MF and MPN); completed September 2006
- Nitrite and Nitrate
- Oil & Grease; completed September 2006
- Orthophosphate
- PAH by isotopic dilution
- Pesticide by GC/MS
- Pesticide/PCB by ECD
- TDS
- TOC
- Total Phosphorous by ICP/MS
- TPN
- TSS and TDS; completed August 2005
- TSS; August 2006
- VOA

Appendix C. Audits by the Laboratory Accreditation Unit– Fiscal Year 2006

The Lab Accreditation Unit completed the following audits during FY06:

Total Laboratories Audited – 98

- Washington labs – 90
- Out-of-state labs – 8

Total Drinking Water Laboratories Audited – 28

Lab type

- Academic – 2
- Commercial – 28
- Federal – 2
- Industrial – 9
- Municipal – 53
- Pretreatment – 2
- State – 1
- Tribal – 1

Names of Audited Laboratories

- AAA Laboratory
- Accurate Testing Labs L.L.C.
- Addy Lab of Southwest Washington
- Aerojet-General Corporation
- Alcoa Wenatchee Works Laboratory
- Alderwood Wastewater Treatment Plant Laboratory
- Analytical Chemistry Inc.
- Applied Speciation and Consulting, LLC
- Arlington Wastewater Treatment Plant Lab
- AV Labs, Inc.
- Avocet Environmental Testing
- Boeing IDS SHEA Environmental Analysis Lab
- Boise White Paper LLC Lab - Wallula
- BP Quality Administration - NW
- Bremerton Wastewater Treatment Plant Lab
- Brewster Wastewater Laboratory

- Bridgeport Wastewater Laboratory
- Buckley Wastewater Treatment Plant Laboratory
- Bureau of Reclamation - PN Regional Lab
- Camas WWTP Laboratory
- CCI Analytical Laboratories, Inc.
- Chadwick & Associates, Inc.
- Chehalis Tribal Water Quality Laboratory
- Chelan Wastewater Treatment Plant Laboratory
- Chelan-Douglas Health District
- Clallam Bay Corrections Center Laboratory
- Colfax Regional Laboratory
- Columbia Inspection, Inc. Laboratory - Portland
- Concrete Wastewater Treatment Plant Laboratory
- CWU Chemistry Department Environmental Testing Lab
- Dragon Analytical Laboratory
- Ellensburg Wastewater Laboratory
- Entiat Wastewater Treatment Plant Laboratory
- ESN Northwest
- ESN Seattle, Inc.
- Forks Wastewater Treatment Plant Laboratory
- Fort James Camas Environmental Laboratory
- Framatome ANP Richland, Incorporated
- Frontier Geosciences, Inc.
- Goldendale Wastewater Laboratory
- Grandview Environmental Laboratory
- Grays Harbor County Water Testing Lab
- Karcher Creek Sewer District Laboratory
- King County West Point Process Lab
- Kitsap County Health District Laboratory
- Kitsap County Sewer District #7 Laboratory
- Kuo Testing Labs, Inc.
- Lincoln County Environmental Health Lab
- Longview Regional Water Treatment Plant Lab
- LOTT Water Quality Laboratory
- Miller Creek Wastewater Treatment Plant Lab
- Nautilus Environmental (San Diego)
- North Bay Water Reclamation Facility Lab
- Northwest Agricultural Consultants, Inc.
- NW Indian College WQ Lab
- Oak Harbor Wastewater Treatment Plant Lab
- Ocean Shores Wastewater Treatment Plant
- Okanogan Wastewater Laboratory
- Olympic Water and Sewer, Inc. Laboratory
- Olympus Terrace Wastewater Treatment Plant Lab

- Omak Wastewater Laboratory
- OnSite Environmental, Inc.
- Pateros Wastewater Treatment Plant
- Potlatch Corporation Environmental Laboratory
- Roche Harbor Wastewater Treatment Plant Lab
- Salmon Creek Wastewater Treatment Plant Lab - Seattle
- Seattle Public Utilities Water Quality Lab
- Selkirk Regional Environmental Lab
- Sequim Wastewater Treatment Plant Laboratory
- Snoqualmie Pass Utility District Laboratory
- Snoqualmie Wastewater Treatment Plant Lab
- Soap Lake Wastewater Laboratory
- Soiltest Farm Consultants, Inc. Laboratory
- Specialty Analytical
- Spectra Laboratories
- Spokane RPWRF Laboratory
- Sunnyside Wastewater Treatment Plant Lab
- TestAmerica - Spokane
- Thurston County Health Department Laboratory
- Tieton Wastewater Treatment Plant Laboratory
- TransAlta Centralia Generation Lab
- TTM Technologies, Inc.
- Twisp Wastewater Treatment Plant Laboratory
- USAg Analytical Services
- Walla Walla County Health Department
- Waste Sampling and Characterization Facility
- Weston Solutions, Inc. - Port Gamble

Appendix D. Quality Assurance Coordinators

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Table D-1. Quality Assurance Coordinators, July 2006

	Program	Managers	QA Coordinators	Location	Phone (360 area code unless otherwise indicated	Email (@ecy.wa.gov)
1	EA	Bill Backous	Cliff Kirchmer	HQ	407-6455	ckir461
2	EA - Laboratory	Stuart Magoon	Karin Feddersen	Manchester	871-8829	kfed461
3	HWTR	Darin Rice	Alex Stone	SWRO	407-6344	alst461
4	NW	Jane Hedges	Jerry Yokel	Kennewick	509-736-3009	jyok46
5	Spills	Dale Jensen	Dale Davis	HQ	407-6972	dald461
6	TC	Jim Pendowski	David Sternberg	HQ	407-7146	dast461
7	WQ	Dave Peeler	Mike Herold	HQ	407-6434	mher46
8	AQ	Stuart Clark	Stan Rauh	NWRO	425-649-7115	srau461
9	SEA	Gordon White	Tom Hruby	HQ	407-7274	thru461
10	SWFA	Cullen Stephenson	Don Nelson	HQ	407-6940	dnel461

Appendix E. Credible Data Policy

Chapter 2: **WQP Policy 1-11**

Established: September 2006

Ensuring Credible Data for Water Quality Management

Purpose: This policy describes the Quality Assurance (QA) measures, guidance, regulations, and existing policies that help ensure the credibility of data and other information used in agency actions based on the quality of state surface waters. Agency actions include (1) determinations of whether a surface water is supporting its designated use, such as the 303(d) and 305(b) assessment processes, (2) establishment of a Total Maximum Daily Load (TMDL) and the associated load allocations and wasteload allocations, and (3) revisions to water quality standards. This policy is required by the *Water Quality Data Act* (WQDA) codified in RCW 90.48.570 through 90.48.590.

Application: This policy applies when evaluating data and information for use in agency decisions when the quality of a surface water of the state is at issue. It is also intended as guidance for all parties interested in submitting data for consideration in decisions related to water quality. The quality of surface water is assessed through comparison of measured parameters to water quality criteria and standards, to sediment quality criteria and standards, and to fish tissue criteria and standards. The quality of surface water is also assessed under the water quality standards through stream biological monitoring and physical habitat evaluation.

The WQDA states that:

- "Ecology shall use credible information and literature for developing and reviewing a surface water quality standard or technical model used to establish a TMDL for any surface water of the state."
- "Ecology shall use credible data for the following actions:
  - Determining whether any water of the state is to be placed on or removed from any section 303(d) list;
  - Establishing a TMDL for any surface water of the state; or
  - Determining whether any surface water of the state is supporting its designated use or other classification."

- The WQDA does not restrict use of data for other department actions. Data generated to meet the requirements of wastewater effluent permits may not meet the requirements specified in the Credible Data policy but may still be used in compliance actions. Data submitted by some organizations and individuals will be compiled in Ecology information systems whether the data meets or does not meet the requirements of the Credible Data policy. The data needs to meet the credible data requirements in order to be used as the basis for the specific water quality actions listed above, according to the WQDA.

Contents:

1. Introduction and Background

The Department of Ecology (Ecology) is required to develop policy regarding the generation and use of credible data in certain water quality-related actions. This policy is required by the *Water Quality Data Act* (WQDA) codified in RCW 90.48.570 through 90.48.590.

Data are considered credible data if:

- Appropriate quality assurance and quality control procedures were followed and documented in collecting and analyzing water quality samples;
- The samples or measurements are representative of water quality conditions at the time the data were collected;
- The data consist of an adequate number of samples based on the objectives of the sampling, the nature of the water in question, and the parameters being analyzed; and
- Sampling and laboratory analysis conform to methods and protocols generally acceptable in the scientific community as appropriate for use in assessing the condition of the water.

This policy includes:

- An explanation of how Ecology uses scientific research and literature to develop and review any water quality standard or technical model used to establish a Total Maximum Daily Load (TMDL) for any water of the state,
- A description of the specific criteria that are used to judge whether data are of adequate credibility to use when (1) determining whether any water of the state is to be placed on or removed from any section 303(d) list, (2) establishing TMDLs, and (3) determining whether any surface water of the state is supporting its designated use, and
- Recommendations for appropriate training and experience needed for collection of credible data.

Policies, guidelines, and protocols that address some of these statutory requirements were established prior to adoption of the WQDA due to agency efforts to document and promote quality assurance principles in data collection and use. These include the following:

Agency-wide Policy

- Ecology Executive Policy 1-21
  Establishing Quality Assurance established a program for ensuring the consistent application of quality assurance principles to the planning and execution of all activities that acquire and use environmental measurement data.
- Ecology Executive Policy 1-22
  Requiring Use of Accredited Environmental Laboratories ensures that laboratories performing environmental analyses are capable of providing accurate and defensible data for Ecology's use in making decisions concerning the environment.
- Ecology Publication 05-03-031.
  Quality Management Plan: Agency Plan to Implement, Document, and Assess the

Effectiveness of the Quality System Supporting Environmental Data Operations is the Ecology blueprint for applying quality assurance and quality control to environmental programs. It defines the quality system for planning, implementing, and assessing the effectiveness of activities supporting environmental data decisions. It requires the preparation of a status report for Ecology management every two years.

Planning Guidelines and Examples

- Ecology Publication No. 04-03-030.
  Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies presents detailed guidance on the preparation of QA Project Plans. It describes 14 elements to be addressed in the plan and provides supporting information and examples relevant to the content of each element.
  Ecology Quality Assurance Project Plans is a link to a list of some recent QA Project Plans prepared by Ecology.
- Environmental Assessment Program (EAP) Procedure 1-04
  Preparation, Review, and Approval of Quality Assurance Project Plans establishes the review and approval process for QA Project Plans. Peer review is required of all QA Project Plans developed by staff within the EA Program.
- Sediment Sampling and Analysis.
  www.ecy.wa.gov/biblio/0309043.html

  This publication provides technical guidance for developing sampling and analysis plans for sediment investigations conducted under the Washington Sediment Management Standards (WAC Chapter 173-204). *www.ecy.wa.gov/programs/tcp/smu/sediment.html*

Monitoring Protocols

- Ecology Publication No. 01-03-036. www.ecy.wa.gov/biblio/0103036.html
  Stream Sampling Protocols for the Environmental Monitoring and Trends Section describes the sample collection, shipment, and analysis procedures used by EAP's Environmental Monitoring and Trends Section staff to collect water quality information at long-term stream monitoring stations.
- Ecology Publication No. 93e04
  Field Sampling and Measurement Protocols for the Watershed Assessments Section describes sampling and measurement protocols used by EAP's Watershed Assessment Section when conducting water quality assessment projects.
- Ecology Publication No. 03-03-052
  Continuous Temperature Sampling Protocols for the Environmental Monitoring and Trends Section describes the protocols used by the EAP's Environmental Monitoring and Trends Section to collect continuous water temperature data at stream monitoring stations.
- Puget Sound Protocols
  www.psat.wa.gov/Publications/protocols/protocol.html
  This publication presents recommended protocols for measuring selected environmental variables in Puget Sound. The objective is to encourage most investigators conducting studies such as monitoring programs, baseline surveys, and intensive investigations to use

equivalent methods whenever possible. If this objective is achieved, most data from future sampling programs should be comparable among studies.

- Sediment Sampling and Analysis
  www.ecy.wa.gov/biblio/0309043.html
  This publication provides technical guidance for developing sampling and analysis plans for sediment investigations conducted under the Washington Sediment Management Standards (WAC Chapter 173-204).
  www.ecy.wa.gov/programs/tcp/smu/sediment.html provides links to sediment related sites**.**
  www.ecy.wa.gov/programs/eap/mar_sed/NOAA-PSAMP%20QA Project Plan.pdf is an example of a QA Project Plan for marine sediments.

Assessment Guidelines and Policy

- EAP Policy 4-01
  Guidelines for Technical Document Review establishes the respective responsibilities of supervisors, authors, and reviewers in this quality assurance process. Appropriate review is an integral step to ensure high quality technical reports, and this set of guidelines lays out peer review procedures for EAP technical documents.
- Water Quality Program (WQP) Policy 1-11, Chapter 1
  Assessment of Water Quality for the Section 303(d) List establishes the system for determining the status of state waters relative to the water quality standards and to help determine priorities for TMDL scheduling and development.
- WQP Policy 1-25
  Dispute Resolution establishes the procedures that Ecology will follow in resolving a dispute on a TMDL issue when resolution cannot be reached through the normal TMDL process.
- Ecology Publication No. 91-78
  Technical Guidance for Assessing the Quality of Aquatic Environments, A Handbook prepared for the Water Quality Financial Assistance Program (revised 1994) discusses developing water quality assessment programs and technical methods for conducting water quality studies.

The U.S. Environmental Protection Agency (EPA) also maintains policy, guidance and procedures that address some of the requirements. This link provides a directory to EPA QA documents:
www.epa.gov/quality/qa_docs.html

2. Water Quality-Based Actions Subject to Water Quality Data Act Policy

The criteria in this policy have been developed to build on the policies that promote the generation and use of credible data in actions undertaken to assess and improve water quality. Typical actions that are intended to improve water quality subject to the provisions of the WQDA and this policy include:

- **Revisions of Water Quality Standards**

  The state revises the water quality standards periodically as new information indicates that a change to water quality criteria, uses, and regulations is needed. The standards are in regulations compiled in the Washington Administrative Code (WAC). The surface water quality standards are in Chapter 173-201A WAC, *Water Quality Standards for Surface Waters of the State of Washington.* The WQDA requires Ecology to (1) use credible information and literature to develop and review a surface water quality standard and (2) explain in this policy how it uses scientific research and literature to develop and review any water quality standard.
  A specific type of revision of the surface water quality standard is described in federal regulation, the Use Attainability Analysis (UAA). A UAA is a structured scientific assessment of the factors affecting the attainment of uses designated for protection in the water quality standards. It may include an assessment of physical, chemical, biologic, and economic factors as described in the federal regulations at 40 CFR 131 10(g). The WQDA requires Ecology to use credible data in a UAA because it is a determination of whether a surface water of the state is supporting its designated use or other classification.

- **Water Quality Assessment Updates**

  The WQDA requires Ecology to use credible data to determine whether any water of the state is to be placed on or removed from any section 303(d) list and whether any surface water of the state is supporting its designated use or other classification.

  The federal Clean Water Act established a process to identify and clean up polluted waters. Every two years, all states are required to prepare a list of waterbodies that do not meet water quality standards. This list is called the 303(d) list because the process is described in Section 303(d) of the Clean Water Act. All waterbodies identified on the list must attain water quality standards within a reasonable period, either through a water quality improvement plan (also known as a Total Maximum Daily Load or TMDL) or other pollution control mechanisms.

  To develop the list, Ecology compiles its own water quality data and invites others to submit water quality data they have collected. All data submitted need to be collected and assessed using appropriate scientific methods as described in the agency's listing policy. Once the list is put together, the public has a chance to review it and give comments. The results of the assessment are submitted to EPA as an "*integrated report*" to satisfy federal Clean Water Act requirements of sections 303(d) and 305(b). The list helps Ecology to use state resources more efficiently by focusing on waterbodies that need the most work. The list of waterbodies in the assessment reflects local government, community, and citizen recognition of water quality problems in Washington, demonstrating citizen interest and commitment to clean water.

- **Total Maximum Daily Load studies, also known as Water Quality Improvement Reports**

  TMDLs identify the maximum amount of pollutant that can be released into a waterbody without impairing specified uses of the water, and allocate that amount among various

sources (both point and nonpoint sources). The technical studies prepared for TMDLs provide a complete and consolidated view of the condition of the water, as well as a framework to help develop, focus, and evaluate activities to improve water quality. The interactions between the public and Ecology during the TMDL process provide a forum to discuss issues, pursue solutions, and adjust activities over time to ensure that progress is made to meet water quality standards and improve water quality.

The WQDA requires Ecology to use credible data when establishing a TMDL for any surface water of the state.

3. Coordination with Tribes

This policy supports intergovernmental cooperation between the state and the tribes in Washington State in the various water quality-based actions. The WQDA specifically allows tribes to submit data in accordance with procedures arranged with EPA. Tribes also have the option to submit data in accordance with the procedures described in this state policy.

"*Ecology shall consider water quality data that has been collected by Indian tribes under a quality assurance project plan that has been approved by the United States Environmental Protection Agency (EPA) if that data meets the objectives of the plan.*" [90.48.580(4) RCW] The Quality Assurance (QA) level assigned to data submitted by Indian tribes will be determined based on the QA documentation accompanying the data and any additional documentation requested by Ecology.

4. Water Quality Standards Revisions

The water quality standards are revised based on a review of available data, information, and technical literature obtained from the public, tribes, government agencies, and other sources (such as academia or library-facilitated literature searches). Quality assurance is maintained through evaluation of study or data collection methods, investigations into the technical literature, and cross-checking assumptions and unusual findings with the authors and other experts in the field. Revisions of the standards are based on information from studies that are generally not waterbody specific and generated by individuals and organizations outside the state of Washington. The studies are not subject to the provisions of credible data in sections five through seven.

Ecology staff examine published, peer-reviewed studies, graduate dissertations, state and federal agency studies, and other information called "*gray literature*." While not published as text books or journal articles, gray literature often contains the most complete information on the methods used to ensure the data and conclusions are sound and represent the environmental conditions described in the research. Academic theses and dissertations have been formally defended prior to completion. Published studies also undergo some level of peer review prior to being accepted for publication, but generally lack the details on methodology found in the gray literature due to constraints on copy size.

Staff critically examine the data, study designs, and findings in an attempt to ensure the measures and results are sound and represent the environmental conditions described in the research. Where study designs or monitoring conditions are in question, any concerns will be formally noted in the review and taken into consideration before choosing to use the results in any way. Questions commonly include:

- Were samples taken at sufficient intervals and representative locations?
- Were other environmental variables at no-effects levels?
- Was there too much variability between the initial test results and the tests for corroboration?

The data and statistical findings contained in the studies are used in the analysis independent of the conclusions and recommendations of the authors. Though in general there is connection between the study recommendations and the study data, this may not be true all of the time. Study recommendations can be reflective of the author's assumptions on policy and risk management, and may fail to acknowledge weak statistical correlations. Where there are questions about a study or data, an attempt will be made to get answers from the original author.

The information is categorized and summarized to create a weight-of-evidence-style analysis (e.g., field studies, laboratory studies, fluctuating exposure, constant exposure, cellular effects, behavioral effects, long-term effects, physiological effects, short-term effects, lethality, sublethal). Where defensible, data may be translated to a standard format to enable the findings of different studies to be compared against each other (e.g., studies that use average concentrations versus studies that use minimum daily concentrations). In some cases the raw data can be used to make these translations directly and in others it is necessary to create a translation equation (e.g., a daily maximum temperature is on average equivalent to a 7-day average daily maximum temperature that is 1.5°C cooler). Where data are of similar quality, Ecology will consider combining the results from multiple studies to increase confidence and reduce the influence of unusual and possibly outlier studies.

Recommendations are developed to ensure that criteria have duration of exposure components (e.g., daily maximums, weekly averages, seasonal averages) supported by the data and technical literature.
As part of the standards development process and as an aid in public review, Ecology provides formal written documentation of the information used to develop a revised water quality standard. Credible studies and data may be submitted by interested parties and incorporated in a revision of the analysis.

5. Components of an Approvable Quality Assurance (QA) Project Plan

All data used in water quality assessment updates and TMDLs are required to meet specific quality assurance requirements. Sampling and analysis must be conducted under a documented QA Project Plan or other plan that Ecology determines to be equivalent.

Guidance for preparing a QA Project Plan is available from several publications.

Ecology

- *Guidelines for Preparing Quality Assurance Plans for Environmental Studies (2004).* Publication No. 04-03-040. www.ecy.wa.gov/biblio/0403030.html.
- *Sediment Sampling and Analysis Plan Appendix: Guidance on the Development of Sediment Sampling and Analysis Plans Meeting the Requirements of the Sediment Management Standards* (2003). Publication No. 03-09-043. www.ecy.wa.gov/programs/tcp/smu/sediment.html.
- QA Project Plan Template – A draft document has been prepared for use by Ecology grantees and others needing simplified guidelines.

Department of Natural Resources (DNR)

- TFW-AM9-99-005, DNR publication 107.

EPA

- *Requirements for Quality Assurance Project Plans* www.epa.gov/quality/qs-docs/r5-final.pdf.
- *EPA Guidance for Quality Assurance Project Plans* www.epa.gov/quality/qs-docs/g5-final.pdf.
- *The Volunteer Monitor's Guide to Quality Assurance Project Plans,* EPA 841-B-96-003. www.epa.gov/OWOW/monitoring/volunteer/qappcovr.htm.

For purposes of identification of impaired and unimpaired waters or development of TMDLs, any entity submitting monitoring data to Ecology must provide Ecology with documentation that the data collection planning, implementation, and assessment was consistent with the concurrent version of *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies.* Documentation should address each of the 14 elements described in the guidelines or provide an explanation for omitted elements. Other pertinent factors that enhance data quality should also be addressed in the project plan document.

Ecology (EAP, WQP, TCP) may accept a QA Project Plan containing less than the required elements if Ecology determines that the reasons stated for omitting an element are valid and that its omission will not impact the quality of the results based upon the type of pollutants to be monitored, the type of surface water, and the purpose of the monitoring.

Ecology may consider that the following data are also credible and relevant to an impaired water identification or TMDL decision, if the sample analysis was performed by a laboratory meeting the criteria of Section 6 or according to applicable field procedures.

- The data were collected before August 31, 1993 with sufficient QA documentation commensurate with commonly accepted practices at the time.
- The data were collected before September 30, 2002 according to a QA Project Plan approvable according to the guidelines existing at the time.

- The data were collected as part of an ongoing monitoring effort by a governmental agency and the data collection yielded results of comparable quality to data collected according to this policy.
- The water quality data were or are collected under the terms of an NPDES permit, permit application, or a compliance order issued by Ecology or EPA, a consent decree signed by Ecology or EPA, or a sampling program approved by Ecology or EPA under MTCA or CERCLA, and the data collection yielded results of comparable quality to data collected according to this policy.
- Data may be excluded from data sets or be assigned a level of credibility different from associated data as determined by Ecology in accordance with the WQDA.

6. Monitoring Procedures

The monitoring entity providing water quality data for water quality assessment updates and TMDLs must collect, preserve, and analyze data using methods of sample collection, preservation, and analysis as prescribed in procedures, where available, published by Ecology, EPA, USGS, APHA, USACOE, ASTM, or in the Code of Federal Regulations. New and revised methods will be added as deemed appropriate according to the exemption policy under accreditation. Accreditation for the new methods will be acquired by the supporting laboratory as soon as practical thereafter.

The monitoring entity must ensure that chemical, microbiological, physical, radiological, and toxicological samples (excluding data generated by field methods) are analyzed in a laboratory accredited by Ecology or obtain a waiver to this requirement in accordance with Ecology Executive Policy 1-22. Use of laboratories not accredited by Ecology must be approved prior to initiating monitoring by seeking and obtaining a waiver to the Executive Policy 1-22 requirement. Laboratories must use approved methods when required by federal programs or Ecology. A list of laboratories and the methods for which they are accredited can be found at *www.ecy.wa.gov/programs/eap/labs/labs_main.html*. Policy 1-22 does not apply to data obtained in the field or to benthic analyses.

7. Minimum Documentation for Data Submission and Recordkeeping

Documentation must be provided with all water quality data submitted for consideration in water quality assessment updates and TMDLs indicating that the objectives of the QA Project Plan or equivalent quality assurance procedures were met. Documentation must also be provided that indicates whether the data are suitable for water quality-based actions. Data suitable for use in water quality-based actions must include an adequate number of measurements in the total data set for a waterbody. The assessment of the data must consider whether the data, in total, fairly characterize the quality of the waterbody at that location at time of sampling. The QA Project Plan must address the adequacy of the number of samples and explain procedures to assure that the sample set yields data that are representative of the waterbody.

Data collectors submitting information to Ecology for an impaired water identification or TMDL decision must document the planning, implementation, and assessment strategies used to collect

the information. The document, or QA Project Plan, is expected to clearly state the original intended use of the information gathered (e.g., chemical/physical data for TMDL analyses) and any limitations on use of the data (e.g., these measurements only represent storm-event conditions). Data sets must be complete, that is, not censored to include only part of the data results from the project.

Data and information submitted by a third party that were initially collected by other entities must document that the required quality assurance objectives were met. If this documentation of data verification and data usability/validation is not provided, the data will not be used in the characterization of the waterbody.

The data submitter should provide Ecology with the following information accompanying data submission.

A. An electronic copy of the QA Project Plan (or the equivalent document), revisions to a previously submitted QA Project Plan, and any other information necessary for Ecology to evaluate the data according to the guidance for exceptions

B. The applicable dates of the QA Project Plan, including any revisions.

C. Written assurance that the methods and procedures specified in the QA Project Plan were followed.

D. The name of the laboratory(s) used for sample analyses and its Laboratory ID number, along with a report of results and a data verification report provided by the laboratory. Field data must be accompanied by a data verification report which includes the name of the organization that performed the measurements.

E. Any field notes, laboratory comments, or laboratory notations concerning a deviation from standard procedures, quality control, or quality assurance that affects data reliability, data interpretation, or data validity.

F. The quality assurance/quality control documentation, including the analytical methods used by the laboratory, method number, detection limits, quantitation or minimum levels, if available, and the types of quality control samples and standards necessary to properly interpret the data, if different from those specified in the QA Project Plan.

G. The QA/QC documentation requirement includes a summary of data assessment documentation including report(s) of data verification, data validation if available, and assessment of data for usability in meeting the objectives expressed in the QA Project Plan.

H. Field instruments, such as multi-parameter devices (Hydrolabs™), must be operated and calibrated according to the manufacturer's recommendations or other acceptable demonstrated method. Calibration information and any other appropriate documentation of accuracy must be submitted if requested by Ecology.

I. The following information must be retained for at least five years (ten years for records associated with data from grant and loan projects) and provided to Ecology if requested:

    i. Other information, such as complete field notes, photographs, weather, or other information related to flow, field conditions, or documented sources of pollutants in the watershed for interpreting or validating data.

ii. All records associated with the generation and interpretation of sample results including documentation related to adherence to the QA Project Plan, or coordinate with Ecology to ensure that adequate records are maintained.

This documentation requirement does not apply to data previously submitted during 303(d) water quality assessment cycles before 2006.

8. Data Audit

Contingent on available resources, Ecology may take one or more of the following actions to determine whether data collected by internal or external parties meet the requirements of this policy:

- Review of quality documentation submitted for completeness (presence/absence checklist)
- Review of QA Project Plans and monitoring reports for adequacy of quality assurance evaluation
- Detailed audit of quality assurance documentation provided by data submitters
- Independent validation of submitted data for quality/credibility

9. Statistical and Modeling Methods for Total Maximum Daily Load Studies

As required by Ecology policy, a QA Project Plan is written prior to collecting data for Total Maximum Daily Load (TMDL) studies. Lombard and Kirchmer (2004) identified 14 required elements for Ecology QA Project Plans, including the following that are relevant to this section:

- Project Description (including Study Goals and Objectives)
- Sampling Process Design (Experimental Design)
- Quality Objectives
- Quality Control
- Data Quality Assessment

The QA Project Plan will include a description of the data Ecology will collect through field monitoring, expected needs for water quality data from external sources, and a summary of how that data will be used in the TMDL analysis, including any anticipated modeling analysis. The methods for determining credibility of external data will be explained in the plan. The QA Project Plan will include criteria for selection of a framework for modeling and for assessment of the quality of modeling results.

The final TMDL report will include a summary of how information was analyzed for determining allocations, including the use of a model, if applicable. If a model was used, the report will include a description of how the model framework was selected and applied to the TMDL study, including the calibration process. An assessment of the credibility of ancillary data from other sources that were used in modeling will be documented in the final report.

The draft TMDL report will be sent to interested and affected parties for their review and comment; all comments received by Ecology will be considered. The TMDL report will also be peer reviewed according to Ecology's TMDL peer review policy. The final Water Quality Improvement Report will undergo public review prior to being submitted to EPA for approval.

The Ecology webpage *Models-for-TMDLs* (www.ecy.wa.gov/programs/eap/models/index.html) contains descriptions of models and tools supported by Ecology for TMDL development. It also includes links to other models and resources used by Ecology.

10. Appropriate Knowledge, Training, and Experience for Collection of Credible Data

Ecology may inquire on the qualifications of individuals responsible for the collection and submittal of data in accordance with this policy and to assign the appropriate level of quality assurance to project data entered into the Ecology database.

Data collectors are those individuals with oversight responsibilities for the planning, implementation, and assessment strategies used to collect information.

Data collectors should have knowledge and practical experience commensurate with the nature of the information collection activity. Data collectors are responsible for ensuring that field, laboratory, quality assurance, and other project personnel are supervised or properly trained in the use of equipment and procedures required to implement and assess the elements defined in the QA Project Plan.

- The recommended qualifications for individuals submitting chemical/physical water quality data (data collectors) include the following:
    - Practical experience or successful completion of college-level training in limnology, aquatic biology, chemistry, environmental sciences, or a related discipline.
    - Knowledge of water quality sampling techniques and practical experience in using water quality sampling equipment.
    - Knowledge of general stream or marine hydrology, morphology, and fluvial processes.
    - Knowledge and sufficient practical experience with systematic planning and development of sampling and analysis plans and/or QA Project Plans.

- The recommended qualifications for individuals submitting macroinvertebrate data include the following:
    - Practical experience or successful completion of training involving limnology, aquatic biology, environmental sciences, or a related discipline.
    - College-level course credit in aquatic invertebrate zoology or equivalent practical experience in the identification of aquatic macroinvertebrates.
    - Familiarity with commonly used macroinvertebrate taxonomic references and dichotomous keys based on at least family level taxonomy.
    - Knowledge of general stream or marine hydrology, geomorphology, and fluvial processes.

- Knowledge of local aquatic macroinvertebrates at the family level.

- The recommended qualifications for individuals submitting physical habitat data include the following:
  - Knowledge of the general principles of stream hydrology, geomorphology, and fluvial process.
  - Successful completion of the DNR habitat evaluation certification.
  - Successful completion of training in assessing Proper Functioning Condition.

11. Abbreviations and Acronyms

CFR	Code of Federal Regulations
DNR	Washington State Department of Natural Resources
EAP	Environmental Assessment Program (of the Department of Ecology)
Ecology–	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
QA/QC	Quality Assurance/Quality Control
RCW	Revised Code of Washington
TCP	Toxics Cleanup Program (of the Department of Ecology)
TMDL	Total Maximum Daily Load
WAC	Washington Administrative Code
WQDA	Water Quality Data Act
WQP	Water Quality Program (of the Department of Ecology)

Appendix F. Agenda for Fall 2006 E-Quest Training

Ecology Quality System Training (E-Quest)

Dates
October 20, 2006 – Ecology HQ, Lacey
October 24, 2006 – Bellevue (NWRO; 2A & B)
October 26, 2006 – Spokane (ERO; 1st Floor Lg. Conf.)
October 27, 2006 – Yakima (CRO; Seafoam & Waterfall)

Time
8:30 AM – 5:00 PM

Highlights
- Agency quality assurance system, policies, and quality system requirements
- Credible Data Law (Water Quality Data Act)
- New Ecology QA Project Plan template to aid in QA Project Plan development
- Systematic Planning, QA Project Plan preparation and review
- EIM – Agency requirements for EIM use and data submittal
- EnvironQual – EIM/Sedqual new tool set, with advanced query capability

Agenda

8:00
- Registration

8:30 Bill Kammin – Introduction to the Ecology Quality System
- Ecology Quality System – Agency-wide requirements
- Ecology Quality Policies
- EA Program/WQ Program Policy
- EA Program SOP Policy
- WQ Program Grantee QA Project Plan Review policy
- TCP EIM use policy

9:15 Cliff Kirchmer – Systematic Planning
- QA Project Plan Development and Review
- New QA Project Plan Template

10:00 Break

10:15 Ecology Data Usability Requirements – Darrel Anderson/Bill Kammin

- Water Quality Program
- Toxics Cleanup Program

10:45 Introduction to EIM -- Chris Neumiller

- EIM History
- Current Status
- Users/Uses

11:15 Wrap-up – key points to consider

11:30 Lunch

1:00 Program Policy Review

- WQ Credible Data Policy – Requirements for Grant/Loan recipients - Mike Herold

1:30 EIM Data Submittal Process – Chris Neumiller

2:45 Break

3:00 New EIM/EnviroQual toolset – Nagesha Kannadaguli

5:00 Adjourn

Appendix G. Acronyms

Following are definitions of acronyms and abbreviations used frequently in this report. This is for internet users who may not be familiar with these.

Programs of the Department of Ecology

AQ	Air Quality
EA	Environmental Assessment (also, EAP)
HWTR	Hazardous Waste and Toxics Reduction
MEL	Manchester Environmental Laboratory (part of EA Program)
NW	Nuclear Waste
SEA	Shorelands and Environmental Assistance
Spills	Spill Prevention, Preparedness, and Response
TC	Toxics Cleanup
WQ	Water Quality
WR	Water Resources

Offices of the Department of Ecology

HQ	Headquarters, Olympia/Lacey
CRO	Central Regional Office, Yakima
ERO	Eastern Regional Office, Spokane
NWRO	Northwest Regional Office, Bellevue
SWRO	Southwest Regional Office, Olympia /Lacey

Other Acronyms and Abbreviations

APHA	American Public Health Association
ASTM	American Society for Testing and Materials
CFR	Code of Federal Regulations
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management System
EPA	U.S. Environmental Protection Agency
FTE	Full Time Equivalent
IDC	Initial Demonstration of Capability
LAU	Lab Accreditation Unit (part of EA Program)
LIMS	Laboratory Information Mangement System (EA Program)
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRDA	Natural Resource Damage Assessment
PBMS	Performance-Based Measurement Systems
QA	Quality Assurance
QC	Quality Control

Other Acronyms and Abbreviations (continued)

QMP	Quality Management Plan
RCW	Revised Code of Washington
SOP	Standard Operating Procedure
TMDL	Total Maximum Daily Load (water cleanup plans)
USACOE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WQDA	Water Quality Data Act