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Determination of Specific Conductance in Fresh/Estuarine/Coastal Waters.

(Reference Method: EPA Method 120.1 and 9050A and Standard Methods 2510.)

Document #: NASLDoc-027

Revision 2019-1
Effective May 1, 2019
I attest that I have reviewed this standard operating procedure and agree to comply with all procedures outlined within this document.

Employee (Print)	Employee (Signature)	Date
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Revised by: _____ Date: _____

Reviewed by: _____ Date: _____

Laboratory Supervisor: _____ Date: _____

Determination of Specific Conductance in Fresh, Estuarine, and Coastal Waters

1. SCOPE and APPLICATION

1.1. The method measures specific conductance using an electrochemical measurement technique integrated into an automated discrete photometric analyzer.
1.2. The Method Detection Limit (MDL) procedure is not applicable to specific conductance.
1.3. The method is suitable for conductivity concentrations 0.08 to 13.0 mS/cm.
1.4. This procedure should be used by analysts experienced in the theory and application of aqueous inorganic analysis. Three months' experience with an analyst, experienced in the analysis of specific conductance in aqueous samples, is required.
1.5. This method can be used for all programs that require analysis of specific conductance.
1.6. This procedure references EPA 120.1 and EPA 9050A.

2. SUMMARY

2.1. Whole water samples are moved through the ECM electrode block where two electrodes in the middle and at the end apply a sine curve to cause a current and measure the sample conductivity.

3. DEFINITIONS

3.1. Acceptance Criteria **-** Specified limits placed on characteristics of an item, process, or service defined in a requirement document. (ASQC)
3.2. Accuracy **-** The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator. (QAMS)
3.3. Aliquot **-** A discrete, measured, representative portion of a sample taken for analysis. (EPA QAD Glossary)
3.4. Analytical Range – the analytical range is 0.08 to 13.0 mS/cm.
3.5. Batch – Environmental samples, which are prepared and /or analyzed together with the same process and personnel, using the same lot(s) of reagents. An **analytical batch** is composed of prepared environmental samples (extracts, digestates, concentrates) and/or those samples not requiring preparation, which are analyzed together as a group using the same calibration curve or factor. An analytical batch can include samples originating from various environmental matrices and can exceed 20 samples. (NELAC/EPA)
3.6. Blank **-** A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results. (ASQC)
3.7. Calibrate **-** To determine, by measurement or comparison with a standard, the correct value of each scale reading on a meter or other device, or the correct value for each setting of a control knob. The levels of the applied calibration standard should bracket the range of planned or expected sample measurements. (NELAC)
3.8. Calibration **-** The set of operations which establish, under specified conditions, the relationship between values indicated by a measuring device. The levels of the applied

calibration standard should bracket the range of planned or expected sample measurements. (NELAC)

3.9. Calibration Blank – A volume of reagent water fortified with the same matrix as the calibration standards, without analyte added.

3.10. Calibration Curve – The graphical relationship between known values, such as concentrations, or a series of calibration standards and their analytical response. (NELAC)

3.11. Calibration Method - A defined technical procedure for performing a calibration. (NELAC)

3.12. Calibration Standard - A substance or reference material used to calibrate an instrument. (QAMS)

3.12.1. Initial Calibration Standards (STD) - A series of standard solutions used to initially establish instrument calibration responses and develop calibration curves for individual target analytes.

3.12.2. Initial Calibration Verification (ICV) - An individual standard, analyzed initially, prior to any sample analysis, which verifies acceptability of the calibration curve or previously established calibration curve.

3.12.3. Continuing Calibration Verification (CCV) - An individual standard which is analyzed after every 18-23 field sample analysis.

3.13. Certified Reference Material (CRM) - A reference material one or more of whose property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body. (ISO 17025).

3.14. Corrective Action - Action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence. (ISO 8402)

3.15. Deficiency - An unauthorized deviation from acceptable procedures or practices. (ASQC)

3.16. Demonstration of Capability -A procedure to establish the ability of the analyst to generate acceptable accuracy. (NELAC)

3.17. Detection Limit - The lowest concentration or amount of the target analyte that can be determined to be different from zero by a single measurement at a stated degree of confidence.

3.18. Duplicate Analyses - The analyses or measurements of the variable of interest performed identically on two sub samples (aliquots) of the same sample. The results from duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage external to the laboratory (EPA-QAD)

3.19. Electrochemical Unit (ECM) – Optional unit on discrete analyzer that uses ion selective electrodes for pH and conductivity measurements.

3.20. External Standard (ES) - A pure analyte is measured in an experiment separate from the experiment used to measure the analyte(s) in the sample. The signal observed for a known quantity of the pure external standard is used to calibrate the instrument response for the corresponding analyte(s). The instrument response is used to calculate the concentrations of the analyte(s) in the unknown sample.

3.21. Field Duplicates (FD1 and FD2) - Two separate samples collected at the same time and place under identical circumstances and treated exactly the same throughout field and laboratory procedures. Analyses of FD1 and FD2 give a measure of the precision

associated with sample collection, preservation and storage, as well as with laboratory procedures.

3.22. Holding Time **-** The maximum time which samples may be held prior to analysis and still be considered valid. (40 CFR Part 136) The time elapsed from the time of sampling to the time of extraction or analysis, as appropriate.

3.23. Laboratory Duplicates (LD1 and LD2) - Two aliquots of the same sample taken in the laboratory and analyzed separately with identical procedures. Analyses of LD1 and LD2 indicate precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.

3.24. Laboratory Reagent Blank (LRB) - A matrix blank that is treated exactly as a sample including exposure to all glassware, equipment, solvents, and reagents that are used with other samples. The LRB is used to determine if method analytes or other interferences are present in the laboratory environment, the reagents, or the instrument.

3.25. Laboratory Control Sample (LCS) **-** A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes from a source independent of the calibration standards or a material containing known and verified amounts of analytes. The LCS is generally used to establish intra-laboratory or analyst-specific precision and bias or to assess the performance of all or a portion of the measurement system. (NELAC)

3.26. Limit of Quantitation (LOQ)- The minimum levels, concentrations, or quantities of a target variable (target analyte) that can be reported with a specified degree of confidence. The LOQ is set at 3 to 10 times the LOD, depending on the degree of confidence desired. Also referred to as Quantitation Limit.

3.27. Linear Dynamic Range (LDR) - The absolute quantity over which the instrument response to an analyte is linear. This specification is also referred to as the Linear Calibration Range (LCR).

3.28. Material Safety Data Sheet (MSDS) - Written information provided by vendors concerning a chemical's toxicity, health hazards, physical properties, fire, and reactivity data including storage, spill, and handling precautions.

3.29. May **-** Denotes permitted action, but not required action. (NELAC)

3.30. Method Detection Limit (MDL) - The minimum concentration of an analyte that can be identified, measured, and reported with 99% confidence that the analyte concentration is greater than zero (Standard Methods).

3.31. Must **-** Denotes a requirement that must be met. (Random House College Dictionary)

3.32. Precision **-** The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms. (NELAC)

3.33. Preservation **–** Refrigeration, freezing and/or reagents added at the time of sample collection (or later) to maintain the chemical and or biological integrity of the sample.

3.34. Quality Control Sample (QCS) -A sample of analyte of known and certified concentrations. The QCS is obtained from a source external to the laboratory and different from the source of calibration standards. It is used to check laboratory performance with externally prepared test materials. Also referred to as CRM.

3.35. Run Cycle – Typically a day of operation – the entire analytical sequence from sampling the first standard to the last sample of the day.

3.36. Sample Segment – Bar-coded metal tray that holds up to nine four milliliter auto analyzer vials containing samples or standards. The user identifies each vial in the operating software.
3.37. Sample Segment Holder – An automated temperature controlled carousel that contains up to six sample segments. This carousel spins in clockwise or counterclockwise manner to move the sample segments into position for analysis. This carousel format allows for continuous processing.
3.38. Sensitivity **-** The capability of a test method or instrument to discriminate between measurement responses representing different levels (concentrations) of a variable of interest.
3.39. Shall **-** Denotes a requirement that is mandatory whenever the criterion for conformance with the specification requires that there be no deviation. (ANSI)
3.40. Should **-** Denotes a guideline or recommendation whenever noncompliance with the specification is permissible. (ANSI)
3.41. Standard Reference Material (SRM) - Material which has been certified for specific analytes by a variety of analytical techniques and/or by numerous laboratories using similar analytical techniques. These may consist of pure chemicals, buffers, or compositional standards. The materials are used as an indication of the accuracy of a specific analytical technique. Also referred to as CRM.
3.42. Test Definition – A photometric test consisting of a user defined testing sequence, reagent additions, calibration standards, incubations and absorption results.
3.43. Test Flow – Functions to define the parameter for reagent and sample dispensing, dilution, incubation and measurement

4. INTERFERENCES

4.1. The conductivity electrodes can degrade and cause erratic results. The electrodes must be examined to ensure they have not corroded or eroded, and are properly seated. Regular cleaning of the electrodes through the Stand By procedures will ensure a long, reliable, and accurate service. Under normal conditions, electrodes can last six to twelve months, and are replaced by a service engineer during scheduled maintenance.

5. SAFETY

5.1. Safety precautions must be taken when handling reagents, samples and equipment in the laboratory. Protective clothing including lab coats, safety glasses and enclosed shoes must always be worn. In certain situations, it may also be necessary to use gloves and/or face shield. If solutions or chemicals come in contact with eyes, flush with water continuously for 15 minutes. If solutions or chemicals come in contact with skin, wash thoroughly with soap and water. Contact Solomons Rescue Squad (911) if emergency treatment is needed and also inform the Chesapeake Biological Laboratory (CBL) Associate Director of Administration and Facilities Maintenance of the incident. Contact the CBL Associate Director of Administration and Facilities Maintenance if additional treatment is required.
5.2. The toxicity or carcinogenicity of each reagent used in this procedure may not have been fully established. Each chemical should be regarded as a potential health hazard and exposure should be as low as reasonably achievable. Cautions are included for known extremely hazardous materials and procedures.

5.3. Do not wear jewelry when troubleshooting electrical components. Even low voltage points are dangerous and can injure if allowed to short circuit.
5.4. The standards and chemicals regularly used in this procedure are not classified according to the GHS.

6. EQUIPMENT AND SUPPLIES

6.1. Gallery multi-wavelength automated discrete photometric analyzer with ECM. Gallery control software operates on a computer running Microsoft Windows NT, XP or 7 operating system.
6.2. Refrigerator, capable of maintaining 4 +/- 2ºC.
6.3. Lab ware – All reusable lab ware (glass, Teflon, plastic, etc.) should be sufficiently clean for the task objectives. This laboratory cleans all lab ware related to this method with a 10% HCl (v/v) acid rinse, followed by 4-6 reagent water rinses.

7. REAGENTS AND STANDARDS

7.1. Purity of Water – Unless otherwise indicated, references to water shall be understood to mean reagent water conforming to Specification D 1193, Type I. Freshly prepared water should be used for making the standards intended for calibration. The detection limits of this method will be limited by the purity of the water and reagents used to make the standards.
7.2. Purity of Reagents – Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without compromising the accuracy of the determination.
7.3. Working standard 0.08 mS/cm –
Purchased from ThermoScientific Ref 984339
7.4. Working standard 1.4 mS/cm –
Purchased from ThermoScientific Ref 984336
7.5. Working standard 13.0 mS/cm –
Purchased from ThermoScientific Ref 984337
7.6. ECM prime
Purchased from ThermoScientific Ref 984340
7.7. ECM Rinse Liquid
Purchased from ThermoScientific Ref 984998

8. SAMPLE COLLECTION, PRESERVATION AND STORAGE

8.1. Water collected for specific conductance should be refrigerated at 4° C. The sample container should be clean and sample rinsed.
8.2. Refrigerated specific conductance samples may be stored up to 28 days.

9. QUALITY CONTROL

9.1. The laboratory is required to operate a formal quality control (QC) program. The minimum requirements of this program consist of an initial demonstration of laboratory capability and the continued analysis of laboratory instrument blanks field

duplicates, and calibration standards analyzed as samples as a continuing check on performance. The laboratory is required to maintain performance records that define the quality of data generated.

9.2. Initial Demonstration of Capability

9.2.1. The initial demonstration of capability (iDOC) – is used to characterize laboratory performance (analysis of QC samples) prior to the analyses conducted by this procedure.

9.2.2. Quality Control Sample (QCS/SRM) – When using this procedure, a quality control sample is required to be analyzed at the beginning or middle and end of the run, to verify data quality and acceptable instrument performance. If the determined concentrations are not within ± 3s of the certified values, performance of the determinative step of the method is unacceptable. The source of the problem must be identified and corrected before proceeding.

9.2.3. Method Detection Limits (MDLs) – Per EPA Definition and Procedure for the Determination of the Method Detection Limit, Revision 2, the MDL procedure is not applicable to specific conductance.

9.3. Assessing Laboratory Performance

9.3.1. Laboratory Reagent Blank (LRB) – The laboratory must analyze at least one LRB with each batch of samples. The LRB consists of reagent water treated the same as the samples. Analyte found in LRB indicates possible reagent or laboratory environment contamination. LRB data are used to assess and correct contamination from the laboratory environment.

9.3.2. Quality Control Sample (QCS)/ Standard Reference Material (SRM)- When using this procedure, a quality control sample is required to be analyzed at the beginning and end of the run, to verify data quality and acceptable instrument performance. If the determined concentrations are not within ± 3s of the certified values, performance of the determinative step of the method is unacceptable. The source of the problem must be identified and corrected before continuing with the analyses. The results of these QCS/SRM samples shall be used to determine batch acceptance.

9.3.3. The QCS are obtained from a source external to the laboratory and different from the source of calibration standards.

9.3.4. Control Charts – The Accuracy Control Chart for QCS/SRM samples and reagent blanks is constructed from the average and standard deviation of the 20 most recent QCS/SRM measurements. The accuracy chart includes upper and lower warning levels (WL=±2*s*) and upper and lower control levels (CL=±3*s*). These values are derived from stated values of the QCS/SRM. The standard deviation (*s*) is specified relative to statistical confidence levels of 95% for WLs and 99% for CLs. Enter QCS/SRM results on the chart each time the sample is analyzed.

9.3.5. Calibration Verification, Initial and Continuing (ICV/CCV)– Immediately following calibration (ICV) and following every 18-23 samples (CCV), three calibration verifications of 0.08mS/cm, 1.4 mS/cm, and 13.0 mS/cm are analyzed to assess instrument performance. The CCVs are the same material as calibration standards and are to be within ± 3*s*. Failure to meet the criteria requires correcting the problem, including reanalysis of any affected samples. If not enough sample exists, the data must be qualified if reported.

9.4. Assessing Analyte Recovery

9.4.1. Analyte recovery is assessed through percent recoveries of laboratory spikes.

9.4.2. Percent Recovery = (Actual value/expected value) X 100. Percent Recovery for each spiked sample should fall within 10-110%.

9.5. Assessing Analyte Precision – Relative Percent Difference

9.5.1. Analyte replication is assessed through duplicate analyses of samples – Relative Percent Difference.

9.5.2. RPD = (Laboratory Duplicate Result 1 – Laboratory Duplicate Result 2)/[(Laboratory Duplicate Result 1 + Laboratory Duplicate Result 2)/2] X 100

9.6. Corrective Actions for Out-Of-Control Data

9.6.1. Control limit – If one measurement exceeds Accuracy Control Chart CL, repeat the analysis immediately. If the repeat measurement is within the CL, continue analyses; if it exceeds the CL, discontinue analyses and correct the problem.

9.6.2. Warning limit – If two out of three successive points exceed Accuracy Control Chart WL, analyze another sample. If the next point is within WL, continue analyses; if the next point exceeds the WL, evaluate potential bias and correct the problem.

9.6.3. Trending – If seven successive Accuracy Control Chart measurements are on the same side of the central line, discontinue analyses and correct the problem.

9.6.4. When external QCS samples are out of control, correct the problem. Reanalyze the samples analyzed between the last in-control measurement and the out-of-control one.

9.6.5. When external CCV samples are out of control, correct the problem. Reanalyze the samples analyzed between the last in-control measurement and the out-of-control one.

9.7. General Operation - To assure optimal operation and analytical results, the Reagent Blank and CCV are tracked daily in the raw data file, copied to Reagent Blank and CCV Control Charts.

Table 1:

QC Indicator	Acceptance/ Action Limits	Action	Frequency (Batch)
Total slope	< -0.850	If >-0.850, evaluate data points of the calibration curve. Rerun curve to achieve total slope >-0.850	1 per batch if acceptable.
Quality Control Sample (QCS)/ Certified Reference Material (CRM)	± 10%	If QCS value is outside ± 10% of the target value reject the run, correct the problem and rerun samples.	Following the ICV and after every 18-23 samples following the CCV.
Initial Calibration Verification (ICV)	± 10%	Recalibrate if outside acceptance limits.	Beginning of run following standard curve.

Continuing Calibration Verification (CCV)	± 10%	If outside 10%, correct the problem. Rerun all samples following the last in-control CCV.	After every 18-23 samples.
Method Blank/Laboratory Reagent Blank (LRB)	≤ Method Quantitation Limit	If the LRB exceeds the quantitation limit, results are suspect. Rerun the LRB. If the concentration still exceeds the quantitation limit, reject or qualify the data, or raise the quantitation limit.	Following the ICV and after every 18-23 samples following the CCV.
Laboratory Fortified Sample Matrix Spike	± 10%	If the recovery of any analyte falls outside the designated acceptance limits and the QCS is in control, the recovery problem is judged matrix induced. Repeat the LFM and if the sample results are again outside the acceptable recovery range, the sample should be reported with a "matrix induced bias" qualifier.	1/10 (spike OR duplicate)
Laboratory Duplicate	± 10%	If the RPD fails to meet the acceptance limits, the samples should be reanalyzed. If the RPD again fails to meet the acceptance limits, the sample must be reported with a qualifier identifying the sample analysis result as not having acceptable RPD for duplicate analysis.	1/10 (spike OR duplicate)

10. CALIBRATION AND STANDARDIZATION

10.1. Calibration - Daily calibration must be performed before sample analysis may begin.

10.2. **Specific Conductance Working Standards-**
0.08 mS/cm
1.4 mS/cm
13.0 mS/cm

The instrument software prepares a standard curve for each set of calibrators. A graph plotting measured absorbance against standard concentration is presented for review and approval. If acceptance criteria are not met the entire curve can be reanalyzed or individual standards can be reanalyzed. One standard value (original or reanalyzed) for each and every standard is incorporated in the curve. The calculated concentration of

each calibrator is reviewed. The calculated value of each calibrator must be within ten percent of the expected value. The total slope must be greater than -0.850.

11. PROCEDURE – DAILY OPERATIONS AND QUALITY CONTROL

11.1. Turn on computer. Open Gallery software using Desktop icon. Once software is running, turn on instrument and allow connection between the instrument and computer to complete. Logon to software using Username and Password "Dealer."

11.2. Fill the water reservoir with fresh reagent water.

11.3. Remove from refrigerator samples that will be analyzed that day. Begin daily bench sheet documentation.

11.4. Place cuvette waste container and waste water container into designated areas.

11.5. Once water reservoir is full, place in designated area. Use instrument software to click the wrench icon labeled F5, Actions, Extra wash. – complete at least five water wash cycles.

11.6. Once water washes are complete, load ECM prime into sample rack, and identify the rack and position using the instrument software. (Click the tube with magnify glass icon labeled F2, Racks, Controls). Load the rack into the instrument. Use instrument software to click the wrench icon labeled F5, Actions, ECM prime – complete at least five ECM prime cycles. Once the ECM prime cycles are complete, perform one more water wash from the same screen.

11.7. Perform Start Up operations by clicking Start Up at the bottom of the Home page labeled F1.

11.8. Gather working standards from drawer below instrument.

11.9. Once startup is complete, check the instrument water blanks by clicking the wrench icon labeled F5, water blank results. If any of the instrument blanks are outside their predefined and software controlled limits, the user will be notified on the main menu page. User takes corrective action to return instrument functions to controlled limits.

11.10. Load working standards into a sample rack, and identify the rack and position using the instrument software. (Click the tube with magnify glass icon labeled F2, Racks, Calibrators). Load the rack into the instrument.

11.11. Select the methods to be calibrated by clicking the graph icon labeled F4, Calibr. /QC Selection. Click the calibration tab and then select SP COND as the method to be calibrated. Click Calibrate at the bottom of the page. The method will now show as pending. Return to the home page.

11.12. Begin calibration by clicking Start on the home page.

11.13. As calibration curves are produced by the instrument, review them for acceptability. The instrument software prepares a standard curve for each set of calibrators. A graph plotting measured absorbance against standard concentration is presented for review and approval. If acceptance criteria are not met, either the entire curve shall be reanalyzed or individual standards shall be reanalyzed, depending on the violation. One standard value (original or reanalyzed) for each and every calibrator is incorporated in the curve.

11.14. Organize samples, reagent blanks, check standards and all quality control samples while instrument performs calibrations.

11.15. Once calibration curves are accepted, samples are loaded into the sample segments and loaded into the instrument for analysis. After the reagent blanks the first samples

analyzed should be ICV (initial calibration verification) samples. Running all three standards (0.08mS/cm, 1.4 mS/cm, and 13.0 mS/cm) as ICVs is recommended.

11.16. Samples are loaded into the segments and analyzed. CCV (Continuing Calibration Verification) samples (all three standards) follow every 18-23 samples. Standard Reference Material (SRM) samples as well as Laboratory Reagent Blanks (LRB) are scattered throughout the analytical batch. Throughout the analytical batch, samples are chosen as laboratory duplicates and laboratory spikes to assess analyte precision and analyte recovery, respectively. The total number of duplicates and spikes performed will be equal to or greater than ten percent of the total number of samples in the analytical batch.

11.17. As sample analysis is complete, results must be reviewed and accepted manually. If results fall outside acceptance limits, the sample should be reanalyzed. If sample result exceeds the highest standard of the highest calibration range, the samples can be automatically diluted by the instrument and reanalyzed.

11.18. Upon completion of all analysis, results should be saved to a daily report file. Click the tube with magnify glass icon labeled F2, Reports, All results to file. The file is then named by the run date. The daily report file for analytical batch of January 2, 2019 would be named 010219. The file is converted to Microsoft Excel for data work up and copied to a removable flash drive. Remaining samples are discarded.

11.19. All reagents are removed from the reagent rack and returned to the refrigerator. Reagents that have exceeded their stability period are discarded.

11.20. Initiate the shutdown procedure. In the rack with the ECM prime, load the washing solution and cleansing solution, and identify where they are located (Click the tube with magnify glass icon labeled F2, Racks, Controls, choose from menu). Load rack into instrument, and click on home page and select Standby at the bottom of the screen. Daily files are cleared from the instrument software by clicking the wrench icon labeled F5, Actions, Clear daily files. Once prompted remove the rack containing ECM prime, washing solution, and cleansing solution from the instrument. The software is exited and the instrument is turned off. The computer is turned off.

11.21. The waste is flushed down the drain with copious amounts of tap water. The waste cuvette box is emptied into a trash bag and disposed of. The reagent water is dumped. The instrument is wiped clean of drips or splashes.

11. DATA ANALYSIS AND CALCULATIONS

12.1. Upon completion of all analysis, results are saved to a daily report file. The file is named by the run date. The daily report file for analytical batch of January 2, 2019 would be named 010219. Raw results for each run are copied into a Microsoft Excel spreadsheet. Data are sorted by sample name and time of analysis so that all samples will be displayed by number and results for each sample will be displayed consecutively.

12.2. Dilution by the instrument is noted by software as analysis ensues and, also, documented in the data report spreadsheet. The analyst examines each row of data. Results are eliminated that are outside the limits of the calibration range, or have an unrepeated high blank response greater than 0.001 absorbance units.

13. POLLUTION PREVENTION

13.1. Pollution prevention encompasses any technique that reduces or eliminates the quantity of toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operation. The USEPA has established a preferred hierarchy of environmental management techniques that places pollution as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the agency recommends recycling as the next best option.

13.2. For information about pollution prevention that may be applicable to laboratories and research institutions, consult "Less is Better: Laboratory Chemical Management for Waste Reduction", available from the American Chemical Society, Department of Government Relations and Science Policy, 1155 16th Street N. W., Washington, D.C. 20036.

14. WASTE MANAGEMENT

14.1. The standards used in this procedure are minimal and are not hazardous. Due to the small quantity used, the standards can be flushed down the drain with running water.

14.2. For further information on waste management consult The Waste Management Manual for Laboratory Personnel, available from the American Chemical Society.

15. REFERENCES

15.1. U.S. Environmental Protection Agency, 1982. Methods for the Determination of Chemical Substances in Marine and Estuarine Environmental Samples. Method 120.1. U.S. Environmental Protection Agency. Washington, D.C.