



Clinical Laboratory of San Bernardino, Inc.

Quality Assurance Manual

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Foreword

The following Document was prepared in accordance with the USEPA guidelines specified in "Interim Guidelines and specifications for preparing Quality Assurance Project Plans" (QAMS-005/80). It is the intent of CLSB to meet or exceed the QA/QC requirements set by USEPA or other appropriate governmental or private entities and assure that all analytical data generated are scientifically valid, defensible, comparable and of known acceptable precision and accuracy.

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QA/QC Manager

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President



1.0 Introduction

The purpose of the Clinical Laboratory of San Bernardino (CLSB) Quality Assurance Manual is to document the minimum quality assurance requirements for the laboratory. This Quality Assurance Manual provides ready reference for chemists and clients on CLSB's policy pertaining to the accuracy and reliability of analytical tests performed in the laboratory.

The policies contained within this CLSB Quality Assurance Manual are to be applied to all laboratory operations. The manual is updated annually, to provide for the addition of new methods and procedures as they are developed.

2.0 CLSB Services

CLSB is an environmental testing laboratory providing a wide range of analytical services to both the public and private sectors. CLSB is located in Grand Terrace, California and features modern facilities and equipment. CLSB specializes in organic, inorganic, microbiology, and radiological chemistry of drinking water and wastewater. For a complete description of certified ELAP approved methods, please refer to **Appendix B**.

The analytical staff is comprised of chemists, analysts, and technicians from a broad range of academic and environmental disciplines. The staff recognizes the need for high quality and legally defensive data, and the impact that this data has on the decisions of our clients. It is our company mission to provide our customers with high quality and timely results that will meet or exceed our customers' expectations.

3.0 Laboratory Organization and Responsibility

Since the demands on an environmental testing laboratory can be great and diverse in nature, the CLSB laboratory is structured into distinct and effective departments. These departments have clearly defined objectives and responsibilities that are directly involved in the analytical testing process. The structure of CLSB provides a framework for high quality analytical operations for which the Quality Assurance Manual is the blueprint. The minimum responsibilities of laboratory personnel are defined as follows with the laboratory organization outlined in **Appendix A** (QAM-3). Refer to QAM-9 for detailed job description.

3.1 President

The President is responsible for the management of the entire laboratory. It is the President's job to implement corporate goals, objectives and policies. The President is in direct communication with the Laboratory Director (hereinafter "**Technical Manager**").

3.2 Technical Manager

The ultimate responsibility for laboratory operations and quality assurance is that of the Technical Manager. The Technical Manager communicates with the QA/QC Manager to ensure that the CLSB Quality Assurance Manual and SOPs are followed as written. The Technical Manager works with each department supervisor to implement the QA/QC procedures of this manual. It is the Technical Manager's job to see that non-



laboratory departments (accounts payable, data processing, etc.) of CLSB work with their laboratory counterparts to achieve high quality results and client satisfaction.

3.2.1 NOTE – Should the Technical Manager be absent for fifteen (15) consecutive days, the Quality Assurance Manager shall be appointed as interim Technical Manager; if absence exceeds 35 consecutive days, then Environmental Laboratory Accreditation Program (ELAP) will be notified in writing.

3.2.2 NOTE – Should the Technical Manager leave and not be replaced within 15 days, a temporary Technical Manager of lesser qualifications will be appointed for a period not to exceed 90 days while a qualified Technical Manager is recruited. Records of notification to ELAP of a Technical Manager change, and ELAP's return notification of new Technical Manager confirmation will be documented.

3.3 Project Manager

Project Managers assure that clients' needs are addressed by coordinating analysis and reporting activities. Project Managers work closely with the Technical Manager, Department Supervisors, QA/QC Manager and Field Services to achieve client satisfaction.

3.4 Department Supervisors

CLSB is divided into four analytical departments: Inorganic, Organic, Radiochemistry and Microbiology. The department supervisors provide supervision of group operations, implement the laboratory quality assurance plan, ensure proper scheduling and execution of analyses, assure that proper analyses techniques are being used, review all data before they are released, and report all discrepancies to the QA/QC department.

3.5 Field Services

Field Services has the responsibility of proper sampling and transportation of samples to and from CLSB. Field service personnel are required to know CLSB's QA policies and report to the Field Services Manager.

3.6 Data Control

Data Control (Front Office) is responsible for generation, emailing, hard copy mailing, filing, and archiving all reports generated by CLSB.

3.7 Sample Receiving

Sample Receiving is responsible for receiving, logging, checking and, if necessary, preserving the samples and distributing the samples to the correct analytical work or storage location.



3.8 Accounts Payable/Receivable

Accounts Payable/Receivable is responsible for the management of financial operations, including accounting and procurement of all laboratory items. It is the Accounts Payable's job to ensure that purchased items and services meet the QA Plan requirements and perform as outlined in this document.

3.9 Quality Assurance/Quality Control Manager

Quality Assurance/Quality Control Manager coordinates with analysts in implementing the policies included in this QA Manual. The QA/QC department continuously evaluates the effectiveness of the QA/QC program. Unacceptable findings are reported to the Technical Manager. The QA/QC Manager is responsible for the monitoring of daily laboratory QA/QC activities as follows:

3.9.1 Ensures that all records, logs, standard operating procedures (SOPs), project plans, and analytical results are maintained in a retrievable fashion.

3.9.2 Ensures that copies of SOPs, and contract requirements are distributed to laboratory personnel involved with sample analyses.

3.9.3 Ensures that analysts are utilizing QC samples, following SOPs, and implementing and documenting corrective actions.

3.9.4 Ensures that instrument logs, extraction logs, standard logs, and QC documents are maintained and are completed with the correct information.

3.9.5 Ensures that samples are properly labeled and stored, and that the instruments are properly calibrated through internal audits.

4.0 Objectives of the Quality Assurance Program

The primary objective of the Quality Assurance (QA) program is to produce quality data which are legally defensible. This will ensure that the data can be relied on to represent the true value for a given sample. Our QA Program includes annual Proficiency Testing (PT), periodic Quality Control Standards (QCS), and daily QC checks for each method of analysis. Our instruments are routinely monitored for performance and some are under service contract to correct serious instrument malfunctions. We work with various manufacturers for calibrations on balances and certified thermometers. We keep records of all our analyses via hard copy and/or electronic files for five years. All analytical data have a second party and Project Manager's review before the results are reported to our clients.

The CLSB Quality Assurance/Quality Control Program is an essential part of our analytical procedure. The program has been integrated into every phase of laboratory operation. It is designed to monitor and control the quality of the data generated by the laboratory, thus ensuring that errors are kept to an acceptable level and corrective actions are taken when necessary. The program detects and corrects problems in the measurement process to ensure that all data are valid and legally defensible. Acceptance limits are set and followed; should acceptance limits be out of control a corrective action report is generated for a brief description of possible causes. Qualifiers for out-of-range recoveries



are added in LIMS and show up in the final reports. Our staff is fully trained and well qualified for each test. New analysts are trained and required to perform Initial Demonstration of Capabilities (IDC) prior to independently handling client samples.

4.1 Ethics and Data Integrity System

Data integrity is of the utmost importance in the lab and shall be performed initially upon employment. It is the intent of CLSB that all employees perform their duties in a professional manner. All employees performing work under guidance of this Quality Manual are expected to follow the methods and procedures outlined within this document. All employees are required to abide by the CLSB data integrity plan. Employees who fail to abide will face disciplinary action up to and including immediate termination. Policy and Procedures for Data Integrity are discussed further in applicable SOP.

5.0 Analytical Methods Summary

The primary methods used for the analyses of drinking water and wastewater come from US Environmental Protection Agency procedures, HACH Water Analyses Handbook and American Public Health Association's Standard Methods, 19th, 20th, 21st, 22nd and 23rd Editions. All analyses performed at CLSB comply with these methods and are listed in **Appendix B**.

CLSB has written Standard Operating Procedures, SOPs, that comply with current certification, and all federal and state regulations. A copy of company SOPs and associated official methods are located where each analysis is performed and in the QA office.

6.0 QA Manual Description

The organization of this manual is presented in the table of contents. Essentially, the manual follows the logical progression of analytical work and the application of the QA Program in the laboratory. The program can be divided into four major areas.

6.1 Pre-Analytical Procedures

The pre-analytical work includes various aspects of sampling receipt, preservation, storage, sampling procedures, documentation, materials, field sampling, and collection. Prior to samples being analyzed, they must be logged into the Laboratory Management Information System, LIMS, and properly labeled by sample receiving staff.

6.2 Procedures Concurrent with Analyses

This group of procedures includes QC steps such as calibration and calibration verification, blanks, DLR checks, spikes, internal standards, surrogates, replicates, etc., as well as analytical methodology.



6.3 Data Reduction and Evaluation

Both QC and sample data must be evaluated to ensure data obtained are valid and fall within acceptable control limits. The Department Supervisors, QA Manager and/or Technical Manager review all data before they are released to Project Managers for final reporting.

6.4 Data Reporting

Specific reporting formats may be required for different projects, but all data must be signed off, both electronically and hard copy, before being released. Hard copy raw data packages combined with QC summaries are printed, stored and maintained to allow access for future inquiries concerning the results. The LIMS allows instant electronic access to all of the QC parameters associated with any sample.

7.0 Sample Receipt

All non-microbiological samples are received and processed upon arrival or are stored at 2 – 6 °C refrigerator prior to logging into the system.

7.1 The Sample Receiving staff will receive the samples and:

7.1.1 Examine all samples and determine if proper temperature and preservation have been maintained during shipment.

7.1.2 Compare samples received against those listed on the chain of custody (COC).

7.1.3 Verify that sample holding times have not been exceeded.

7.1.4 Sign and date any COC form

7.1.5 Place the samples in proper laboratory storage.

7.1.6 Enter all login information into LIMS and create the work order which can be seen by analysts when using LIMS to query for samples to be analyzed.

7.1.7 Scan the completed chain of custody record into LIMS, and place COC hard copy in the work order file.

7.1.8 Sample Receiving staff are to preserve samples, if needed, within 1 hour of sample reception.

7.1.8.1 Policy and Procedures for Sample Receiving are discussed further in applicable SOP.

7.2 NOTE: After sample receipt and inspection, the Sample Receiving staff will sign the COC form. For samples delivered by mail or by a third party, the client should include a signed COC form with all the required information.



7.3 Refer to the latest version of **Sample Receiving** SOP (SOP-Q-9) for information regarding sample handling procedures.

7.4 Refer to the latest version of **Chain of Custody Protocol** SOP (SOP-Q-12) for additional information.

7.5 Refer to the latest version of **Sample Acceptance and Rejection** SOP (SOP-Q-22) for additional information.

8.0 Sample Transport

Field sampling and transport are critical parts of the analytical process and can have a direct effect on data quality. Samples are to be shipped in ice-chests containing wet bagged ice, whether shipped by direct transport, by field personnel, or commercial carrier. All samples must be properly collected, preserved, and transported to the laboratory before analysis.

9.0 Holding Times, Preservation and Storage

Containers provided by CLSB have been purchased from commercial suppliers. Samples must be placed in containers compatible with the intended analyses and properly preserved. Also, collectors of samples must consider the time interval between acquiring the sample and analysis (holding time) so that sample results are valid. **Appendix D** provides requirements for various analytical parameters with respect to preservation, maximum holding time between collection and analyses, and proper container storage.

Preservation of samples is addressed and summarized in laboratory SOPs as well. The primary consideration for sample storage is the extraction and analysis of samples within the prescribed holding times for the parameters of interest. Placing of samples in the proper storage environment is the responsibility of the Sample Receiving Staff, who should notify the Department Supervisor if there are any samples that must be analyzed immediately because of holding time requirements. The LIMS allows analysts to queue samples to be analyzed based on holding time, due date or other criteria.

10.0 Field Collection and Shipment

Prior to collecting samples, the sampler must consider the analyses to be performed so that proper sample containers and shipping containers can be assembled and proper preservatives added to containers. In addition, field logs, record sheets, and COC forms must be assembled. Refer to last version of Field Sampling Microbiology SOP-Q-16, Field Sampling Semi-VOA SOP-Q-18, Field Sampling Selective VOA & Inorganic SOP-Q-19 for further information.

The field staff must complete all records required for proper documentation. The primary documenting record is the Chain of Custody, COC form, as discussed in **Section 11.1**. In addition to initiating the COC form, field personnel are also responsible for labeling samples, providing proper preservation, and packaging samples to prevent breakage during transport or shipping.



11.0 Sampling Procedures and Documentation

Proper sampling in the field requires consideration of many aspects including: sampling technique, labeling, documentation via chain of custody, and documentation via microbiology forms. SOP of field sampling, thermometer calibrations, travel blanks, sample receiving and sample storage are available as ready reference. The items discussed in these sections touch on several of these key elements in environmental sampling procedure and documentation.

11.1 Chain of Custody

An overriding consideration for accurate analytical results is the ability to demonstrate that the samples have been obtained from the location(s) stated and that they have reached the laboratory without alteration. To accomplish this, evidence of collection, shipment, laboratory receipt, and laboratory custody must be documented. Refer to latest version of Chain of Custody SOP-Q-12.

Documentation is accomplished through a "chain of custody" (COC) form that records each sample and the individuals responsible for sample collection, shipment and receipt. **Appendix C** represents a COC form used by CLSB personnel in collecting and shipping samples. A sample is considered in custody if it is:

- 11.1.1 In a person's actual possession
- 11.1.2 In view after being in physical possession
- 11.1.3 In a secured area, restricted to authorized personnel

Each individual who has the sample(s) in their possession must sign the COC form. Preparation of the COC form shall be as follows:

11.1.4 The individual who brings the samples to the laboratory must fill out a COC form with complete client information, sample location(s), date, time, and pertinent analyses for each sample. This individual must sign as relinquished by and print the company name along with the date and time.

11.1.5 If the individual does not deliver samples directly to the laboratory, the next individual who receives the samples (i.e. drivers) must sign as received by with company name. In this case, sampler must fill out COC with complete client information, sample location, date, time and appropriate analyses for samples.

11.1.6 As samples get transported from one individual to another, the relinquished by and received by sections must be signed along with the date and time. It is also the responsibility of each individual who has possession of the sample to match the COC form with actual samples.

11.1.7 Sample receiving personnel must sign with date and time. It is the responsibility of sample receiving personnel to ensure all samples match the COC.



11.1.8 If samples have been damaged during shipment, the remaining samples shall be carefully examined to determine whether they were affected. This will be noted on the COC form and sample receiving personnel are to inform the Project Manager who in turn, will notify the client.

11.1.9 Duplicate carbon copies may be used so that a copy of the COC can be returned to the person shipping the samples after they are received in the laboratory. Otherwise, scanned copies will be made and distributed with the final report.

11.1.10 If the analytical testing is not specified with the sample shipment, the Sample Receiving staff shall immediately notify the responsible field personnel for clarification. If the samples are external to CLSB, the client shall be contacted by the Project Manager to determine the analyses required. The Sample Receiving Staff will store the samples as appropriate, until the issue is resolved.

11.1.11 The final step in providing information to the laboratory is the “Analyses Requested” portion of the COC form. The Analyses Requested, included on the CLSB COC form shall be completed by the field personnel and included with the COC record. Any other form, provided by the client, that details the requested analyses may be substituted for the COC form provided sufficient information is included. It is imperative that the “Analyses Requested” information be provided to enable the lab to comply with maximum allowable sample holding times.

Non chain of custody paperwork is accepted to submit samples if all the critical information is included. Currently, chain of custody forms are highly recommended to our clients, but not required.

12.0 Sample Login

The laboratory has assigned a specific in-house labeling process to identify samples and its required analyses. sample must be labeled, containing the following information:

12.1 LIMS work order/Sample ID Number

12.2 Sample location (such as well number)

12.3 Sampling date and time

12.4 Sample preservation/conditioning method, if applicable

12.5 Analyses requested

12.6 Analysis turnaround time

12.7 Matrix

12.8 For a complete description of project number assignment and logging samples into LIMS, refer to the latest version of Sample Receiving SOP (SOP-Q-9).



13.0 Sample Disposal

Ultimate disposition of the samples is addressed in CLSB's Sample Storage SOP (SOP-Q-10) and Business Emergency/Contingency Plan. There are several possibilities for sample disposition:

- 13.1 The sample may be completely used up during analyses.
- 13.2 Samples may be returned to the client or location of sampling for disposal.
- 13.3 The samples may be stored after analyses.
- 13.4 NOTE: Proper environmental control and holding time must be observed if re-analyses is anticipated. Otherwise, environmental conditions for storage will interfere with sample analysis.

The Sample Receiving Manager shall determine disposition of samples if not specified on the COC form. In general, CLSB retains samples between five and twelve weeks after sampling, unless otherwise specified; please see latest version of sample storage SOP (SOP-Q-10) for storage details.

14.0 Materials and Apparatus

The materials used in the laboratory include containers of polyethylene, and borosilicate glassware that are free from cross-contaminations so that their effect upon analytical results and method criteria show accurate and precise measurements. Equipment used in the laboratory includes, but is not limited to the following: GC, HPLC, ICP, ICP-MS, GCMS, AA, pH meters, EC meters and spectrophotometers. All materials purchased by CLSB meet the minimum method requirements and are outlined in the SOPs. Refer to **Appendix J** for precise up-to-date instrumentation used at Clinical.

The QA/QC Manager ensures that materials are intact and meet the required specifications.

The duties of the Departmental Supervisors and Laboratory Analysts include:

- 14.1 Specifying in purchase orders the materials needed as defined by the applicable Standard Method and EPA Methods.
- 14.2 Ensuring all equipment are intact, free from scratches or cracks preventing proper analyses.
- 14.3 Proper labeling and storage of materials as defined by the laboratory SOP.
- 14.4 Proper handling and maintenance of instrumentation as outlined from manufacturer's instructions.
- 14.5 Updating maintenance logbooks whenever any instrument or apparatus is dysfunctional producing inadequate data results.



14.6 Containers

Containers used in the laboratory can affect the quality of analytical results. Soft glass containers are not recommended, especially for the storage of reagents. Chemically resistant borosilicate glass and other glassware that are manufactured under the trade names of Pyrex or Kimax, are recommended for use. This glassware is satisfactory for analyses performed by CLSB unless otherwise noted in the sampling or testing procedure. The use of plastic containers and other materials made of polyethylene, polystyrene and polypropylene is also desirable for certain specified applications. Material composition, volumetric tolerances and cleaning are important considerations in laboratory containers. **Appendix D** lists the containers used for sample collection.

14.6.1 Material Composition

The following guidelines should be considered when selecting the material composition of laboratory glassware:

- 14.6.1.1 Contents and chemical composition of preservatives added to solution
- 14.6.1.2 Method requirements for storage and shipment capabilities
- 14.6.1.3 Light and temperature sensitivity of analytes within solution
- 14.6.1.4 Container effect on the chemical stored inside

In general, borosilicate glassware is used for organic analytes. Polyethylene, polystyrene, and polypropylene containment is for inorganic and bacterial constituents. Disposable containers of glass and durable plastic can be used if specified by the method (e.g., microbiological bottles, VOC vials).

14.6.2 Volumetric Tolerances

CLSB uses glassware rated grade A as required for each analytical procedure. The types of glassware include volumetric flasks, volumetric pipettes and accurately calibrated burettes. Less accurate types of glassware, including graduated cylinders and measuring pipettes have specific uses when a less accurate amount of volume is used by the analytical procedure. Refer to latest version of Estimation of Uncertainty SOP (SOP-Q-3) CLSB calibrates quarterly the automatic pipets used throughout the lab, so that their accuracy is within a tolerance of plus or minus 2.5%. Disposable pipets are calibrated per lot number.

14.6.3 Glassware Cleaning (Refer to latest version of Glassware Washing SOP (SOP-Q-5))

Methods of cleaning glassware are selected according to the substances that are to be removed and analytical procedures required per department.



Microbiology & Radiochemistry Department Glassware Procedures:

1. Use enough solid Alconox detergent to clean glassware.
2. Scrub glassware with foamed Alconox suds, using a brush. Ensure brush is adequate and prevents scratches to glassware.
3. Dump contents into the sink.
4. Use hot tap water to rinse glassware 3 times to remove any trace of detergent.
5. Rinse with de-ionized water 3 times to ensure that glassware is free of contaminants.

Inorganic Department Glassware Procedures:

1. Use enough solid Alconox detergent to clean glassware.
2. Scrub glassware with foamed Alconox suds, using a brush. Ensure brush is adequate and prevents scratches to glassware.
3. Dump contents into the sink.
4. Use hot tap water to rinse glassware 3 times to remove any traces of detergent.
5. Rinse with de-ionized water 3 times to ensure glassware is free of contaminants.
6. Allow glassware to air dry. For EPA Method 1664B, place the flasks and other glassware in laboratory oven between 105°C -115°C.
7. Rinse all glassware with specified solvent used per method at the beginning of analyses.

EPA Method 218.6 Glassware Procedures:

1. Rinse all glassware with tap water, enough times so detergent is removed.
2. Soak all glassware in tub with a mixture of nitric acid and hydrochloric acid for 4 hours.
3. Waste contents should be properly disposed.
4. Use hot tap water to rinse glassware 3 times to remove any traces of detergent.
5. Rinse with de-ionized water 3 times to ensure glassware is free of contaminants.
6. Allow glassware to air dry.
7. Rinse all glassware with specified solvent used per method at beginning of analyses.

Organics Department Glassware Procedures:

1. Use enough solid Alconox detergent to clean glassware.
2. Scrub glassware with foamed Alconox suds, using a brush. Ensure brush is adequate and prevents scratches to glassware.
3. Dump contents into the sink.
4. Use hot tap water to rinse glassware 3 times, removing any traces of detergent.
5. Rinse with de-ionized water 3 times to ensure glassware is free of contaminants.
6. Allow glassware to air dry.
7. Rinse all glassware with specified solvent used per method at the beginning of analyses.
8. All volumetric glassware must not be placed in the laboratory oven. After they have been air-dried, they are rinsed with acetone and the final solvent used in the analysis in order to remove contaminants.

14.7 Equipment /Instrument Maintenance and Repair

Environmental chemical analyses are heavily dependent on properly maintained and calibrated instruments. Sensitivity and reliability of these high precision instruments require periodic maintenance and calibration to



assure precise and accurate measurements. Therefore, the SOPs include routine instrument calibration and maintenance.

The purpose of instrument maintenance is to maintain proper equipment performance and to prevent instruments and equipment from failing during use. An adequate maintenance program increases reliability of a measurement system and will include equipment cleaning, lubricating, reconditioning, adjustment and/or testing. Department Supervisors shall implement the program, and the QA/QC Manager shall review the implementation to verify compliance.

CLSB's maintenance program considers several factors:

14.7.1 The availability of spare parts within the laboratory to minimize downtime

14.7.2 Frequency that preventive maintenance is required

Preventive maintenance is performed on a routine basis and documented by departmental analysts in a maintenance logbook assigned to each instrument. This logbook indicates when parts are replaced or if the instrument has deteriorated from use, etc. **Appendix E** illustrates one type of maintenance log currently in use.

15.0 Reagents, Solvents, Standards, and Gases

Chemical reagents, solvents and gases are available in a variety of grades of purity, ranging from technical grade to ultra-pure grades. The purity required varies with the analytical method specifications. The parameter measured, and the sensitivity/specificity of the detection system are also important factors in determining the concentration levels of the reagents and standards used (Refer to Approved Vendors List QAM-18)

Standards are obtained from commercial sources and are traceable to EPA, NIST CRADA (Cooperative Research and Development Agreement) or A2LA (American Association for Laboratory Accreditation). Our commercial suppliers include trusted companies such as Ultra-Scientific, VWR, Aldrich, ERA, Absolute Standards, etc. Certificates of Analyses for all standards are obtained and kept in a departmental binder that is available for review. All standards are labeled with their name and can be traced back to the standard logbooks. Expiration dates are also found on the labels and in the logbooks. No expired standards shall be used. Standard shelf life is not to exceed 2 year. The QA/QC Manager audits all standard logbooks.

15.1 Reagents and Solvents

In general, Analytical Reagent Grade (AR) reagents and solvents are adequate for departmental method analyses. Some GC detectors require that reagents and solvents be free of certain classes of contaminants. Individual analytical methods specify the reagents needed as well as proper storage procedures. Refer to the latest version of Purchasing Services and Supplies' SOP (SOP-Q-23).

To minimize potential deterioration of reagents and solvents, the analyst should take extra precaution not to contaminate the clean reagents and solvents when used. Each reagent lot and solvent lot must be checked to determine suitability for the analyses.



All dry reagents and solvents have specific manufacturer's expiration dates the laboratory follows for compliance. All reagents and standards will be logged in the standard logbook upon receipt and will be stored in accordance with the manufacturer's recommendations. General reagents and solvents are stored in a cool dry environment. Flammable solvents are stored in a specialized closed containment.

15.1.1 Deionized Water

Deionized water is used for dilution, preparation of reagent solutions, and final rinsing of glassware. A resistance equal to or greater than 18.3 mega ohms/cm at 25° C is required. This is equivalent to less than 0.1 mg/L of ionized material.

Organic-free water is required for volatile organic analyses and may be verified by the purge and trap GC/MS instrumentation. The laboratory uses a Barnstead E-Pure Water with a cartridge to produce an organic-free water.

15.2 Standards

There are three types of standards used in the laboratory: stock standards, working standards, and QC check standards. Standards denoted as stock standards are purchased from suppliers and received in the laboratory, usually at high concentrations, and used for the preparation of working standards. Working standards are made for daily calibrations, calibration verification, and other spike sources prepared to check instrument performance and method precision. QC check standards include annual PT and second source periodic checks required in some methods.

Standards used for atomic absorption and emission spectroscopy shall be of spectro-quality. Reference grade standard is the minimum acceptable grade for standards used in inorganic and organic analyses. As standards are used throughout the laboratory, they are recorded in a standard inventory logbooks and standard preparation logbooks, as well as LIMS, to ensure traceability should an analytical result be in question. General light-sensitive standards are stored in a cool, dark area. General working standards are kept refrigerated at 2°C to 6°C. For specifications refer to CLSB's SOP of applicable analyses.

Standard logbooks indicate proper expiration dates; standards are removed from use once expired. All stock standards are kept according to the manufacturer's specified expiration date. Expiration dates for media used in our microbiology department vary depending on caps and culture tubes in which media are prepared. Store all prepared screw-cap media and use within three months. Store all prepared slip-cap media; use LSB media within one week and use HPC media within two weeks.

All standards are verified upon receipt with Certificates of Analysis, indicating standard concentrations and other specifications. As Certificates of Analysis are received, analyst's initials as well as date received and unique laboratory identification are documented on the certificate for traceability purposes. Types of working standards include the LCS, IS, surrogate, and calibration standards.



15.3 Gases

In general, fuel and oxidant gas used for atomic absorption can be commercial grade and volatile analyses gases are ultra high purity. Ultra high purity gases used in the laboratory include compressed nitrogen, compressed hydrogen, and compressed helium. Compressed air is commercially supplied, zero grade.

The P10 mix, used for radiochemistry analysis, consists of 90% argon and 10% methane. Liquid argon is also used in the laboratory. All gases are purchased from Airgas or Cameron and are replenished as needed.

16.0 Calibration

The calibration program verifies that the instrument is of the proper type and range, providing accuracy and precision to data results compatible with specified method requirements.

This section of the QA Manual prescribes the practices used by the laboratory to implement a calibration program. Implementation is the responsibility of the laboratory management and analysts. The QA/QC Manager shall also review the implementation of the calibration program.

16.1 Calibration Procedures

Whenever possible, procedures such as those published by ASTM, US EPA, Standard Methods, or manufacturers shall be used by CLSB. If established procedures are not available, a procedure shall be developed considering the type of equipment, stability characteristics of the equipment, required accuracy and the effect of operational error on the quantities measured. As a minimum, the procedures shall include:

- Type of instrumentation used
- Standard references for traceability
- Step-by-step calibration procedures
- Calibration technique
- Acceptable performance criteria
- Frequency of calibration
- Proper calibration documentation
- Non-conformance corrective action procedures
- On-going calibration verification procedures

Two types of calibration procedures are discussed in this section:

OPERATIONAL CALIBRATION is routinely performed as part of an instrument's daily use, such as the development of a standard curve. Operational calibration is performed as part of the analytical procedure.

PERIODIC CALIBRATION is performed at prescribed intervals for equipment, such as balances, thermometers, and pipettes. In general, equipment that can be calibrated periodically is a distinct, single purpose unit and is relatively stable in performance.

16.1.1 Operational Calibration Procedures



A standard calibration curve is prepared for each applicable instrument. Preparation of a standard calibration curve is accomplished by using calibration standards. Calibration standards are also referred to as "working standards," they are prepared by mixing known analyte concentration into the solvent that is to be introduced into the instrument.

The concentrations of the calibration standards are chosen to cover the working range of the instrument. All sample measurements are made within this working range. The calibration curve is prepared by plotting instrument response versus analyte concentration. Actual sample concentrations are then read directly from the calibration curve or determined by interpolation. Data reduction is done manually and/or by electronic data systems. Types of operational calibration procedures discussed below include gas chromatograph (GC), gas chromatograph/mass spectrometers (GCMS), Inductively Coupled Plasma Spectrometer (ICP), (ICP-MS), Atomic Absorption (AA), Ion Chromatograph (IC), and High-Performance Liquid Chromatography (HPLC).

16.1.2 Calibration Models

Instruments in the Lab use either Average Response Factor, linear or quadratic curves to quantify results. Average Response Factor has a minimum of 4 calibration standards. Linear curves ($y = mx + b$) require a minimum of five standards. Quadratic curves ($y = ax^2 + bx + c$) have a minimum of 6 standards. Refer to method SOPs for additional information.

NOTE – Where there is a choice between correlation coefficient or relative standard deviation to determine calibration viability, CLSB will choose RSD first if method allows. In the event that RSD fails, correlation coefficient will be used.

NOTE – Measure of relative error in the calibration will be documented on the analytical report / chromatogram. Instruments in the Lab that use correlation coefficient or coefficient determination will evaluate relative error by Relative Standard Error (%RSE). For instruments in the Lab that use average response factor, the measure of relative error will be the relative standard deviation (RSD).

Criterion for Relative Error is method specific and is discussed further in method specific SOPs.

16.1.3 GC, and HPLC, GCMS

For GC and HPLC, a minimum four-point standard curve is initially analyzed to calibrate instrument response and to define the working range of the instrument for the analytes of interest. For GCMS, a minimum of four points are needed for calibration.

After initial calibration is established, mid-point calibration standards are analyzed to confirm continuing instrument calibration verification. For some methods, e.g., VOCs, BSs/LCS are analyzed to confirm that the calibration is still in control. The acceptance criteria are method specific, outlined in the SOPs, and are strictly adhered to by CLSB.



The calibration used include: Average Response Factor, linear regression or quadratic regression curves. For the Average Response Factor curves, Response Factors (RF) are to be calculated for each analyte at each concentration level (acceptable response factors are given in the individual SOPs). These RFs will be averaged to generate the mean RF for each analyte over the range of the standard curve. The mean response factor will be used to calculate the sample concentration of the analytes of interest. When sample responses exceed the range of the standard curve, the sample will be diluted to fall within the range of the standard curve and be reanalyzed. The results of the daily GC standardization will be tabulated and filed with the corresponding sample analyses. Calibration reports are generated by using computer software for some methods.

16.1.4 ICP, ICP-MS, AA, and IC

The ICP, ICP MS, and AA are standardized for the metal of interest by the analyses of a set of calibration standards prepared by diluting a stock solution of known concentration. IC Standards are for ion chromatography. Working standards are prepared by dilution of the stock standard. The concentration of the calibration standards is chosen so as to cover the working range of the instrument. Subsequently, all sample measurements are made within this working range. Once the working standards are prepared, they are analyzed on the IC, ICP, ICP MS, or AA, and the instrument response is calibrated to provide a direct readout of the analyte concentration.

The calibration is accomplished by inputting the analyte concentration equivalent to the readout in response units during analyses of the working standards. Once the instrument has been initially calibrated, the analyses of second source working standards or similar source with a different lot # are run to confirm the initial calibration settings. A typical calibration process is as follows:

Working standards are prepared by dilution of a stock standard solution for the analyte of interest.

A calibration curve is prepared within the working range of the instrument established by analyses of four to six working standards.

The second source working standards or similar source with a different lot# are analyzed to confirm the calibration settings. If the calibration is not confirmed, the instrument is recalibrated.

The samples are then analyzed for the analyte(s) of interest.

During sample analyses, a midpoint standard is analyzed to monitor continuous instrument stability. If the analysis indicates that instrument calibration has changed, the instrument is recalibrated and the analysis is repeated.



16.2 Periodic Calibration Procedures

Periodic calibration or calibration checks, shall be performed for equipment such as balances, thermometers, and pipettes that are required in analytical methods, but that are not routinely calibrated as part of the analytical procedure. Documentation of calibration shall be kept for each equipment item.

Calibration requirements are determined within the laboratory depending upon the equipment used and its operating function. Following is an example for the calibration of balances with examples of a calibration data sheet to serve as a guideline for the preparation of laboratory specific procedures.

16.2.1 Balance(s)

All balances are calibrated daily using working weights traceable to NIST. Calibration weights shall be Class 1 or better. The calibration of working weights is checked monthly and records filed in QA Binder – Working Weight Calibration Check. Balances are calibrated by an external agency once a year. Working and reference weight are recertified every three years by an external source. Records can be obtained from the QA/QC Manager.

Acceptance criteria for the balance weights are shown on **Appendix F**. **Appendix G** provides an example of logbook used for balance calibration.

16.2.2 Thermometer(s)

All thermometers are calibrated annually using a certified NIST traceable reference thermometer. Refer to (SOP-Q-6). Working thermometers are calibrated internally as specified in the standard SOP. Records can be obtained from the QA/QC Manager. Certified thermometers are calibrated by an external agency every three (3) years.

The list of thermometers at CLSB is in **Appendix H**. Once calibrated, all thermometers are properly labeled with the name or number of support equipment, thermometer manufacturer, serial number, correction factor, date calibrated, calibration due date, and analyst.

16.2.3 Pipette(s)

Automated pipettes are calibrated quarterly. Refer to SOP-Q-20. The disposable 10 mL glass pipets are calibrated, per lot, when received. For automatic pipettes, weigh three replicates of the pipette volume. For adjustable automatic pipettes, weigh three measurements at the lower, middle, and higher end of the pipette it is used. In some cases, a pipette is calibrated at one point it is utilized in the lab. Pipette is affixed with a sticker the range or single volume it is used. For disposable 10 mL pipet, measure 10 mL three times. After temperature correction, weights should be within 2.5% and for disposable 25 mL pipet, measure 25 mL three times and calculate the mean to determine the accuracy.



16.3 Calibration Frequency

Instruments and equipment shall be calibrated at prescribed intervals and/or as part of the operational use of the equipment. Frequency shall be based on the type of equipment, inherent stability, manufacturer's recommendations, analyte percent recovery, intended use, and effect of error upon the measurement process. Calibration frequency is clarified in the corresponding SOPs.

16.4 Calibration Reference Standards

Two types of reference standards are used at CLSB for calibration:

PHYSICAL STANDARDS such as certified weights for calibrating balances and certified thermometers for calibrating working thermometers and ovens. These are generally used for periodic calibration.

Whenever possible, physical reference standards shall have known relationships to nationally recognized standards (e.g., NIST). If national standards do not exist, the basis for the reference standard shall be documented. Physical reference standards shall be used only for calibration and shall be stored separately from equipment used in daily analyses. In general, physical reference standards shall be at least four to ten times as accurate as the requirements for the equipment that they are used to calibrate.

CHEMICAL STANDARDS such as Standard Reference Materials (SRMs) provided by the National Institute of Standards and Technology (NIST), QC check standards, bioindicators, and working standards.

Whenever possible, chemical reference standards shall be directly traceable to NIST SRMs. If SRMs are not available, standards of high purity will be used to prepare calibrations. All chemical standards are recorded in Promium LIMS and standard preparation logs.

16.4 Calibration Records

Records shall be maintained for each instrument subject to calibration. Records demonstrating accuracy of reference standards shall also be maintained. A current calibration curve of applicable instruments shall be kept in a ready package located by the instrument in a secure location that is accessible upon request. Records for periodic calibrated instruments shall include, as appropriate:

- Identification number of equipment and type of equipment
- Calibration range and acceptable tolerances
- Date calibration was performed
- Calibration data
- Reference standards used for calibration
- Identity of CLSB personnel performing the calibration
- Injection and/or sequence run log



For instruments that are calibrated on an operational basis, calibration generally consists of determining instrumental response against analytes of known concentration. A record of these calibrations is maintained in two ways:

a logbook prepared for each instrument that contains all calibration data and/or calibration data package kept with analytical raw data results in a folder or stapled with results

17.0 Quality Control Batches

For any drinking water and wastewater analysis, a QC batch is defined by the number of total samples in an analytical run. Typically, a batch consists of method blanks, laboratory control samples, continuing calibration verification, matrix spikes, DLR checks, field blanks, and the samples ready for environmental testing. In order for an analytical batch to be validated, CLSB must comply with the Environmental Laboratory Accreditation Program (ELAP) regulations governed by the US EPA method regulations. Refer to the following sections for a detailed outline of what is maintained at CLSB.

18.0 Analyses and Frequency of Blanks

In general, blanks are used to determine if contamination is present. Typically, one method blank (MBLK) is run every batch of samples; however, some EPA methods require a blank every 10 samples. Results of blanks should be below the MDL (for TCP and other methods) or California Detection Limit of Reporting DLR (most methods). In select specified cases, MBLK results can be no greater than half the DLR level. Refer to SOPs for stated criteria and frequency.

18.1 Trip Blank(s)

A trip blank (TB), used with EPA 524.2, EPA 504.1 and some UCMR samples, are prepared by filling one VOA vial with organic free water and shipping the blanks with the field kit. The TB accompanies the sample containers through collection and shipment to the laboratory and is stored with the samples. Volatile organics samples are susceptible to contamination by diffusion of organic contaminants through the Teflon faced silicone rubber septum of the sample vial; therefore, the TB is analyzed to monitor for possible sample contamination during transport and storage. Results of TB analyses are kept with the corresponding sample analytical data in the project file. Refer to Travel Blank Preparation SOP-Q-14.

NOTE – available upon request.

18.2 Method Blank(s)

A method blank (MBLK) is analyzed by following the analytical procedure step by step, including the addition of all of the reagents and solvents, in the quantity required by the method. The volume of the blank must be approximately equal to the sample volume processed. A MBLK should be performed with each analytical batch of samples. Analysis of the blank verifies that any contamination in the analytical process is known and minimized. If the MBLK is not passing, steps must be taken to eliminate or reduce the interference to a level at or below the required level.



18.3 Field Blank(s)

A field blank (FB) is defined as deionized water placed into a sample container prepared in the laboratory and treated like a sample in all aspects (i.e., shipment, preservation, exposure to sampling site). The primary purpose of FB is to determine if contamination of method analytes are present in the field environment.

19.0 Analyses and Frequency of Spiked Samples

Samples are spiked with known concentration of the analytes being measured in order to determine the percent recovery per analyte. Depending on method specifications, the frequency and criteria of each spiked sample varies. Refer to SOPs for stated criteria. **Appendix I** gives an example of spiked QC acceptance criteria and frequency.

19.1 Matrix Spikes

In general, at least one matrix spike (MS) and one matrix spike duplicate (MSD) will be analyzed per analytical batch when the method requires it. If not enough sample is available for a MS, then a Laboratory Control Sample (LCS) or Tap Spike (TS) and a Laboratory Control Sample Duplicate (LCSD) or Tap Spike Duplicate (TSD) will be used. MS is defined as a sample matrix that is chosen randomly and spiked with known quantities of analytes added prior to sample extraction/digestion, and analyses.

The purpose of MS is to evaluate the effect of the sample matrix upon analytical methodology, typically spiked at midpoint concentration level, and analyzed with the sample batch. The percent recovery for the known analytes will then be calculated. Relative percent difference (RPD) will also be calculated if MSD is analyzed.

If the percent recovery falls outside specified QC limits, the data is re-evaluated and the sample reanalyzed if criteria are not met. When samples are reanalyzed, and the confirmation is still outside the specified criteria, the appropriate flag is noted (especially when results are non-detect). If the problem is serious, the QA Manager fills out a corrective action form and works with the analyst to prevent a repeat of the problem. When MS is outside of specified criteria, the common cause is matrix interference. All MS results are summarized in LIMS.

19.2 Laboratory Control Samples

A laboratory control sample (LCS) will be processed per analytical batch. Depending on method criteria, an LCS can also be processed every 10 or 20 samples. LCS is defined as a clean matrix (deionized water) spiked with known analyte(s) representative of the target analytes, which is processed through the entire analytical preparation and procedure. The results of the LCS are compared to control limits established for both precision and bias to determine the validity of the data. LCS criteria vary from method to method. Refer to the SOPs for details. Referred as Blank Spike (BS) within Promium Element LIMS.

LCS is generally a second source standard that can be used as continuing calibration verification (CCV) standard for some methods or different lot# of the same source. If the LCS is used as a CCV, the spiked



standard must meet both criteria. All LCS results should be summarized on the raw data sheets, runlogs, or logbooks.

19.3 Calibration Standards

Calibration of instruments such as GC, GCMS, HPLC, IC, ICP, ICP MS, and AA requires the use of standard calibration solutions as discussed in Section 16.0. These calibration standards are carefully prepared by volumetric or gravimetric methods and verified against the second source LCS before use in the laboratory. CLSB performs instrument calibrations as required by each method.

Because instrument response and calibration curves are subject to change and can vary from day to day, a CCV must be analyzed every 10 or 20 samples depending on the method. Analysis of this standard is necessary to verify the standard curve.

19.4 Internal Standards

An internal standard (IS) is a known amount of an analyte not normally found in environmental samples added to each organic sample before extraction or analysis. The IS is to be run on all organic analyses including spikes and blanks. Compare the IS response peak area of all samples for each day to the IS area of the Initial Calibration midpoint or the average IS area response peak of the calibration standards used. The IS response recovery requirement is detailed in every method. In addition to the peak area response, the retention time of the IS is monitored by the analyst to ensure that there is minimal change.

If the IS of any sample is outside the acceptable range, the analyst will optimize the GC response, re-extract and/or re-inject the sample – depending on sample availability. If re-extract or re-inject is still outside the acceptance range, the analyst will report initial result and choose the LIMS qualifier for reanalysis documenting matrix interference. The analyst will find the probable cause, perform maintenance and recalibrate instrument if necessary.

19.5 Surrogates

A surrogate is an organic analyte which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are often spiked into each sample prior to extraction and thereby will provide recovery data for extraction performance. Although such data is typically derived from analytes closely related to the analytes under investigation, it is not analyte specific and in the strict sense should not be used for making corrections for recovery. Since the information is provided with every sample, it is nevertheless very useful in detecting both sample specific and systematic recovery problems. Surrogates are not required in some methods like TCP by GCMS. If surrogate recoveries exceed their specified control limits corrective action will be implemented as specified in the individual method SOPs.



19.6 Quality Control Sample

The QCS is used to check laboratory performance with externally prepared test materials. This requirement is satisfied every time analysts run a second source external standard (different than calibration standards), such as the LCS. Similar source with a different lot number may be used.

19.7 DLR checks

DLR checks are of known analyte concentration, spiked at the State DLR level. ELAP requires DLR analysis quarterly; however, CLSB runs a DLR for every batch for most methods. The purpose of the DLR check is to determine if the instruments are capable of detecting analytes at low concentration levels. The default required DLR check recovery is 50 – 150%, unless otherwise stated. Referred as **Standard Reference Material (SRM)** within Promium Element LIMS.

If the DLR is outside the recovery criteria acceptable range, if sample is available, re-extract and re-inject the sample. If the DLR check is used as an LCS and/or CCV, the DLR check must then meet both criteria.

19.8 Method Detection Limit

The Method Detection Limit (MDL) is the lowest concentration at which an analyte can be detected with 99% confidence. MDLs are analyzed as required by the method or whenever there is a major change in the instrument's system, whichever is sooner. MDLs must follow the outlined procedures and regulated criteria as stated in **Appendix B** to part 136 of Code of Federal Regulations (CFR) Title 40. Refer to Method Detection Limit SOP-Q-7. The Method Detection Limit (MDL) is defined as the minimum concentration of a substance that can be identified, measured and reported with 99% confidence that the analyte concentration is greater than zero and determined from analysis of a sample in a given matrix containing analyte. The MDL_s is calculated from replicate measurements of eight (8) spiked samples with analyte at concentrations more than one to five times the estimated MDL. The MDL_b is calculated from replicate measurements of eight (8) method blanks. The greater of MDL_s or MDL_b will be selected as MDL.

Refer to **Appendix I** for examples of our current MDL and DLR levels. For MDL calculation, use the formula below.

$$\text{MDL} = \text{SD} \times 2.998$$

Where SD represents the standard deviation of the eight replicates and 2.998 is the students' "t" value for a 99% confidence level with 7, (n-1), degrees of freedom. Refer to **Determination of Method Detection Limits** SOP for additional information.

20.0 Quality Assurance Internal Audits

The QA/QC Manager will perform ongoing audits using an *Internal Audit Inspection Checklist* that is created and designed in house to qualitatively and quantitatively assess the data output generated within the laboratory. Ensure to retain all original hand written records used for the internal audit if information is transcribed into spreadsheets. Audits are considered an essential part of the CLSB QA Program. Refer to Internal Audit Checklist QAM-19. CLSB



conducts audits annually to evaluate and ensure data obtained is valid and falls within acceptable precision and accuracy-controlled limits. The internal audit findings will be summarized, documented, and reported to the Technical Manager. Major elements of the internal audits to be evaluated per department per method are listed below:

- 20.1 SOPs are available and updated
- 20.2 Published methods are available
- 20.3 Standards are not expired
- 20.4 Lab logbooks have been properly completed and reviewed
- 20.5 Instrument maintenance logs are updated and current
- 20.6 All work is properly documented
- 20.7 Properly trained chemist(s) are performing analyses
- 20.8 Traceability of all standard preparation
- 20.9 Safety practices of chemical handling by laboratory personnel is implemented
- 20.10 QC checks are within acceptable criteria
- 20.11 MDLs updated and IDCs are done as required
- 20.12 Proper standards and materials are used per method
- 20.13 Chemists are following the SOP

21.0 Proper Housekeeping

The QA/QC Manager ensures that all areas of the lab are clean and free of clutter, so as to maintain ideal working conditions with ample space for every analyst to perform the assigned duties. A weekly cleaning is done by an outside party. All chemicals are stored properly, for example flammable solvents are placed in special cabinets.

22.0 Subcontract Laboratories

CLSB sends samples to other environmental laboratories for analyses which are not performed in-house by CLSB. CLSB will only subcontract analytical work with a laboratory accredited under ELAP, a laboratory that meets applicable statutory and regulatory requirements for the test performance and the reporting of results, or a laboratory specified by the customer. These laboratories include but are not limited to the following: LA Testing, Weck Labs, CLS labs, Davi Labs, Enthalpy Labs, and Pace Analytical Inc. All analyses are handled and treated in the same



manner from logging in samples with laboratory specific identification, to reporting results with a second party review. Careful consideration is taken to ensure holding times and turnaround times are met.

22.1 Refer to Subcontracting of Environmental Tests (SOP-Q-11) for additional information

23.0 Procedural References

CLSB utilizes US EPA prescribed methods whenever applicable. Other sources of analytical methods may be used for other analyses if widely recognized by the State Water Resources Board and ELAP field of analysis (FOA). Such sources include HACH Methods, and Standard Methods published by the American Public Health Association (APHA) and the American Water Works Association (AWWA).

Refer to **Appendix B** for a summary of the certified analytical method numbers. Analyses will be performed in accordance with the methods cited herein.

24.0 Standard Operating Procedures

CLSB relies heavily on the use of Standard Operating Procedures (SOPs). CLSB's SOPs not only include the instrumentation and procedures but also include all aspects of the complete analytical process, from sample receipt to waste disposal.

No procedure or task is accepted for use until an appropriate SOP has been written and approved by the QA/QC Manager and Technical Manager. The QA/QC Manager updates all SOPs annually, or when changes in the SOP occur, after review and correction by the Department Supervisors and Technical Manager. Revisions to SOPs may be suggested and/or written by the Technical Manager, QA Manager, Department Supervisor, or a Chemist. Updated version of SOP is added to Control Document Log (QAM 2). Refer to Document Control SOP-Q-8 for additional information.

The SOPs are kept in the appropriate lab areas, readily available to each analyst. SOPs are clearly identified with the effective date, the revision number, and the signature(s) of the approving authority. The SOPs are written in a numbered outline format with the following major section headings:

- 1.0 Scope and Application
- 2.0 Responsibilities
- 3.0 Reporting Limit
- 4.0 Applicable Matrix and Matrices
- 5.0 Summary of Method
- 6.0 Definitions
- 7.0 Contamination and Interferences
- 8.0 Apparatus and Materials
- 9.0 Reagents and Standards
- 10.0 Sample Collection, Preservation, Shipment, and Storage
- 11.0 Quality Control
- 12.0 Calibration and Standardization



13.0	Procedure
14.0	Calculations
15.0	Pollution Prevention and Waste Management
16.0	Corrective Actions for Out-of-Control Data
17.0	References
18.0	Tables, Diagrams, Flow Charts
19.0	Training and Qualification Verification
20.0	Health and Safety
21.0	Revision History

25.0 Data Reduction

Data processing within the analytical laboratory ensures that the reported results will correctly represent the analyses performed. This function has two primary activities, (1) the processing of QC samples to demonstrate that analyses are within laboratory prescribed limits for accuracy and precision, and (2) the processing of samples to ensure complete results. In general, an analyst will process data in three of the following ways:

- Manually processed data (i.e. plate count, present/absent coliform testing)
- Computer processed data with manual input into computer system (i.e. MBAS, spectrometer methods)
- Computer processed data, automatically (i.e. GC, GCMS, AA, ICP, ICP MS methods)

25.1 Manually Processed Data

If the data is manually processed by an analyst (such as in microbiology), all steps in the computation shall be documented including equations used, method specified criteria parameters, dilution factors, and calculation constants. If calculations are not performed directly on the data sheet, calculations should be done on a separate sheet of paper and attached to the data sheets. Analyst initials and date are required in all instances. All analytical results are reported in a bound logbook, or in date sequenced pages bound together after analysis. For any mistakes made, the analyst shall initial and date with a single line cross-out over the incorrect result and write the correct result in.

25.2 Computer Processed Data with Manual Input into Computer System

For data that are input by an analyst and processed using a computer, a copy of the input shall be kept and uniquely identified with the batch number and other information as needed. All paperwork is then printed out, reviewed, reported, and properly filed. Refer to Element LIMS Use SOP-Q-21.

25.3 Computer Processed Data with Automatic Output

If data are directly processed from instrumentation, the analyst shall verify that the following are correct: project and sample numbers, calibration constants and response factors, output parameters such as units and numerical values used for detection limits (if a value is reported as less than).



For computer generated chromatograms, proper integration must be assured. For cases where the computer doesn't automatically integrate the peak correctly (i.e. failure to detect a peak, peak tailing, peak splitting), manual integration is approved. Appropriate integrations include valley-to-valley and baseline-to-baseline, and small shoulder peak skims whereas, inappropriate integrations which include peak skimming or peak enhancement done only to achieve quality assurance requirements is not acceptable. All original chromatograms, before integration or baseline adjustments, must be printed and saved. Chromatograms after adjustment are also printed and saved.

25.4 QC Frequency and Acceptable Limits

When the analysis of a sample set is completed, the results will be reviewed and evaluated to assess the validity of the data set. Review is based on the following criteria:

Method Blank (MBLK) Evaluation - The MBLK is generally run in order to evaluate the system for high biased readings of background contamination. If high blank values are observed, laboratory glassware and reagents should be checked for possible cross-contamination. The analysis is then halted until the system can be brought under control. In general, MBLK acceptance is based on the result being less than the DLR or less than some multiple of the MDL, as stated in method. CLSB generally reports results based on the DLR level. MBLKs are prepared and analyzed per batch of samples.

Trip Blank (TB) Evaluation - TB is analyzed to determine possible sample contamination during collection, shipment and storage of samples. TB results are evaluated for high readings similar to the MBLK described above. If high TB readings are encountered, the procedure for sample collection, shipment and sample preservation should be reviewed. High biased TB readings for other parameters may be due to contaminated sample bottles or cross contamination due to sample leakage and poorly sealed sample containers. TBs are prepared and analyzed per batch of samples depending on the method requirement.

Field Blanks (FB) Evaluation - FB is analyzed to determine possible contamination during field sampling. FB results are evaluated for high readings similar to the MBLK and TB described above. High biased FB readings may be due to air cross contamination. In the case of volatile organic analysis (VOA), ambient air in the laboratory and reagents should be eliminated as soon as possible for sources of contamination. FBs are prepared and analyzed per batch of samples as specified by the method or if requested by a client.

Calibration Evaluation - A calibration curve consists of standards prepared for each analyte parameter. Recommended calibration levels can be found in Module 4, Section 1.7.1.1(f) of TNI Standard 2016. Calibration is valid if response factors or correlation coefficient (for linear or quadratic regression fit curves) as well as analyte percent recovery criteria are met. The standard curve is then verified by the analysis of a midpoint standard concentration or as specified in the method. The calibration curve is evaluated to determine proper response through its full range.



Matrix Spike (MS) Evaluation - The observed recovery of the MS versus the theoretical spike recovery is used to calculate accuracy, defined as percent recovery. The purpose of the MS is to see how the sample matrix interferes with analytes of interest. The accuracy value (percent recovery value) vs. analyte concentration may be plotted on a control chart for each parameter. The percent recovery limit is method specific. If the percent recovery exceeds the criteria limits for the given parameter, the Departmental Supervisor or the QA/QC Manager is notified.

Laboratory Control Sample (LCS) Evaluation - The results of the LCS analyses are compared with the true value recovery, so that the percent recovery can be calculated similar to the MS formula calculation mentioned above. If the LCS percent recovery is not within acceptance criteria, the control sample and the samples in its batch should be reanalyzed. If the LCS is used for other QC checks such as continuing calibration verifications (CCV), then the LCS must meet both the CCV and LCS criteria.

Sample Duplicate Evaluation - Duplicate sample analyses for the sample set is used to determine the precision of the analytical batch. Duplicates can be run on actual samples, on matrix spikes, referred to as matrix spike duplicate (MSD), as well as laboratory control samples, referred to as laboratory control sample duplicate (LCSD). Duplicate results allow precision to be measured in terms of relative percent difference (RPD). The RPD should be plotted on control charts for each parameter determined. Control Charts can be checked and reviewed in Promium LIMS. Typically the criteria for RPD should be $\leq 20\%$ and can be method dependent. If the precision value exceeds the control limit for the given parameter, the Departmental Supervisor or QA/QC Manager is notified.

Standard Reference Evaluation - Standard Reference Materials also known as Certified Reference Materials are introduced annually into the testing scheme by the QA/QC Manager to evaluate the testing procedure and the analyst's performance procedures. Such standards include Water Supply (WS) performance evaluation (also is called Proficiency Testing – PT) standards, and Water Pollution (WP) performance evaluation standards. Acceptance limits are specified by manufacturer and must be within acceptable criteria at all times. If values are outside acceptance limits, all reference standards must be re-analyzed. Successful analysis of annual performance evaluation standards is an ELAP requirement to maintain State certification.

Surrogate Standard Evaluation - The results of surrogate standard determinations are compared with its true value spiked into each sample prior to extraction and analysis. The percent recovery of the surrogate standards is determined and must meet the method specification. Every sample is spiked with the required and appropriate surrogate standards prior to extraction for both volatile and semi-volatile organic analyses.

Internal Standard (IS) Evaluation – IS are added to each sample as prescribed in some methods. A pure analyte is added to an extract or standard solution in a known amount and used to measure the relative response of other method analytes and surrogates. The IS must be an analyte that is not a sample component. In general, the IS response must be within 70-130 percent recovery of the average daily calibration standard IS area response. Re-extract the sample if available whenever the re-injected sample fails to meet the IS criterion. Otherwise, report result from reanalysis, flag the result and inform the Project Manager if the client can resample.



25.5 Control Chart Evaluation

As more data is accumulated, the present SOP acceptance limits are evaluated by LIMS; it provides useful information on LCS recovery, relative percent differences, and other QC parameters. Control charts are derived from data that has been entered into the LIMS database and can be viewed in Element to see if there are any trends that can be resolved, e.g., instrument response is getting out of control. This can be a helpful tool in addition to QC Checklist evaluated in data package.

26.0 Data Validation

Data validation begins with the processing of data (including QC data) and continues through the review and reporting of final data analytical results. The supervisor/personnel, independent of the data acquisition, will perform data review. The Department Supervisor reviews and validates that the data processing has been correctly performed and continues by verifying that the reported analytical results correspond to the data acquired and processed. Final review of the data to be reported is by the QA/QC Manager, Project Manager, or Technical Manager.

26.1 Second- and Third-Party Reviewer

Following is a listing of practices used for reviewing data results.

26.1.1 The primary analyst performing the analysis shall give the data package to Department Supervisor, QA/QC Manager or Technical Manager. The data package (in a folder, stapled, or with paper clip) shall consist of raw data sheets, QC acceptable limits summary table, run logs, calculation sheets, and any corrective action forms where applicable.

26.1.2 The primary analyst and the second party reviewer shall check the data for:

26.1.2.1 Appropriateness of equations used as well as proper units

26.1.2.2 Correctness of numerical input and significant figures reported

26.1.2.3 Correct interpretation of QC acceptable limits summary to ensure all QC are within limits

26.1.2.4 Proper documentation practices

26.1.2.5 Traceability of standards, QC checks, and raw data sheets

26.1.3 All generated data, except those that are generated by automated data collection systems must be recorded legibly in ballpoint black or blue pen. When mistakes occur in either electronic or paper documents, each mistake is crossed out (not erased, made illegible or deleted) using a single line going through the error and the correct value entered alongside. All such alterations to documents are initialed and dated by the person making the correction. Corrections due to reasons other than transcription errors must have an explanation for the correction.



26.1.4 All entries and calculations verified shall be marked with a check mark. The checking process must be thorough enough to validate that the results are correct. If the checker disagrees with any part of the computations, the checker shall mark through the number with a single line and place the revised correction next single line, initial, and date the new change(s).

26.1.5 If the data have been processed by computer, the primary reviewer shall also check the output entries. If the analyst disagrees with the results, the number should be marked through with a single line and place the revised correction next single line, initial, and date the new change(s).

26.1.6 If a computer-generated error is identified and the data has been processed, it will be necessary to reprocess the data. In this case, the primary analyst shall note the change (in the second set of reprocessed data), initial, and date as needed.

26.1.7 Any changes made by the second party reviewer shall be re-checked by the primary analyst. If the analyst agrees with the change, no action is necessary. If the primary analyst disagrees, both the analyst and the secondary reviewer must resolve the difference so they agree with the result presented; QA/QC Manager or Technical Manager may be consulted to resolve the issue.

26.1.8 The secondary reviewer shall validate results by initialing the original raw data results and indicating the respective date.

26.1.9 QC criteria and final results are reviewed by a third-party reviewer, usually the Project Manager. Qualifiers are used to validate a batch as appropriate. Refer to **Appendix K** for existing qualifiers.

26.2 General Considerations for Analytical Precision

The quality of matrix spike duplicates, IDCs and duplicate samples is ensured with the precision criteria specified in every method. For a group of IDCs for example, the precision is the percentage relative standard deviation (%RSD), i.e. the standard deviation divided by the mean, multiplied by 100. The relative percent difference (RPD) is calculated to measure precision of a duplicate. The RPD is defined as 100 times the difference (range) of each replicate set, divided by the average value (mean) of the replicate set.

26.3 General Considerations for Analytical Accuracy

Accuracy reflects how close the recovery is to the true value being spiked. Accuracy is a Percent Recovery (%R) calculation. The %R is defined as the observed concentration minus the sample concentration, divided by the true concentration of the spike, all multiplied by 100. Each allowable %R is method specific and must be followed at all times. QC summary tables are made to identify which QC is within acceptance limits. Refer to SOPs for further instructions.



27.0 Data Reports and Data Flow

Once samples enter CLSB with their respective COC forms, all samples are logged into the LIMS system. Once samples are analyzed, results are entered in LIMS by manual input or using automated software. The LIMS Data Review screen with all results are compared to the raw data from the instruments by the Analyst, Supervisor and/or QA/QC Manager. Once reports are properly generated by Project Managers, results are sent to clients via email, mail or website upload.

27.1 CLSB currently has two types of data report forms; a generic report form and an EDT confirmation report form. Data reports generally include the following information:

27.1.1 Unique sample identification number and/or the sample identification and matrix provided to the laboratory which can be used if different than identification used in the laboratory

27.1.2 Reporting limit which is typically set to the state DLR levels

27.1.3 Method detection limit; when low level reporting is requested

27.1.4 Sample results; QC results if specified by the client

27.1.5 Laboratory name and information providing test results

27.1.6 Client contact information

27.1.7 Sampler name

27.1.8 Appropriate dates and times (i.e., date and time sampled, date and time received, date and time started, date and time completed, date reported)

27.1.9 MCL levels only on drinking water report forms

27.1.10 Reporting units, method ID code, and sample matrix

27.1.11 Approved electronic signature of the reporting project manager

27.1.11.1 Electronic signatures are controlled to ensure authenticity, integrity, and traceability of analytical reports. An electronic signature is a secure, graphic representation of an authorized user's handwritten signature, applied to Crystal Reports to indicate the Project Manager has reviewed, validated, and authorized the data. Signatures are created by obtaining the individual's handwritten signature, scanning it, and importing it into Element LIMS solely by a designated LIMS Administrator. The signature file is deleted immediately after upload and exists only within the secure Element LIMS database. Each signature is uniquely linked to the user's password-protected LIMS account, will only appear on reports generated by that user, and cannot be used by unauthorized personnel. Removal of an electronic signature from a user profile is permanent.



27.2 Corrective Action Process

27.2.1 All errors, or potential errors, occurring during the process of sample collection, transport, storage, analysis, reporting, or disposal are potential candidates for the corrective action process. The primary purpose of the corrective action process is to modify existing procedures with the goal of minimizing or eliminating detected errors. When an error does occur, the individual discovering the error will inform their immediate supervisor, the department supervisor, and/or the QA/QC Manager. The nature of the corrective action will vary depending on the seriousness of the error or potential error detected.

27.2.2 The corrective action record (CAR) documentation is demonstrated in **Appendix L**. This document outlines the steps and individual responsibilities required to report and correct a detected error, or potential error. All corrective action reports will be properly documented in the logbook. The corrective action paper work will be initiated and monitored to completion by the QA/QC Manager. Once complete, copies of the Corrective Action documentation will be provided to all involved and the Technical Manager. Completed CARs are filed in binder in the QA Department.

28.0 Employee Training: Test Methods and Validation

In order to determine the capability of each analyst to generate valid data, a basic routine training program is required and demonstrated prior to analyses performed. Training includes reading and understanding SOP/method requirements, proper documentation procedures, and performance of IDCs. Once training files are complete and acceptable precision and accuracy for IDCs are attained, the analyst can independently analyze client samples.

28.1 Initial Test Method Evaluation

28.1.1 An active SOP will be available prior to method validation.

28.1.2 A method is validated before it is put into use by performing a demonstration of capability.

28.1.2.1 For chemical analyses, the initial test method evaluation involves the following (in order):

- a) IDOC
- b/c) determination of the Method Detection Limit (MDL) / confirmation of the Reporting Limit (RL)
- d) “acceptable” PT.

28.2 Demonstration of Capability (DOC)

The laboratory confirms that it is capable of generating data of acceptable accuracy and precision on all methods before employing them.

Work cells together meet specified acceptance criteria and demonstrations of capability. The DOC is documented on the form in **Appendix M**, and these completed forms are kept in the training files for each



analyst. A DOC is performed for each analyte whenever the method, analysts, analytes, or instrument type is changed. The Supervisor certifies that technical staff members in their area of expertise are trained and authorized to perform all tests for which we are accredited by signing the DOC form. The process for DOC is documented below.

28.3 Process for DOC:

- a) A quality control sample is obtained from an outside source. If not available, the QC is prepared using stock standards that are prepared independently from those used in instrument calibration.
- b) The analyte(s) is diluted in a volume of clean quality system matrix sufficient to prepare four aliquots at the concentration specified, or if unspecified, to a concentration of 1-4 times the reporting limit.
- c) At least four aliquots are prepared and analyzed according to the test method either concurrently or over a period of days.
- d) Using all of the results, calculate the mean recovery in the appropriate reporting units and the standard deviations of the population sample (in the same units) for each parameter of interest.
- e) Compare the information from (d) above to the corresponding acceptance criteria for precision and accuracy found in the quality manual appendices. If all parameters meet the acceptance criteria, the analysis of actual samples may begin. If any one of the parameters do not meet the acceptance criteria, the performance is unacceptable for that parameter. The acceptance criteria must be defined prior to the analyst performing the method.
- f) When one or more of the tested parameters fail at least one of the acceptance criteria, the analyst must proceed according to 1) or 2) below.
 1. Locate and correct the source of the problem and repeat the test for all parameters of interest beginning with c) above.
 2. Beginning with c) above, repeat the test for all parameters that failed to meet criteria. Repeated failure, however, confirms a general problem with the measurement system. If this occurs, the source of the problem is located and corrected and the test repeated for all compounds of interest beginning with c)

28.4 On-Going (or Continued) Proficiency

28.3.1 After the demonstration of capability is completed, on-going proficiency is maintained and demonstrated at least annually through the analysis of either single-blind samples, performing another DOC, use of four consecutive blank spikes compared to pre-determined acceptance limits for precision and accuracy, or analyze authentic samples and obtain results statistically indistinguishable from those of another trained analyst. This is documented in the training file of each analyst.



28.5 Method Detection Limit

28.5.1 The policy and procedures for MDLs are discussed in Section 19.8

28.6 Proficiency Test Samples or Inter-laboratory comparisons

28.6.1 The laboratory participates in proficiency test (PT) samples once per year. Corrective action procedures are instituted for all failed PT samples.

28.6.2 The laboratory does not share PT samples with other laboratories, does not communicate with other laboratories regarding current PT sample results, and does not attempt to obtain the assigned value of any PT sample from the PT provider.

28.6.3 Proficiency Testing (PT) or Proficiency Evaluation (PE) samples are treated as typical samples in the normal production process where possible, including the same preparation, calibration, quality control and acceptance criteria, sequence of analytical steps, number of replicates, and sample log-in. PT samples are not analyzed multiple times unless routine environmental samples are analyzed multiple times.

28.6.3.1 PT study samples may have special instructions provided by the PT/PE provider. Records showing the PT study samples were handled and prepared in accordance with the provided instructions will be documented and maintained within the sample preparation batch - and/or- extraction / preparation logbook.

28.6.3.2 The policy and procedures for PTs are discussed further in applicable SOP.

29.0 Records Management and Retention of Records

As results are coming out, hard copies of raw data generated are placed into a file folder which is stored appropriately by the QA/QC Manager after data review. CLSB maintains all hard copies of raw data results for 5 years. Similarly, all logbooks and final data report folders are stored for a minimum of 5 years. Once the maximum laboratory storage capacity for raw data storage is filled, the older file folders are placed into boxes and moved to storage trailer that is secured with a lock. Boxes of results placed in the trailer are recorded by filling out the Date In of QA Archive Box Logbook (QAM -20). Results older than one year are typically moved off site to a larger storage facility and the Date Out column of QA Archive Box Logbook is filled out. A record is kept, with specific laboratory storage identification number for record maintenance and traceability. Refer to Archive Document Access Log QAM-21 in case Department Supervisor needs to check previous results that have been archived.

Electronic copies are also stored for at least 5 years. The IT manager is routinely backing up the electronic raw data and also the LIMS data that makes up every report sent to clients to ensure data security.



30.0 Security of Records

The laboratory ensures that records are protected from unauthorized editing or changes, especially the LIMs. With the approval of the Technical Manager, the IT Supervisor creates and assigns the lab staff the hierarchy of LIMS editing privilege based on the task they perform.

The analysts has the privilege in working with the LIMS, e.g., creating lab batches/bench sheets and being able upload data and get them at analyzed. And Project Managers can report results which have been reviewed. The Laboratory Supervisors, Technical Manager, and Quality Manager are authorized to get the results at reviewed. If changes are needed on the completed reports that have been sent to the clients, the Technical Manager or Quality Manager are able to revert the LIMS results at analyzed so that changes can be done. Each personnel is assigned a code to log on Element and are automatically logged out by the system if there is no activity on the computer they are logged on.

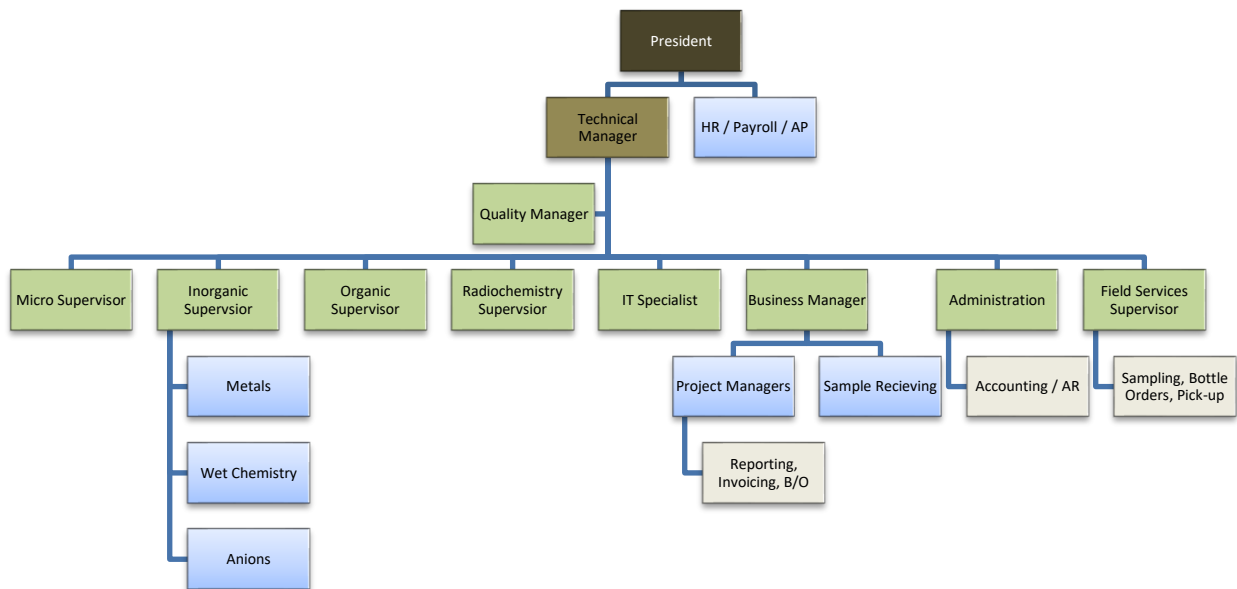
Archived hard copies of results are organized in boxes and stored in locked storage area.



Appendix



Appendix A – Organizational Chart





Appendix B – Certified Analytical Methods




CALIFORNIA STATE

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

CERTIFICATE OF ENVIRONMENTAL LABORATORY ACCREDITATION
Is hereby granted to

Clinical Laboratory of San Bernardino, Inc.

21881 Barton Road
Grand Terrace, CA 92313

Scope of the certificate is limited to the
"Fields of Accreditation"
which accompany this Certificate.

Continued accredited status depends on compliance with applicable laws and regulations,
proficiency testing studies, and payment of applicable fees.

This Certificate is granted in accordance with provisions of
Section 100825, et seq. of the Health and Safety Code.

Certificate No.: **1088**
Effective Date: **2/1/2024**
Expiration Date: **1/31/2026**

Sacramento, California
subject to forfeiture or revocation



Christine Sotelo, Program Manager
Environmental Laboratory Accreditation Program



**CALIFORNIA STATE
 ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM
 Fields of Accreditation**



Clinical Laboratory of San Bernardino, Inc.

21881 Barton Road
 Grand Terrace, CA 92313
 Phone: 9098670947

**Certificate Number: 1088
 Expiration Date: 1/31/2026**

Field of Accreditation:101 - Microbiology of Drinking Water		
101.010	001	Heterotrophic Bacteria SM 9215 B
101.020	004	Total Coliform (Enumeration) SM 9221 B,C
101.020	005	Fecal Coliform (Enumeration) SM 9221 B,E
101.050	001	Total Coliform P/A SM 9223 B Colliert
101.050	002	E. coli P/A SM 9223 B Colliert
101.050	005	Total Coliform P/A SM 9223 B Colliert 18
101.050	006	E. coli P/A SM 9223 B Colliert 18
101.050	007	Total Coliform (Enumeration) SM 9223 B Colliert 18
101.050	008	E. coli (Enumeration) SM 9223 B Colliert 18
Field of Accreditation:102 - Inorganic Chemistry of Drinking Water		
102.020	001	Turbidity EPA 180.1
102.026	001	Calcium EPA 200.7
102.026	002	Magnesium EPA 200.7
102.026	003	Potassium EPA 200.7
102.026	004	Silica EPA 200.7
102.026	005	Sodium EPA 200.7
102.026	006	Hardness (Calculation) EPA 200.7
102.030	003	Chloride EPA 300.0
102.030	005	Fluoride EPA 300.0
102.030	006	Nitrate (as N) EPA 300.0
102.030	007	Nitrite (as N) EPA 300.0
102.030	009	Sulfate (as SO4) EPA 300.0
102.045	001	Perchlorate EPA 314.0
102.060	001	Nitrate (as N) (Calculation) EPA 353.2
102.061	001	Nitrite (as N) EPA 353.2
102.100	001	Alkalinity SM 2320 B-1997
102.130	001	Specific Conductance SM 2510 B-1997
102.140	001	Residue, Filterable TDS SM 2540 C-1997
102.175	001	Chlorine, Free SM 4500-Cl G-2000
102.175	002	Chlorine, Total Residual SM 4500-Cl G-2000
102.191	001	Cyanide, Total SM 4500-CN F-1999
102.203	001	Hydrogen Ion (pH) SM 4500-H+ B-2000
102.240	001	Phosphate,Ortho (as P) SM 4500-P E-1999

As of 8/9/2024 , this list supersedes all previous lists for this certificate number.
 Customers: Please verify the current accreditation standing with the State.



Clinical Laboratory of San Bernardino, Inc.

Certificate Number: 1088
 Expiration Date: 1/31/2026

102.260	001	Organic Carbon-Total (TOC)	SM 5310 B-2000
102.261	001	Dissolved Organic Carbon (DOC)	SM 5310 B-2000
102.270	001	Surfactants	SM 5540 C-2000
102.280	001	UV254	SM 5910 B-2011

Field of Accreditation: 103 - Toxic Chemical Elements of Drinking Water

103.040	002	Antimony	SM 3113 B
103.040	003	Arsenic	SM 3113 B
103.040	005	Beryllium	SM 3113 B
103.040	006	Cadmium	SM 3113 B
103.040	007	Chromium	SM 3113 B
103.040	010	Lead	SM 3113 B
103.040	012	Nickel	SM 3113 B
103.040	013	Selenium	SM 3113 B
103.040	014	Silver	SM 3113 B
103.130	001	Aluminum	EPA 200.7
103.130	003	Barium	EPA 200.7
103.130	008	Copper	EPA 200.7
103.130	009	Iron	EPA 200.7
103.130	011	Manganese	EPA 200.7
103.130	017	Zinc	EPA 200.7
103.130	018	Boron	EPA 200.7
103.140	001	Aluminum	EPA 200.8
103.140	002	Antimony	EPA 200.8
103.140	003	Arsenic	EPA 200.8
103.140	004	Barium	EPA 200.8
103.140	005	Beryllium	EPA 200.8
103.140	006	Cadmium	EPA 200.8
103.140	007	Chromium	EPA 200.8
103.140	008	Copper	EPA 200.8
103.140	009	Lead	EPA 200.8
103.140	010	Manganese	EPA 200.8
103.140	011	Mercury	EPA 200.8
103.140	012	Nickel	EPA 200.8
103.140	013	Selenium	EPA 200.8
103.140	014	Silver	EPA 200.8
103.140	015	Thallium	EPA 200.8
103.140	016	Zinc	EPA 200.8
103.140	017	Boron	EPA 200.8
103.140	018	Vanadium	EPA 200.8
103.140	019	Strontium	EPA 200.8
103.150	014	Thallium	EPA 200.9
103.310	001	Chromium VI (Hexavalent Chromium)	EPA 218.6

As of 8/9/2024, this list supersedes all previous lists for this certificate number.
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Clinical Laboratory of San Bernardino, Inc.

Certificate Number: 1088
 Expiration Date: 1/31/2026

Field of Accreditation: 104 - Volatile Organic Chemistry of Drinking Water		
104.030	001	1,2-Dibromoethane (EDB) EPA 504.1
104.030	002	1,2-Dibromo-3-chloropropane (DBCP) EPA 504.1
104.035	001	1,2,3-Trichloropropane (TCP) SRL 524M-TCP
104.200	002	1,1,1-Trichloroethane EPA 524.2
104.200	003	1,1,2,2-Tetrachloroethane EPA 524.2
104.200	004	1,1,2-Trichloroethane EPA 524.2
104.200	005	1,1-Dichloroethane EPA 524.2
104.200	006	1,1-Dichloroethylene (1,1-Dichloroethene) EPA 524.2
104.200	008	1,2,4-Trichlorobenzene EPA 524.2
104.200	010	1,2-Dichlorobenzene EPA 524.2
104.200	011	1,2-Dichloroethane (Ethylene Dichloride) EPA 524.2
104.200	012	1,2-Dichloropropane EPA 524.2
104.200	015	1,4-Dichlorobenzene EPA 524.2
104.200	018	Benzene EPA 524.2
104.200	020	Carbon Tetrachloride EPA 524.2
104.200	021	Chlorobenzene EPA 524.2
104.200	022	cis-1,2-Dichloroethylene (cis 1,2 Dichloroethene) EPA 524.2
104.200	023	cis-1,3-Dichloropropylene (cis 1,3 Dichloropropene) EPA 524.2
104.200	025	Dichloromethane (Methylene Chloride) EPA 524.2
104.200	027	Ethyl tert-butyl Ether (ETBE) EPA 524.2
104.200	028	Ethylbenzene EPA 524.2
104.200	031	Methyl tert-butyl Ether (MTBE) EPA 524.2
104.200	036	Styrene EPA 524.2
104.200	037	t-Butyl alcohol (2-Methyl-2-propanol) EPA 524.2
104.200	038	tert-Amyl Methyl Ether (TAME) EPA 524.2
104.200	040	Tetrachloroethylene (Tetrachloroethene) EPA 524.2
104.200	041	Toluene EPA 524.2
104.200	042	trans-1,2-Dichloroethylene (trans- 1,2 Dichloroethene) EPA 524.2
104.200	043	trans-1,3-Dichloropropylene (trans-1,3 Dichloropropene) EPA 524.2
104.200	044	Trichloroethylene (Trichloroethene) EPA 524.2
104.200	045	Trichlorofluoromethane EPA 524.2
104.200	046	Trichlorotrifluoroethane EPA 524.2
104.200	047	Vinyl Chloride EPA 524.2
104.200	102	m-p-Xylene EPA 524.2
104.200	103	o-Xylene EPA 524.2
104.200	201	Bromodichloromethane EPA 524.2
104.200	202	Bromofom EPA 524.2
104.200	203	Chlorofom EPA 524.2
104.200	204	Dibromochloromethane (Chlorodibromomethane) EPA 524.2
Field of Accreditation: 105 - Semi-volatile Organic Chemistry of Drinking Water		
105.050	005	Chlordane (total) EPA 508.1

As of 8/9/2024 , this list supersedes all previous lists for this certificate number.
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Clinical Laboratory of San Bernardino, Inc.

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 Expiration Date: 1/31/2026

105.050	010	Endrin	EPA 508.1
105.050	011	Heptachlor	EPA 508.1
105.050	012	Heptachlor Epoxide	EPA 508.1
105.050	013	Hexachlorobenzene	EPA 508.1
105.050	014	Hexachlorocyclopentadiene	EPA 508.1
105.050	015	Lindane (HCH-gamma)	EPA 508.1
105.050	016	Methoxychlor	EPA 508.1
105.050	028	PCBs as Aroclors	EPA 508.1
105.050	029	Toxaphene	EPA 508.1
105.083	001	2,4-D	EPA 515.4
105.083	002	Dinoseb	EPA 515.4
105.083	003	Pentachlorophenol	EPA 515.4
105.083	004	Picloram	EPA 515.4
105.083	005	2,4,5-TP (Silvex)	EPA 515.4
105.083	006	Dalapon	EPA 515.4
105.083	007	Bentazon	EPA 515.4
105.090	001	Alachlor	EPA 525.2
105.090	003	Atrazine	EPA 525.2
105.090	004	Benzo(a)pyrene	EPA 525.2
105.090	008	Di(2-ethylhexyl) Adipate	EPA 525.2
105.090	009	Di(2-ethylhexyl) Phthalate	EPA 525.2
105.090	022	Molinate	EPA 525.2
105.090	025	Simazine	EPA 525.2
105.090	028	Thiobencarb	EPA 525.2
105.100	001	Aldicarb (Temik)	EPA 531.1
105.100	002	Aldicarb Sulfone	EPA 531.1
105.100	003	Aldicarb Sulfoxide	EPA 531.1
105.100	004	Carbaryl (Sevin)	EPA 531.1
105.100	005	Carbofuran (Furadan)	EPA 531.1
105.100	006	3-Hydroxycarbofuran	EPA 531.1
105.100	007	Methomyl (Lannate)	EPA 531.1
105.100	008	Oxamyl	EPA 531.1
105.120	001	Glyphosate	EPA 547
105.140	001	Endothall	EPA 548.1
105.150	001	Diquat	EPA 549.2
105.200	001	Bromoacetic Acid	EPA 552.2
105.200	003	Chloroacetic Acid	EPA 552.2
105.200	005	Dibromoacetic Acid	EPA 552.2
105.200	006	Dichloroacetic Acid	EPA 552.2
105.200	007	Trichloroacetic Acid	EPA 552.2
Field of Accreditation: 106 - Radionuclides in Drinking Water			
106.092	001	Uranium	EPA 200.8

As of 8/9/2024, this list supersedes all previous lists for this certificate number.
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Clinical Laboratory of San Bernardino, Inc.

Certificate Number: 1088
 Expiration Date: 1/31/2026

106.270	001	Gross Alpha	SM 7110 C
Field of Accreditation: 107 - Microbiological Methods for Non-Potable Water and Sewage Sludge			
107.001	001	Total Coliform (Enumeration)	SM 9221 B,C-2006
107.001	002	Fecal Coliform (Enumeration)	SM 9221 C,E-2006
107.050	001	Total Coliform (Enumeration)	SM 9221 B-2014
107.052	001	Fecal Coliform (Enumeration)	SM 9221 E-2014
Field of Accreditation: 108 - Inorganic Constituents in Non-Potable Water			
108.007	001	Residue, Volatile	EPA 160.4
108.009	001	Turbidity	EPA 180.1
108.013	001	Calcium	EPA 200.7
108.013	002	Magnesium	EPA 200.7
108.013	004	Potassium	EPA 200.7
108.013	005	Silica, Dissolved	EPA 200.7
108.013	006	Sodium	EPA 200.7
108.017	002	Chloride	EPA 300.0
108.017	003	Fluoride	EPA 300.0
108.017	004	Nitrate (as N)	EPA 300.0
108.017	005	Nitrate-Nitrite (as N)	EPA 300.0
108.017	006	Nitrite (as N)	EPA 300.0
108.017	008	Sulfate (as SO4)	EPA 300.0
108.025	001	Ammonia (as N)	EPA 350.1
108.029	001	Kjeldahl Nitrogen, Total (as N)	EPA 351.2
108.033	001	Nitrate-Nitrite (as N)	EPA 353.2
108.033	002	Nitrite (as N)	EPA 353.2
108.053	002	Oil & Grease, Total Recoverable	EPA 1664 B
108.063	001	Alkalinity	SM 2320 B-2011
108.065	001	Hardness (Calculation)	SM 2340 B-2011
108.069	001	Specific Conductance	SM 2510 B-2011
108.070	001	Residue, Total	SM 2540 B-2015
108.071	001	Residue, Total	SM 2540 B-2011
108.073	001	Residue, Filterable TDS	SM 2540 C-2011
108.074	001	Residue, Non-filterable TSS	SM 2540 D-2015
108.075	001	Residue, Non-filterable TSS	SM 2540 D-2011
108.078	001	Residue, Settleable	SM 2540 F-2015
108.079	001	Residue, Settleable	SM 2540 F-2011
108.114	001	Chlorine, Total Residual	SM 4500-Cl G-2011
108.137	001	Hydrogen Ion (pH)	SM 4500-H+ B-2011
108.173	001	Oxygen, Dissolved	SM 4500-O G-2011
108.175	001	Phosphate, Ortho (as P)	SM 4500-P E-2011
108.175	002	Phosphorus, Total	SM 4500-P E-2011
108.201	001	Sulfide (as S)	SM 4500-S D-2011
108.206	001	Biochemical Oxygen Demand	SM 5210 B-2016

As of 8/9/2024, this list supersedes all previous lists for this certificate number.
 Customers: Please verify the current accreditation standing with the State.



Clinical Laboratory of San Bernardino, Inc.

Certificate Number: 1088
Expiration Date: 1/31/2026

108.206	002	Carbonaceous BOD	SM 5210 B-2016
108.207	001	Biochemical Oxygen Demand	SM 5210 B-2011
108.207	002	Carbonaceous BOD	SM 5210 B-2011
108.214	001	Organic Carbon-Total (TOC)	SM 5310 B-2014
108.215	001	Organic Carbon-Total (TOC)	SM 5310 B-2011
108.225	001	Surfactants	SM 5540 C-2011
108.325	001	Chemical Oxygen Demand	Hach 8000

Field of Accreditation: 109 - Metals and Trace Elements in Non-Potable Water

109.623	001	Aluminum	EPA 200.7
109.623	004	Barium	EPA 200.7
109.623	006	Boron	EPA 200.7
109.623	009	Cobalt	EPA 200.7
109.623	010	Copper	EPA 200.7
109.623	011	Iron	EPA 200.7
109.623	013	Manganese	EPA 200.7
109.623	014	Molybdenum	EPA 200.7
109.623	022	Zinc	EPA 200.7
109.625	001	Aluminum	EPA 200.8
109.625	002	Antimony	EPA 200.8
109.625	003	Arsenic	EPA 200.8
109.625	004	Barium	EPA 200.8
109.625	005	Beryllium	EPA 200.8
109.625	007	Cadmium	EPA 200.8
109.625	008	Chromium	EPA 200.8
109.625	009	Cobalt	EPA 200.8
109.625	010	Copper	EPA 200.8
109.625	013	Lead	EPA 200.8
109.625	014	Manganese	EPA 200.8
109.625	015	Molybdenum	EPA 200.8
109.625	016	Nickel	EPA 200.8
109.625	017	Selenium	EPA 200.8
109.625	018	Silver	EPA 200.8
109.625	019	Thallium	EPA 200.8
109.625	022	Vanadium	EPA 200.8
109.625	023	Zinc	EPA 200.8
109.627	015	Thallium	EPA 200.9
109.629	001	Chromium VI (Hexavalent Chromium)	EPA 218.6
109.669	002	Antimony	SM 3113 B-2010
109.669	003	Arsenic	SM 3113 B-2010
109.669	005	Beryllium	SM 3113 B-2010
109.669	006	Cadmium	SM 3113 B-2010
109.669	007	Chromium	SM 3113 B-2010

As of 8/9/2024, this list supersedes all previous lists for this certificate number.
 Customers: Please verify the current accreditation standing with the State.



Clinical Laboratory of San Bernardino, Inc.

Certificate Number: 1088
Expiration Date: 1/31/2026

109.669	012	Lead	SM 3113 B-2010
109.669	015	Nickel	SM 3113 B-2010
109.669	016	Selenium	SM 3113 B-2010
109.669	017	Silver	SM 3113 B-2010

Field of Accreditation: 126 - Microbiological Methods for Ambient Water

126.003	001	Total Coliform (Enumeration)	SM 9221 B,C-2006
126.003	002	Fecal Coliform (Enumeration)	SM 9221 C,E-2006
126.017	001	E. coli (Enumeration)	SM 9223 B-2004 Collert 18
126.102	001	Total Coliform (Enumeration)	SM 9221 B-2014
126.104	001	Fecal Coliform (Enumeration)	SM 9221 E-2014
126.122	001	E. coli (Enumeration)	SM 9223 B-2016 Collert 18

As of 8/9/2024 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

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Appendix D – Sample Holding Time, Preservation, and Storage Table

Inorganic Drinking Water/Wastewater

Analyses	Container	Holding Time	Preservative	Method No.
Alkalinity	½ pint plastic	14 days	Cool 6° C	SM 2320-B
Aluminum (Al)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.7 / 200.8
Ammonia (NH ₃), Ammonia-N (NH ₃ -N)	½ pint plastic	28 days	Add (*) H ₂ SO ₄ to pH < 2 Cool 6° C	EPA 350.1
Antimony (Sb)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.8
Arsenic (As)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.8
Barium (Ba)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.7 / 200.8
Beryllium (Be)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.8
Bicarbonate (HCO ₃)	½ pint plastic	14 days	Cool 6° C	SM 2320-B
Biochemical Oxygen Demand (BOD)	1 pint plastic	48 hours	Cool 6° C	SM 5210-B
Boron (B)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.7 / 200.8
Cadmium (Cd)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.8
Calcium (Ca)	½ pint plastic	14 days	Cool 6° C or HNO ₃ pH < 2 (acidification in lab)	EPA 200.7
Carbonate (CO ₃)	½ pint plastic	14 days	Cool 6° C	SM 2320-B
Chemical Oxygen Demand (COD)	½ pint plastic	28 days	add (*) H ₂ SO ₄ to pH < 2, Cool 6° C	HACH 8000
Chloride	½ pint plastic	28 days	None Required	EPA 300.0
Chlorine Residual	125 ml amber glass	15 minutes	Analyze ASAP	SM 4500-Cl G
Chromium (Cr)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.7 / 200.8
Chromium VI (Hexavalent Cr)	½ pint plastic	24 hours	Cool 6° C (14 day HT with preservation)	EPA 218.6/218.7
Carbon Dioxide CO ₂	½ pint plastic	15 minutes	Analyze ASAP	SM 4500-CO ₂ -Docas
Color	General Physical Glass	48 hours	Cool 6° C	SM 2120-B
Copper (Cu)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.7 / 200.8
Cyanide, Total (CN)	½ pint plastic	14 days	Add NaOH to pH > 12, Cool 6° C / w Cool 6° C	SM 4500-CN-E,F
Dissolved Oxygen (DO)	Plastic Misc	15 minutes	Analyze ASAP	SM 4500 O-G
Electrical Conductivity	½ pint plastic	28 days	Cool 6° C	SM 2510-B
Fluoride (F)	½ pint plastic	28 days	None required	EPA 300.0
Hardness (Total)	½ pint plastic	14 days	Cool 6° C or HNO ₃ pH < 2 (acidification in lab)	SM 2340-C/ EPA 200.7

Inorganic Drinking Water/Wastewater continued

Analyses	Container	Holding Time	Preservative	Method No.
Hydroxide (OH)	½ pint plastic	14 days	Cool 6° C	SM 2320-B
Iron (Fe)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.7

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Langelier (Corrosivity)	½ pint plastic	48 hours	Cool 6° C	SM 203 (16 th)
Lead (Pb)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.8
MBAS	½ pint plastic	48 hours	Cool 6° C	SM 5540-C
Magnesium (Mg)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.7
Manganese (Mn)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.7
Mercury (Hg), cold vapor	½ pint plastic	28 days	HNO ₃ pH < 2 (acidification in lab)	EPA 200.8
Molybdenum (Mo)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.7 / 200.8
Nickel (Ni)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.8
Nitrate (NO ₃), Nitrate as N (NO ₃ -N)	½ pint plastic	48 hrs	Cool 6° C	EPA 300.0/ 353.2
Nitrate + Nitrite (as N)	½ pint plastic	48 hrs/28 days	Cool 6° C/ 28 days with (*) H ₂ SO ₄ pH < 2	EPA 300.0/ 353.2
Nitrite as N (NO ₂ -N)	½ pint plastic	48 hrs	Cool 6° C	EPA 300.0/ 353.2
Odor	General Physical Glass	24 hours	Cool 6° C	EPA 140.1M
Oil & Grease	1 liter amber glass	28 days	H ₂ SO ₄ pH < 2 Cool 6° C	EPA 1664B
Percent moisture by weight	½ pint plastic	7 days	Cool 6° C	SM 2540-B
Perchlorate (ClO ₄)	½ pint plastic w/ head space	28 days	Cool 6° C	EPA 314.0
pH	½ pint plastic	15 minutes	Analyze ASAP	SM 4500 H+ B
Phosphate (PO ₄)	½ pint plastic	48 hours	Cool 6°C (for dissolved phosphate, filter immediately)	SM 4500-P E
Phosphorus (Total) (P)	½ pint plastic	28 days	Cool 6° C, add H ₂ SO ₄	SM 4500-P E
Potassium (K)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.7
Selenium (Se)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.8
Settleable Solids	½ gallon plastic	48 hours	Cool 6° C	SM 2540F
Silica (Si)	½ pint plastic	28 days	HNO ₃ pH < 2 (acidification in lab)	EPA 200.7
Silver (Ag)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.8
Sodium (Na)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.7
Sulfate (SO ₄)	½ pint plastic	28 days	Cool 6° C	EPA 300.0
Sulfide (S)	250 ml Glass	7 days	Cool 6° C, Zinc Acetate+NaOH pH >9	SM 4500S ² D
Suspended Solids (TSS,NFR)	½ gallon plastic	7 days	Cool 6° C	SM 2540D



Inorganic Drinking Water/Wastewater continued

Analyses	Container	Holding Time	Preservative	Method No.
Temperature (field)		ASAP	Analyze immediately, None	
Thallium (Tl)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.8
Total Dissolved Solids (TFR)	½ pint plastic	7 days	Cool 6° C	SM 2540-C
Total Kjeldahl Nitrogen (TKN)	½ pint plastic	28 days	Add (*) H ₂ SO ₄ to pH < 2, Cool 6° C	EPA 351.2
Total Petroleum Hydrocarbons	1 liter amber glass	28 days	Cool 6° C 28 days if acidified with H ₂ SO ₄	EPA 1664A
Turbidity	General Physical Glass	48 hours	Cool 6° C	EPA 180.1
Uranium	½ pint plastic		HNO ₃ pH < 2 (acidification in lab)	EPA 200.8
Vanadium (V)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.8
Volatile Dissolved Solids	1 pint plastic	7 days	Cool 6° C	EPA 160.4
Zinc (Zn)	½ pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	EPA 200.7 / 200.8
Combined Tests:				
Analyses	Container	Holding Time	Preservative	Method No.
General Physical	General Physical Glass	24 hours	Cool 6° C	
General Mineral (Requires 2 containers)				
Analyses	Container	Holding Time	Preservative	Method No.
Container 1	½ gallon plastic	15 min	Cool 6° C – Analyze pH ASAP	
Container 2	1 pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	
Inorganic Chemical Panel (Requires 2 containers)				
Analyses	Container	Holding Time	Preservative	Method No.
Container 1	½ gallon plastic	15 min	Cool 6° C – Analyze pH ASAP	
Container 2	1 pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	
General Mineral & Inorganic (Requires 2 containers)				
Analyses	Container	Holding Time	Preservative	Method No.
Container 1	½ gallon plastic	15 min	Cool 6° C – Analyze pH ASAP	
Container 2	1 pint plastic	6 months	HNO ₃ pH < 2 (acidification in lab)	
Inorganic Nitrogen				
Analyses	Container	Holding Time	Preservative	Method No.
Nitrate as N (NO ₃ -N)	½ pint plastic	48 hrs	Cool 6° C	EPA 300.0/ 353.2
Nitrite as N (NO ₂ -N)	½ pint plastic	48 hrs	Cool 6° C	EPA 300.0/ 353.2
Ammonia as N (NH ₃ -N)	½ pint plastic	48 hrs/28 days	Cool 6° C/28 days with (*) H ₂ SO ₄ pH < 2	EPA 350.1



Organic Nitrogen				
Analyses	Container	Holding Time	Preservative	Method No.
Total Kjeldahl Nitrogen (TKN)	½ pint plastic	28 days	Cool 6° C (*) H ₂ SO ₄ pH < 2	EPA 351.2
Ammonia as N (NH ₃ -N)	½ pint plastic	28 days	Cool 6° C (*) H ₂ SO ₄ pH < 2	EPA 350.1
Total Nitrogen				
Analyses	Container	Holding Time	Preservative	Method No.
Total Kjeldahl Nitrogen (TKN)	½ pint plastic	48 hrs/28 days	Cool 6° C/28 days with (*) H ₂ SO ₄ pH < 2	EPA 351.2
Nitrate as N (NO ₃ -N)	½ pint plastic	48 hrs	Cool 6° C	EPA 300.0/353.2
Nitrite as N	½ pint plastic	48 hrs	Cool 6° C	EPA 300.0/353.2
Subcontracted Samples				
Analyses	Container	Holding Time	Preservative	Method No.
Asbestos – TEM	1 quart plastic	48 hours	Cool 6° C	EPA 100.2
Bromate (BrO ₃)	½ pint plastic	28 days	Ethylene Diamine, Cool 6° C	EPA 300.1
Bromide (Br)	½ pint plastic	28 days	Cool 6° C	EPA 300.1
Chlorate	½ pint plastic	28 days	None required	EPA 300.1
Chlorite (ClO ₂)	½ pint plastic	28 days	Ethylene Diamine, Cool 6° C	EPA 300.1
Phenolic Compounds	250 mL amber glass	28 days	Cool 6° C H ₂ SO ₄ pH < 2	EPA 420.2
Volatile Suspended Solids %	½ gallon plastic	7 days	Cool 6° C	EPA 160.4



Radioactivity Drinking Water/Wastewater

Analyses	Container	Holding Time	Preservative	Method No.
Gross Alpha	½ gallon plastic	6 months	HNO ₃ to pH < 2 analyze within 5 days	SM 7110C
Uranium	½ pint plastic	6 months	HCl to pH < 2 analyze within 5 days HNO ₃ to pH < 2 analyze within 6 months	EPA 200.8
Subcontracted Samples:				
Gross Beta	½ gallon plastic	6 months	HNO ₃ to pH < 2 analyze within 5 days	EPA 900.0
Radium, Total	½ gallon plastic	6 months	No preservative	EPA 903.1/EPA Ra-05
Radon 222	Glass, foil lined lid, TFE	4 days	No preservative, Cool 6° C	EPA 903.1/ SM 7500 RnB
Radium 226	½ gallon plastic	6 months	No preservative	EPA 903.1
Radium 228	½ gallon plastic	6 months	No preservative	EPA Ra-05
Strontium-90	½ gallon plastic	6 months	No preservative	EPA 905.0
Tritium	½ gallon plastic	6 months	No preservative	EPA 906.0



Organic Drinking Water/Wastewater

Analyses	Container	Holding Time	Preservative	Method No.
Volatile Organic Analytes	2-40 ml amber vials	14 days	Na ₂ S ₂ O ₃ HCl to pH < 2, Cool 6° C Ascorbic Acid, HCl to pH < 2, Cool 6° C HCl to pH < 2, cool 0° C	EPA 524.2
THM Maximum Potential	250 ml amber	14 days	None , Cool 6° C	EPA 510.1
EDB/DBCP	2-40 ml amber vials	14 days	Na ₂ S ₂ O ₃ , Cool 6° C	EPA 504.1
1,4-Dioxane	15 mL amber	28 days	Na ₂ S ₂ O ₃ , NaHSO ₄ , Cool 6° C	EPA 522
Herbicides (Chlorinated)	1 liter glass amber	14 days	Na ₂ SO ₃ Cool 6° C	EPA 515.4
Carbamate Pesticides	250 ml glass amber	28 days	Monochloroacetic acid to pH < 3, Cool 6° C	EPA 531.1
Glyphosate	250 ml glass amber	14 days	Na ₂ S ₂ O ₃ Cool 6° C HCl to pH < 2	EPA 547
Haloacetic Acids	2-60 ml amber vials	14 days	NH ₄ Cl, Cool 6° C	EPA 552.2
Pesticides (Chlorinated)	1 liter glass amber	14 days	Non-Chlorinated Source: Cool 6° C HCl to pH < 2 Chlorinated Source: Na ₂ S ₂ O ₃ Cool 6° C HCl to pH < 2	EPA 508.1
1,2,3-TCP	2-40 mL amber vials	14 days	Non-Chlorinated Source: Cool 6° C HCl to pH < 2 Na ₂ S ₂ O ₃ , Cool 6° C HCl to pH < 2	SRL 524M-TCP
Endothall	1 liter glass amber	7 days	Na ₂ S ₂ O ₃ Cool 6° C	EPA 548.1
DEHP/Thiobencarb	2 liter glass amber	14 days	Non-Chlorinated Source: Cool 6° C HCl to pH < 2 Chlorinated Source: Na ₂ S ₂ O ₃ Cool 6° C HCl to pH < 2	EPA 525.2
Diquat	1 liter high density amber plastic/PVC	7 days	Na ₂ S ₂ O ₃ Cool 6° C	EPA 549.2
Total Organic Carbon (TOC)	125 ml Glass	28 days	Add HCl to pH < 2, Cool 6° C	SM 5310 B
UV254	125 mL amber glass	48 hours	Cool 6° C	SM 5910B



Microbiology Drinking Water/Wastewater

Analyses	Container	Holding Time	Preservative	Method No.
Coliform/E coli. (Enumeration)	100 mL Sterile Plastic Bacterial Sample Bottle	30 hours	Na ₂ S ₂ O ₃ , Cool 6° C	SM 9223
Coliform/E coli. (Presence/Absence)	100 mL Sterile Plastic Bacterial Sample Bottle	30 hours	Na ₂ S ₂ O ₃ , Cool 6° C	SM 9223
Coliform/E coli. (Multiple Tube Fermentation)	100 mL Sterile Plastic Bacterial Sample Bottle	Drinking Water: 30 hours	Na ₂ S ₂ O ₃ , Cool 6° C	SM 9223
		Waste Water: 8 Hours	Na ₂ S ₂ O ₃ , Cool 6° C	SM 9221 A B E
Heterotrophic Plate Count	100 mL Sterile Plastic Bacterial Sample Bottle	8/24 hours	Na ₂ S ₂ O ₃ , Cool 6° C	SM 9215 B



Subcontracted Samples:				
Purgeable Organics	3-40 ml amber vials	14 days	HCl to pH < 2, cool 6° C	EPA 624
Purgeable Hydrocarbons/aromatics	3-40 ml amber vials	14 days	HCl to pH < 2, cool 6° C	EPA 624
Purgeable Hydrocarbons	3-40 ml amber vials	14 days	HCl to pH < 2, cool 6° C	EPA 624
Purgeable Aromatics	3-40 ml amber vials	14 days	HCl to pH < 2, cool 6° C	EPA 624
Pesticides (Chlorinated)	1 liter glass amber	7 days	Na ₂ S ₂ O ₃ Cool 6° C	EPA 608
Base/Neutral Acid Extractable	2 liter glass amber	7 days	Na ₂ S ₂ O ₃ Cool 6° C	EPA 625
Dioxins	2-liter glass amber	40 days	Na ₂ S ₂ O ₃ Cool 6° C	EPA 1613
TPH:				
Gas	2-40 ml amber vials	14 days	HCl to pH < 2, cool 6° C	EPA 8015
Oil and Diesel	1 liter glass amber	14 days	HCl to pH < 2, cool 6° C	EPA 8015
PCB's	1 liter glass amber	7 days	Na ₂ S ₂ O ₃ , Cool 6° C	EPA 8082
Purgeable Organics	2-40 mL amber vials	14 days	Na ₂ S ₂ O ₃ , Cool 6° C HCl to pH < 2	EPA 8260

EDA = Ethylenediamine, H₂SO₄ = Sulfuric Acid, HCl = Hydrochloric Acid, HNO₃ = Nitric Acid, Na₂S₂O₃ = Sodium Thiosulfate, NaOH = Sodium Hydroxide, Na₂SO₃= Sodium Sulfite

(*) acidification with H₂SO₄ in lab, within 48 hr of sampling is allowable



Appendix E – Maintenance Log (example)

Clinical Laboratory of San Bernardino
Instrument Repair and Maintenance Log

Instrument/System ID: Shimadzu 17A
GCMS Radiochem/VOC Department
Serial #: _____

Date	Problem Description	Corrective Action/ Maintenance Performed	Repaired By	Comments



Appendix F – Balance Acceptance Criteria

Analytical Balance		Top Loading Balance	
Balance Weights	Acceptance Limits	Balance Weights	Acceptance Limits
1 g	± 0.0002 (0.9998-1.0002)	1 g	± 0.01 (0.99-1.01)
10 g	± 0.0005 (9.9995-10.0005)	10 g	± 0.01 (9.99-10.01)
50 g	± 0.0010 (49.9990-50.0010)	50 g	± 0.02 (49.98-50.02)
100 mg	± 0.0002 (0.0998-0.1002)	100 mg	± 0.01 (0.09-0.11)
20 mg	± 0.0002 (0.0198-0.0202)		
2 mg	± 0.0002 (0.0018-0.0022)		



Appendix H – Thermometer Listings

Thermometer ID	Serial Number	Temperature (°C)
EQ-104 Thermco	1025	5 °C
EQ-177 Thermco	2079	80°C
EQ-201 Thermco	1267	180°C
EQ-290 Thermco	7684	121°C
EQ-197 Thermco	59008	35°C
EQ-210 Thermco	937071	5°C
EQ-192 Thermco	64584	-10°C
EQ-97 Thermco	27573	4°C
EQ-84 Thermco	27668	4°C
EQ-178 Thermco	97220	4°C
EQ-215 Thermco	937423	4°C
EQ-174 Thermco	100638	4°C
EQ-216 Ertco	17269	4°C
EQ-172 Thermco	101237	4°C
EQ-86 Frio-Temp	149927	4°C
EQ-98 Thermco	39787	4°C
EQ-87 Thermco	18844	4°C
EQ-92 Thermco	40705	4°C
EQ-90 Thermco	39851	4°C
EQ-96 Thermco	40571	4°C
EQ-99 Thermco	64706	4°C
EQ-88 Envirosafe	64714	4°C
EQ-89 Thermco	38383	4°C
EQ-93 Thermco	3846	4°C
EQ-173 Thermco	101876	4°C
EQ-82 Frio-Temp	35488	4°C
EQ-81 Frio-Temp	T10671	-10°C
EQ-95 Thermco	38673	-10°C
EQ-83 Thermco	51071	-10°C
EQ-245 Thermco	51327	-10°C
EQ-246 Thermco	50963	-10°C
EQ-183 Thermco	97090	35°C
EQ-185 Thermco	57084	35°C
EQ-186 Thermco	56305	35°C
EQ-163 Thermco	48396	35°C
EQ-162 Thermco	48770	35°C
EQ-247 Thermco	48862	35°C
EQ-219 Thermco	52464	35°C
EQ-248 Thermco	51911	35°C



Appendix I – Acceptance Criteria and MDLs

Inorganic Chemistry of Drinking Water

Method/ SOP	Analyte	Instrument	DLR/ RL	MDL	Units	LCS Limits (%)	LCS Frequency	MS/MSD Limits (%)	MS/ MSD Frequency
EPA 300.0	Chloride	Dionex DX500-IC	8.00	0.2	mg/L	90-110	1 every 10	80-120	1 every 20
EPA 300.0	Fluoride	Dionex DX500-IC	0.10	0.026	mg/L	90-110	1 every 10	80-120	1 every 20
EPA 300.0	Nitrate	Dionex DX500-IC	2.00	0.379	mg/L	90-110	1 every 10	80-120	1 every 20
EPA 300.0	Nitrite as N	Dionex DX500-IC	0.40	0.169	mg/L	90-110	1 every 10	80-120	1 every 20
EPA 300.0	Sulfate	Dionex DX500-IC	8.00	0.141	mg/L	90-110	1 every 10	80-120	1 every 20
EPA 314.0	Perchlorate	Dionex DX500-IC	4.00	0.403	µg/L	90-110	1 every 10	80-120	1 every 20
EPA 353.2	Nitrate	Seal Auto Analyzer 3 colorimeter	2.00	0.169	mg/L	90-110	1 every 10	80-120	1 every 20
EPA 353.2	Nitrite as N	Seal Auto Analyzer 3 colorimeter	400	0.0261	µg/L	90-110	1 every 10	80-120	1 every 20
SM 4500 – P E	Phosphate, Ortho	spectrophotometer	0.02	0.0046	mg/L	80-120	1 every 10	80-120	1 every 20
SM2320B	Alkalinity	pH meter	5.00	-	mg/L	90-110	1 every 20	-	-
SM2510B	Conductivity	HACH sension 5	2.00	-	µS/cm	90-110	1 every 20	-	-
SM2540C	Total Dissolved Solids (TDS)	filtration	5.00	3.067	mg/L	80-120	1 every 20	-	-
SM4500-CN F	Cyanide, Total	probe measurement	100	31.4	µg/L	80-120	1 every 20	80-120	1 every 20
SM5310B	Total Organic Carbon	Shimadzu TOC-V	0.30	0.105	mg/L	80-120	1 every 10	80-120	1 every 20
SM5310B	DOC	Shimadzu TOC-V	0.30	-	mg/L	80-120	1 every 10	80-120	1 every 20
SM5540C	Surfactants (MBAS)	spectrophotometer	0.10	0.0339	mg/L	90-110	1 every 10	80-120	1 every 20
SM 5910B	UV254	Thermo Genesys 10S UV-VIS	0.005	-	Abs.	90-110	1 every 10	-	-
EPA 200.7	Calcium	Perkin Elmer Optima 5300 ICP	1.00	0.13	mg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Magnesium	Perkin Elmer Optima 5300 ICP	1.00	0.119	mg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Potassium	Perkin Elmer Optima 5300 ICP	1.00	0.19	mg/L	85-115	1 every 10	70-130	1 every 20

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EPA 200.7	Silica	Perkin Elmer Optima 5300 ICP	0.50	0.07	mg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Sodium	Perkin Elmer Optima 5300 ICP	1.00	0.214	mg/L	85-115	1 every 10	70-130	1 every 20

Toxic Chemical Elements of Drinking Water

Method/ SOP	Analyte	Instrument	DLR/ RL	MDL	Units	LCS Limits (%)	LCS Frequency	MS Limits (%)	MS Frequency
EPA 200.7	Aluminum	Perkin Elmer Optima 5300 ICP	50.0	12.7	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Barium	Perkin Elmer Optima 5300 ICP	100	11.5	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Copper	Perkin Elmer Optima 5300 ICP	50.0	6.48	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Iron	Perkin Elmer Optima 5300 ICP	100	14.2	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Chromium	Perkin Elmer Optima 5300 ICP	10.0	2.02	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Nickel	Perkin Elmer Optima 5300 ICP	10.0	1.18	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Silver	Perkin Elmer Optima 5300 ICP	10.0	2.58	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Beryllium	Perkin Elmer Optima 5300 ICP	1.0	0.09	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Cadmium	Perkin Elmer Optima 5300 ICP	1.0	0.13	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Manganese	Perkin Elmer Optima 5300 ICP	20.0	0.798	µg/L	85-115	1 every 10	70-130	1 every 20

EPA 200.7	Zinc	Perkin Elmer Optima 5300 ICP	50.0	16.6	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Boron	Perkin Elmer Optima 5300 ICP	100	38.6	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.8	Thallium	Perkin Elmer AAnalyst 600	1.00	0.133	µg/L	90-110	1 every 10	70-130	1 every 20
EPA 200.8	Vanadium	Perkin Elmer AAnalyst 600	3.00	0.145	µg/L	90-110	1 every 10	70-130	1 every 20
EPA 245.1	Mercury	CETAC M6000A	1.00	0.15	µg/L	90-110	1 every 10	70-130	1 every 20
EPA 218.6	Chromium (VI)	Dionex DX500-IC	1.00	0.023	µg/L	95-105	1 every 10	90-110	1 every 20
EPA 218.7	Chromium (VI)	Dionex DX500-IC	1.00	0.05	µg/L	95-105	1 every 10	90-110	1 every 20



Inorganic Chemistry of Wastewater

Method/ SOP	Analyte	Instrument	DLR/ RL	MDL	Units	LCS Limits (%)	LCS Frequency	MS Limits (%)	MS Frequency
SM 4500H ⁺ B	pH	pH meter	-	-	-	98.5-101	1 every 20	-	-
SM 2540 D	Residue, Non-filterable (TSS)	filtration	2.00	-	mg/L	80-120	1 every 20	-	-
SM 2540 F	Residue, Settleable	measure residue	0.10	-	mL/L/hr	-	-	-	-
EPA 160.4	Volatile Dissolved Solids	Thermolyne 1500 Furnace	1.00	-	mg/L	90-110	1 every 10	-	-
EPA 180.1	Turbidity	Orbeco turbidimeter #965-10A	0.10	-	NTU	90-110	1 every 10	-	-
EPA 200.7	Boron	Perkin Elmer Optima 5300 ICP	100	38.6	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Calcium	Perkin Elmer Optima 5300 ICP	1.00	0.013	mg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Magnesium	Perkin Elmer Optima 5300 ICP	1.00	0.119	mg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Potassium	Perkin Elmer Optima 5300 ICP	1.00	0.019	mg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Silica	Perkin Elmer Optima 5300 ICP	0.50	0.07	mg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Sodium	Perkin Elmer Optima 5300 ICP	1.00	0.214	mg/L	85-115	1 every 10	70-130	1 every 20
EPA 300.0	Chloride	Dionex DX5000-IC	8.00	0.2	mg/L	90-110	1 every 10	80-120	1 every 20
EPA 300.0	Fluoride	Dionex DX5000-IC	0.10	0.026	mg/L	90-110	1 every 10	80-120	1 every 20

EPA 300.0	Nitrate	Dionex DX5000-IC	2.00	0.379	mg/L	90-110	1 every 10	80-120	1 every 20
EPA 300.0	Nitrite as N	Dionex DX5000-IC	0.40	0.169	µg/L	90-110	1 every 10	80-120	1 every 20
EPA 300.0	Nitrate-nitrite, Total	Dionex DX5000-IC	-	-	-	-	-	-	-
EPA 300.0	Sulfate	Dionex DX5000-IC	8.00	0.141	mg/L	90-110	1 every 10	80-120	1 every 20
EPA 350.1	Ammonia	Seal Auto Analyzer 3 colorimeter	0.60	0.369	mg/L	90-110	1 every 10	90-110	1 every 10
EPA 351.2	Kjeldahl Nitrogen	Seal Auto Analyzer 3 colorimeter	1.00	0.667	mg/L	90-110	1 every 10	90-110	1 every 20
EPA 353.2	Nitrate calc.	Seal Auto Analyzer 3 colorimeter	2.00	0.287	mg/L	90-110	1 every 10	80-120	1 every 20

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EPA 353.2	Nitrate-nitrite, Total	Seal Auto Analyzer 3 colorimeter	-	-	-	-	-	-	-
SM 4500-O G	Dissolved Oxygen	Orion O2 meter #862	1.00	-	-	-	-	-	-

Inorganic Chemistry of Wastewater continued.

SM 4500 P, E	Phosphate, Ortho	spectrophotometer	0.02	0.0046	mg/L	80-120	1 every 10	80-120	1 every 20
SM 4500 P, E	Phosphorus, Total	spectrophotometer	0.02	0.012	mg/L	80-120	1 every 10	80-120	1 every 20
SM 4500 S ² D	Sulfide	spectrophotometer	0.10	0.0043	mg/L	75-125	1 every 10	75-125	1 every 20
EPA 1664B	TPH	residue weight	1.00	0.43	mg/L	80-120	1 every 20	-	-
EPA 1664B	Oil and Grease	residue weight	2.00	-	mg/L	78-114	1 every 20	78-114	1 every 20
SM2320B	Alkalinity	titration	5.00	-	mg/L	90-110	1 every 20	-	-
SM2510B	Conductivity	HACH sension 5	2.00	-	µS/cm	90-110	1 every 20	-	-
SM2540B	Residue, Total (TS)	gravimetric	5.00	-	mg/L	80-120	1 every 20	-	-

SM2540C	Residue, Filterable (TDS)	gravimetric	5.00	3.067	mg/L	80-120	1 every 20	-	-
SM5210B	BOD	Orion BOD meter # 862	5.00	-	mg/L	85-115	1 every 20	-	-
SM5210B	Carbonaceous BOD	Orion BOD meter # 862	5.00	-	mg/L	85-115	1 every 20	-	-
SM5310B	Total Organic Carbon	Shimadzu 6000 TOC-V	0.30	0.105	mg/L	80-120	1 every 10	80-120	1 every 20
SM5540C	Surfactants (MBAS)	spectrophotometer	0.10	0.0339	mg/L	90-110	1 every 10	80-120	1 every 20
HACH8000	COD	spectrophotometer	5.00	2.38	mg/L	90-110	1 every 10	80-120	1 every 20

Toxic Chemical Elements of Wastewater

Method/ SOP	Analyte	Instrument	DLR/ RL	MDL	Units	LCS Limits (%)	LCS Frequency	MS Limits (%)	MS Frequency
EPA 200.8	Chromium	Perkin Elmer Optima 5300 ICP	10.0	0.198	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.8	Nickel	Perkin Elmer Optima 5300 ICP	10.0	0.122	µg/L	85-115	1 every 10	70-130	1 every 20

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EPA 200.8	Silver	Perkin Elmer Optima 5300 ICP	10.0	0.141	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.8	Beryllium	Perkin Elmer Optima 5300 ICP	1.0	0.272	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.8	Cadmium	Perkin Elmer Optima 5300 ICP	1.0	0.16	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7/200.8	Aluminum	Perkin Elmer Optima 5300 ICP	50.0	12.7/0.896	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7/200.8	Barium	Perkin Elmer Optima 5300 ICP	100	11.5	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7/200.8	Cobalt	Perkin Elmer Optima 5300 ICP	10.0	2	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7/200.8	Copper	Perkin Elmer Optima 5300 ICP	50.0	6.48/0.177	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Iron	Perkin Elmer Optima 5300 ICP	100	14.2	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7/200.8	Manganese	Perkin Elmer Optima 5300 ICP	20.0	0.798/0.14	mg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7	Molybdenum	Perkin Elmer Optima 5300 ICP	10.0	3.5	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 200.7/200.8	Zinc	Perkin Elmer Optima 5300 ICP	50.0	16.6/0.711	µg/L	85-115	1 every 10	70-130	1 every 20
EPA 218.6	Chromium (VI)	Dionex DX500-IC	1.00	0.023	µg/L	95-105	1 every 10	90-110	1 every 20



Microbiology of Recreational Water

Method/ SOP	Analyte	Instrument/process	DLR/ RL	MDL	Units	LCS Limits (%)	LCS Frequency	MS Limits (%)	MS Frequency
SM9221B,C	Total Coliform (Enumeration)	MTF/LTB	<1.1	-	MPN/100 mL	-	-	-	-
SM9221E	Fecal Coliform (Enumeration)	MTF/EC	<1.1	-	MPN/100 mL	-	-	-	-
SM 9223B	E. Coli (Enumeration)	Colilert ³	<1	-	MPN/100 mL	-	-	-	-

Microbiology of Wastewater

Method/ SOP	Analyte	Instrument	DLR/ RL	MDL	Units	LCS Limits (%)	LCS Frequency	MS Limits (%)	MS Frequency
SM9215B	Heterotrophic Bacteria	Pour plate	<1	-	CFU/mL	-	-	-	-
SM9221B	Total Coliform	MTF/LTB	< 1.8	-	MPN/100 mL	-	-	-	-
SM9221C,E (MTF/EC)	Fecal Coliform	MTF/EC	< 1.8	-	MPN/100 mL	-	-	-	-

Microbiology of Drinking Water

Method/ SOP	Analyte	Instrument	DLR/ RL	MDL	Units	LCS Limits (%)	LCS Frequency	MS Limits (%)	MS Frequency
SM9215B	Heterotrophic Bacteria	Pour plate	<1	-	CFU/mL	-	-	-	-
SM9221A,B	Total Coliform	MTF/LTB	<1.1	-	MPN/100 mL	-	-	-	-
SM9221E (MTF/EC)	Fecal Coliform	MTF/EC	<1.1	-	MPN/100 mL	-	-	-	-
SM9223B	Total Coliform	Colilert ³	-	-	P/A	-	-	-	-
SM9223B	E. coli	Colilert ³	-	-	P/A	-	-	-	-

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SM9221B,C	Total Coliform (Enumeration)	MTF/LTB	<1	-	MPN/100 mL	-	-	-	-
SM9221E (MTF/EC)	Fecal Coliform (Enumeration)	MTF/EC	<1	-	MPN/100 mL	-	-	-	-
SM 9223B	E. coli (Enumeration)	Colilert ³	<1	-	MPN/100 mL	-	-	-	-
SM9223B	Total Coliform (Enumeration)	Colilert ³	<1	-	MPN/100 mL	-	-	-	-

Radiochemistry of Wastewater

Method/ SOP	Analyte	Instrument/process	DLR/ RL	MDL	Units	LCS Limits (%)	LCS Frequency	MS Limits (%)	MS Frequency
SM 7110C	Gross Alpha	Coprecipitation	3.0	-	pCi/L	70-130	1 every 20	50-150	1 every 10

Radiochemistry of Drinking Water

Method/ SOP	Analyte	Instrument/process	DLR/ RL	MDL	Units	LCS Limits (%)	LCS Frequency	MS Limits (%)	MS Frequency
EPA 200.8	Uranium	ICP-MS	1.0	-	pCi/L	70-130	1 every 20	50-150	1 every 10

Volatile Organic Chemistry of Drinking Water

Method/ SOP	Analyte	Instrument/process	DLR/ RL	MDL	Units	LCS Limits (%)	LCS Frequency	MS Limits (%)	MS Frequency
EPA 504.1	1,2-Dibromoethane (EDB)	Agilent	0.02	0.0041	µg/L	70-130	1 every 10	70-130	1 every 20
EPA 504.1	1,2-Dibromo-3-chloropropane (DBCP)	Agilent	0.01	0.0025	µg/L	70-130	1 every 10	70-130	1 every 20
EPA 522	1,4-Dioxane	Agilent	0.07	0.028	µg/L	70-130	1 every 20	-	-
EPA 524.2	Volatile Organic Compounds	ThermoScientific	-	-	-	-	-	-	-
EPA 524.2	Benzene	ThermoScientific	0.50	0.081	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	Carbon Tetrachloride	ThermoScientific	0.50	0.129	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	Chlorobenzene	ThermoScientific	0.50	0.0885	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	1,2-Dichlorobenzene	ThermoScientific	0.50	0.128	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	1,4-Dichlorobenzene	ThermoScientific	0.50	0.135	µg/L	70-130	1 every 20	75-125	optional

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EPA 524.2	Dichlorodifluoromethane	ThermoScientific	0.50	0.15	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	1,1-Dichloroethane	ThermoScientific	1.00	0.184	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	1,2-Dichloroethane	ThermoScientific	0.50	0.206	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	1,1-Dichloroethene	ThermoScientific	0.50	0.237	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	cis-1,2-Dichloroethene	ThermoScientific	0.50	0.173	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	trans-1,2-Dichloroethene	ThermoScientific	0.50	0.185	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	Dichloromethane (Methylene Cl)	ThermoScientific	0.50	0.175	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	1,2-Dichloropropane	ThermoScientific	0.50	0.17	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	cis-1,3-Dichloropropene	ThermoScientific	0.50	0.209	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	trans-1,3-Dichloropropene	ThermoScientific	0.50	0.228	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	Ethylbenzene	ThermoScientific	0.50	0.116	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	Styrene	ThermoScientific	0.50	0.168	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	1,1,2,2-Tetrachloroethane	ThermoScientific	0.50	0.13	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	Tetrachloroethene	ThermoScientific	0.50	0.148	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	Toluene	ThermoScientific	0.50	0.11	µg/L	70-130	1 every 20	75-125	optional

EPA 524.2	1,2,4-Trichlorobenzene	ThermoScientific	0.50	0.1	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	1,1,1-Trichloroethane	ThermoScientific	0.50	0.11	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	1,1,2-Trichloroethane	ThermoScientific	0.50	0.13	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	Trichloroethene	ThermoScientific	0.50	0.098	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	Trichlorofluoromethane	ThermoScientific	5.00	0.2	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	Vinyl Chloride	ThermoScientific	0.50	0.241	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	o-xylene	ThermoScientific	0.50	0.124	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	m,p-xylene	ThermoScientific	1.00	0.261	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	Bromodichloromethane	ThermoScientific	1.00	0.329	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	Bromoform	ThermoScientific	1.00	0.477	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	Chloroform	ThermoScientific	1.00	0.247	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	Dibromochloromethane	ThermoScientific	1.00	0.385	µg/L	70-130	1 every 20	75-125	optional



EPA 524.2	Trihalomethanes (total)	ThermoScientific	-	-	-	-	1 every 20	75-125	optional
EPA 524.2	Methyl tert-butyl Ether (MTBE)	ThermoScientific	3.00	1.93	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	tert-Amyl Methyl Ether (TAME)	ThermoScientific	0.50	1.21	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	Ethyl tert-butyl Ether (ETBE)	ThermoScientific	3.00	1.13	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	Trichlorotrifluoroethane	ThermoScientific	0.50	0.10	µg/L	70-130	1 every 20	75-125	optional
EPA 524.2	tert-Butyl Alcohol (TBA)	ThermoScientific	2.00	1.09	µg/L	70-130	1 every 20	75-125	optional
SRL 524M-TCP	1,2,3-TCP	ThermoScientific	0.005	0.0029	µg/L	80-120	1 every 10	80-120	1 every 10

Semi-volatile Organic Chemistry of Drinking Water

Method/ SOP	Analyte	Instrument/process	DLR/ RL	MDL	Units	LCS Limits (%)	LCS Frequency	MS Limits (%)	MS Frequency
EPA 525	Alachlor	Varian CP3800 GC #9678	1.00	0.363	µg/L	70-130	1 every 20	65-135	1 every 20
EPA 525	Atrazine	Varian CP3800 GC #9678	0.50	0.106	µg/L	70-130	1 every 20	65-135	1 every 20

EPA 525	Molinate	Varian CP3800 GC #9678	2.00	0.621	µg/L	70-130	1 every 20	65-135	1 every 20
EPA 525	Simazine	Varian CP3800 GC #9678	1.00	0.138	µg/L	70-130	1 every 20	65-135	1 every 20
EPA 525	Thiobencarb	Varian CP3800 GC #9678	1.00	0.297	µg/L	70-130	1 every 20	65-135	1 every 20
EPA 508.1	PCB's as Aroclors	Varian CP3800 GC #9704	-	-	-	-	-	-	-
EPA 508.1	Chlordane	Varian CP3800 GC #9704	0.10	0.0626	µg/L	70-130	1 every 20	65-135	1 every 20
EPA 508.1	Endrin	Varian CP3800 GC #9704	0.10	0.0089	µg/L	70-130	1 every 20	65-135	1 every 20
EPA 508.1	Heptachlor	Varian CP3800 GC #9704	0.010	0.0084	µg/L	70-130	1 every 20	65-135	1 every 20
EPA 508.1	Heptachlor Epoxide	Varian CP3800 GC #9704	0.010	0.0092	µg/L	70-130	1 every 20	65-135	1 every 20
EPA 508.1	Hexachlorocyclopentadiene	Varian CP3800 GC #9704	1.00	0.0712	µg/L	70-130	1 every 20	65-135	1 every 20
EPA 508.1	Lindane	Varian CP3800 GC #9704	0.20	0.0082	µg/L	70-130	1 every 20	65-135	1 every 20
EPA 508.1	Methoxychlor	Varian CP3800 GC #9704	10.00	0.1067	µg/L	70-130	1 every 20	65-135	1 every 20

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EPA 508.1	Hexachlorobenzene	Varian CP3800 GC #9704	0.50	0.0073	µg/L	70-130	1 every 20	65-135	1 every 20
EPA 508.1	Toxaphene	Varian CP3800 GC #9704	1.00	0.55	µg/L	70-130	1 every 20	65-135	1 every 20
EPA 515.4	2,4-D	Varian CP3800 GC #9704	10.00	5.27	µg/L	70-130	1 every 10	70-130	1 every 20
EPA 515.4	Dinoseb	Varian CP3800 GC #9704	2.00	0.854	µg/L	70-130	1 every 10	70-130	1 every 20
EPA 515.4	Pentachlorophenol	Varian CP3800 GC #9704	0.20	0.095	µg/L	70-130	1 every 10	70-130	1 every 20
EPA 515.4	Picloram	Varian CP3800 GC #9704	1.00	0.726	µg/L	70-130	1 every 10	70-130	1 every 20
EPA 515.4	2,4,5-TP	Varian CP3800 GC #9704	1.00	0.642	µg/L	70-130	1 every 10	70-130	1 every 20
EPA 515.4	Dalapon	Varian CP3800 GC #9704	10.00	4.95	µg/L	70-130	1 every 10	70-130	1 every 20
EPA 515.4	Bentazon	Varian CP3800 GC #9704	2.00	0.964	µg/L	70-130	1 every 10	70-130	1 every 20
EPA 515.4	Dicamba	Varian CP3800 GC #9704	1.50	0.132	µg/L	70-130	1 every 10	70-130	1 every 20

EPA 515.4	Chlorinated Acids	Varian CP3800 GC #9704	-	-	-	-	-	-	-
EPA 531.1	Carbamates	HPLC-Dionex ICS-3000 DP	-	-	-	-	-	-	-
EPA 531.1	Carbofuran	HPLC-Dionex ICS-3000 DP	5.00	1.66	µg/L	70-130	1 every 10	65-135	1 every 20
EPA 531.1	Oxamyl	HPLC-Dionex ICS-3000 DP	20.00	0.981	µg/L	70-130	1 every 10	65-135	1 every 20
EPA 547	Glyphosate	HPLC-Dionex ICS-3000 DP	25.00	16.9	µg/L	70-130	1 every 10	65-135	1 every 10
EPA 549.2	Diquat	HPLC-Dionex ICS 3000 SP	4.0	0.656	µg/L	70-130	1 every 10	70-130	1 every 10
EPA 552.2	Haloacetic Acids (HAA5)	Agilent	-	-	-	-	-	-	-
EPA 552.2	Bromoacetic Acid	Agilent	1.00	0.345	µg/L	70-130	1 every 10	70-130	1 every 10
EPA 552.2	Chloroacetic Acid	Agilent	2.00	0.456	µg/L	70-130	1 every 10	70-130	1 every 10
EPA 552.2	Dibromoacetic Acid	Agilent	1.00	0.477	µg/L	70-130	1 every 10	70-130	1 every 10
EPA 552.2	Dichloroacetic Acid	Agilent	1.00	0.551	µg/L	70-130	1 every 10	70-130	1 every 10
EPA 552.2	Trichloroacetic Acid	Agilent	1.00	0.331	µg/L	70-130	1 every 10	70-130	1 every 10



Not regulated

Method/ SOP	Analyte	Instrument/process	DLR/ RL	MDL	Units	LCS Limits (%)	LCS Frequency	MS Limits (%)	MS Frequency
Sample Receiving	Sample Receiving	N/A	-	-	-	-	-	-	-
Sample Storage	Sample Storage	N/A	-	-	-	-	-	-	-
Field Sampling	Field Sampling-Micro	N/A	-	-	-	-	-	-	-
Field Sampling	Field Sampling-VOC's	N/A	-	-	-	-	-	-	-
Field Sampling	Field Sampling-Radon	N/A	-	-	-	-	-	-	-
Field Sampling	Field Sampling-Misc.	N/A	-	-	-	-	-	-	-
Inhibitory Residue	Inhibitory Residue Test	N/A	-	-	-	-	-	-	-
Hach CN-66	Cl Residual	Cl residual kit	-	-	-	-	-	-	-

Travel Blank	Travel Blank	N/A	-	-	-	-	-	-	-
SM 2120B	Color	Orbeco – Hellige Aqua Tester Model 611-A	3.00	-	-	-	-	-	-
EPA 140.1	Odor	N/A	1.00	-	TON	-	-	-	-
EPA 510.1	Chloroform (MAX THM)	Thermo Scientific	1.00	-	µg/L	70-130	1 every 20	-	-
EPA 510.1	Bromoform (MAX THM)	Thermo Scientific	1.00	-	µg/L	70-130	1 every 20	-	-
EPA 510.1	bromodichloromethane (MAX THM)	Thermo Scientific	1.00	-	µg/L	70-130	1 every 20	-	-
EPA 510.1	dibromochloromethane (MAX THM)	Thermo Scientific	1.00	-	µg/L	70-130	1 every 20	-	-
QC Measures	QC Measures SOP	N/A	-	-	-	-	-	-	-

Uncontrolled When Printed or Copied –
 The controlled copy will carry handwritten signatures



Glassware Washing	Glassware Washing	N/A	-	-	-	-	-	-	-
Thermometer Calibration	Thermometer SOP	N/A	-	-	-	-	-	-	-
Balance Calibration	Balance SOP	top loading/ analytical balance	-	-	-	-	-	-	-
Media Prep.	Media Prep.	N/A	-	-	-	-	-	-	-
SM 2710 F	Specific Gravity	gravimetric	-	-	-	-	-	-	-



Appendix J – Instrument List

Instrument	Method	Instrument Components
Dionex DX500-IC	300.0	Dionex AS-DV Autosampler, Dionex LC20 Chromatograph, Dionex IP25 Isocratic Pump, with CD20 Conductivity Detector
ThermoScientific ICS-1600	300.0	Dionex AS-DV autosampler
Dionex ICS-3000 SP	314.0	Dionex AS40 Autosampler, Dionex ICS-3000DC Pump, with CD20 Conductivity Detector
Dionex DX500-IC	218.6	Dionex AS40 Autosampler, Dionex LC20 Chromatograph, Dionex GP50 Gradient Pump, with AD25 Detector
Perkin Elmer ICP 200.7	200.7	Perkin Elmer S10 Autosampler, Optima 5300 DV Simultaneous ICP/Optical Emission Spectrometer
Perkin Elmer ICP/MS NexION 2000	200.8	Perkin Elmer ESISC4 Fast Autosampler
Perkin Elmer Analyst AA 600	3113B	Perkin Elmer AS 800 Autosampler, Perkin Elmer AA Spectrometer
Perkin Elmer Analyst AA 600	200.9	Perkin Elmer AS 800 Autosampler, Perkin Elmer AA Spectrometer
Perkin Elmer AA Spectrometer PinAAcle	200.9	Perkin Elmer Furnace Autosampler AS900
HACH Sens Ion 5	2510B	HACH Sens Ion 5 probe
HACH Sens Ion 3	4500 H ⁺ B	HACH Sens Ion 3 probe
Agilent GC	504.1	Agilent 7890B GC System with Dual ECD, Agilent 7693A Autosampler
ThermoScientific ISQLT GCMS	524.2	Tekmar Aquatek100 Autosampler, Lumin Teledyne/Tekmar Purge & Trap
ThermoScientific IS7000 GCMS	524.2	Termer LVA Autosampler, Lumin Teledyne/Tekmar Purge and Trap
Varian CP3800 GC	508.1	Varian CP8400 Autosampler, Varian CP3800 GC with Dual ECD
Varian CP3800 GC	515.4	Varian CP8400 Autosampler, Varian CP3800 GC with Dual ECD
Dionex HPLC	531.1/547	Dionex AS-DV Autosampler, Dionex ICS3000 Gradient Pump, Dionex Ultimate 3000 Fluorescence Detector, Pickering Lab Vector PCX Post column Derivatizer, Dionex Ultimate 3000 Column Compartment/Heater
Agilent 5975 GCMS	525.2/548.1	Agilent 6850 Autosampler, Agilent 6850 GC, Agilent 5975 MS
Agilent 5975 GCMS	522	Agilent 7693 Autosampler, Agilent 8890 GC, Agilent 5977B MS
Agilent GC	552.2	Agilent 7890B GC System with Dual ECD, Agilent 7693A Autosampler
Dionex ICS 3000 HPLC	549.2	Dionex AS-DV Autosampler, Dionex Ultimate 3000 Variable Wavelength Detector, Dionex ICS-3000 SP Gradient Pump
ThermoScientific		



Instrument	Method	Instrument Components
Genesys 20	376.2	Thermo Spectronic Model 4001/4 (single beam wavelength range 325 to 1100nm)
Genesys 10	SM5910B	ThermoScientific Spectrophotometer, Genesys 10S UV-VIS
VWR Oven	SM2540D	Sheldon Manufacturing Inc., Model 1305U
VWR Oven, 80 C	SM2540C	VWR Model 1305U
Sheldon Lab Oven, 180 C	SM2540C	Sheldon Manufacturing Inc., Model 1305U
Boekel Oven	160.4	Boekel Scientific Model 107801
Thermo Electron Corp, Cyanide Probe	SM4500-CN- F	Orion 4-Star pH-ISE Bench Top
Brinkmann Buret	Alk	Brinkmann Bottle Top Buret 50
HACH Dr 2800	8000	HACH 2800 Portable Spectrophotometer (wavelength range 340 to 900 nm)
HACH Dr 2800	5540C	HACH 2800 Portable Spectrophotometer (wavelength range 340 to 900 nm)
HACH Dr 2800	HACH 8048/ 365.1	HACH 2800 Portable Spectrophotometer (wavelength range 340 to 900 nm)
HACH Dr 2800	HACH 8190	HACH 2800 Portable Spectrophotometer (wavelength range 340 to 900 nm)
Shimadzu TOC-L	5310B	Shimadzu ASI-L Autosampler
Orbeco Turbidimeter 966	180.1	Orbeco Model No. 966 Turbidimeter
Seal Auto Analyzer 3	353.2	Automatic High Resolution Digital Colorimeter
Seal Auto Analyzer 3	351.2	Automatic High Resolution Digital Colorimeter
Seal Auto Analyzer 3	350.1	Automatic High Resolution Digital Colorimeter



Appendix K – Qualifiers

Codes	Category	Qualifier
A	Microbiology	A
NR	Microbiology	No Result
P	Microbiology	P
A-01	Microbiology	< 1
A-02	Microbiology	< 1.1
A-03	Microbiology	< 2
A-04	Microbiology	> 5700
A-05	Microbiology	> 1600
A-06	Microbiology	> 23
A-07	Microbiology	> 200
A-08	Microbiology	> 2400
A-09	Microbiology	> 16,000
A-11	Microbiology	> 5
A-15	Microbiology	> 24,000
A-20	Microbiology	2.0
B-01*	BOD	The sample dilutions set-up did not meet the oxygen depletion criteria of at least 2 mg/L dissolved oxygen, the reported result is an estimated value only
B-02	BOD	The dilutions set up failed to meet the residual dissolved oxygen criteria of at least 1 mg/L; the reported value is a low estimate
B-03	BOD	Sample results read past max incubation time; reported results accepted based on passing QC criteria for the entire batch
CO2-01	CO2	CO@ result is greater than 12 mg/L; a notification trigger established by Llano Del Rio
F-04	General QC	Sample results non-reportable due to off-scale value
F-05	General QC	Analysis on hold; sample re-analyzed per supervisor/project manager
FGL	Subcontract	Analysis performed at FGL; ELAP 5867
FILT	Filtration	Sample was passed through a 0.45 micron filter prior to analysis
GA-01	RadioChemistry	This sample had a gross alpha + 0.84 counting error result of greater than 5 pCi/L. This will often trigger other analysis such as uranium or radium
HDSP	Volatile Organics	Sample aliquot taken from VOA vial with headspace present
HT-01	Hold Time	Analysis performed outside of recommended hold time
HT-02	Hold Time	Extraction performed outside of recommended hold time
HT-03	Hold Time	Initial analysis performed within recommended hold time with off-scale results. Diluted results from analysis performed outside of recommended hold time.
HT-04	Hold Time	Analysis performed outside of recommended hold time due to initial run failure
HT-05	Hold Time	Analysis hold time extended to 28 days by sample acidification
HT-06	Hold Time	Sample was received and analyzed outside of recommended hold time
HT-08	Hold Time	Analysis performed outside of recommended 8 hour hold time but with required 24 hour hold time
J	J Flag	Detected below the reporting limit; reported concentration is estimated; (J-Flag)
J-02	J Flag	Results not detected down to MDL
J-03	J Flag	J-Flag ND / Results not detected down to 1.0 ug/L
J-MTBE	J Flag	MTBE not detected down to 1.0 ug/L



Appendix L – Corrective Action Form

Complaint/Corrective/Preventative Action Form:

Basis: Audit Complaint PT failure Deficiency QC failure SOP departure Prevention

Description:

Data: Type _____ Samples _____

Recorded By (Sign/Print): _____ **Date:** _____

Root Cause / Purpose:

Investigated By (Sign/Print): _____ **Date:** _____

Potential Corrective / Preventative Actions:

Recommended By (Sign/Print): _____ **Date:** _____

Actions Performed:

Disposition of Data: Reanalyzed Rejected Qualified Recalled

Performed By (Sign/Print): _____ **Date:** _____

Follow-up Activities:

- Continue another corrective action
- Change to Document # _____
- Reassess corrective action in: _____ Days

Approved By (Sign/Print): _____ **Date:** _____

Reassessment Actions:

- Effective; close out corrective action
- Ineffective; continue another corrective action

Verified By (Sign/Print): _____ **Date:** _____



Appendix M – Training and IDOC / DOC Statement

Document Control No: QAM-24.1
Approved Date: June 23, 2023
Active Date: June 30, 2023

Training and Demonstration of Capability Statement

Analyte(s)/Description: _____

Analyst name: _____

Matrix: _____ Date: _____

Method: _____ SOP: _____

I have read, understand, and agree to use the latest version of the test method and SOP.

Analyst's Signature: _____ Date: _____

I have read, understand, and agree to follow the policies (including the quality policy) and procedures outlined in the latest version of the Quality Assurance Manual.

QAM Revision Number: _____

Analyst's Signature: _____ Date: _____

DOC Certification Statement: Initial (IDOC) Ongoing (ODOC)
Proficiency Demonstrated by: (See attachment)

- a. Acceptable performance of a blind sample.
- b. Another demonstration of capability.
- c. Acceptable at least 4 consecutive Blank Spikes.
- d. Analysis of authentic sample analyzed by another trained analyst with statistically indistinguishable results

We, the undersigned, CERTIFY that:

- 1.- The Analyst identified above, using the cited test method(s), which is in use at this facility for the analyses of samples under the Environmental Laboratory Accreditation Program, have met the Demonstration of Capability
- 2.- The test method(s) was performed by the analyst(s) identified on this certification.
- 3.- A copy of the test method(s) and the laboratory-specific SOPs are available for all personnel on-site
- 4.- The data associated with the demonstration capability are true, accurate, complete and self-explanatory (*)
- 5.- All raw data (including a copy of this certification form) necessary to reconstruct and validate these analyses have been retained at the facility, and that the associated information is well organized and available for review by authorized assessors

Supervisor's Name and Signature

Date

QA Officer's Name and Signature

Date



Appendix N – Terms and Definitions

List of general terms and definitions used in Lab documents.

B10.1 Laboratory Reagent Blank / Method Blank (LRB/MB) – An aliquot of reagent water or other blank matrix this is placed in a sample container in the Lab and treated as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with other samples. The LRB is used to determine if method analysis or other interferences are present in the Lab environment, reagents, or apparatus.

B10.2 Laboratory Fortified Blank / Laboratory Control Sample (LFB/LCS) / Blank Spike (BS) - An aliquot of reagent water or other blank matrix to which known quantities of the method analytes are added in the Lab. The LFB is analyzed exactly like a sample and its purpose is to determine whether the methodology is in control and whether the Lab is capable of making accurate and precise measurements.

B10.3 Initial Calibration Verification / Continuing Calibration Verification (ICV/CCV) - An aliquot of reagent water or other blank matrix to which known quantities of the method analytes are added in the Lab.

B10.4 Stock Standard Solution (SSS) – A concentrated solution containing one or more method analytes prepared in the Lab using assayed reference materials or purchased from a reputable commercial source.

B10.5 Calibration Standard (CAL) – A solution prepared from the primary dilution standard solution or SSS and the internal standards and surrogate analytes. The CAL solutions are used to calibrate the instrument response with respect to analytes concentration.

B10.6 Quality Control Sample (QCS) – A solution of method analytes of known concentrations which are used to fortify an aliquot of LRB or sample matrix. The QCS is obtained from a source external to the Lab and different from the source of the CAL's. It is used to check Lab performance.

B10.7 Laboratory Duplicate (Dup) – An aliquot of the parent sample taken in the Lab and analyzed separately with identical procedures. Analysis of Dup indicate precision associated with Lab procedures but not with sample collection, preservation, or storage procedures.

B10.8 Field Duplicates (FD) – Two separate samples collected at (approximately) the same time and place under identical circumstances and treated exactly the same throughout field and Lab procedures. Analysis of FD give a measure of the precision associated with sample collection, preservation, and storage (as well as with Lab procedures).

B10.9 Detection Limit for Reporting (DLR) / Standard Reference Material (SRM) – A solution of method analyte concentration, spiked at the State DLR level. The purpose of the DLR check is to determine if the instruments are capable of detecting analytes at low



concentration levels. The default required DLR check recovery is 60 – 140%, unless otherwise stated.

B10.10 Matrix Spike (MS) / Matrix Spike Duplicate – An aliquot of an environmental sample to which known quantities of the method analytes are added in the Lab. The MS/MSD is analyzed exactly like a sample and its purpose is to determine whether the sample matrix contributes bias to the analytical results. The background concentrations of the analytes in the sample matrix must be determined in a separate aliquot and the measured values in the MS/MSD corrected for background concentrations.

B10.11 Calibration Blank (CB) – A volume of reagent water treated in the same manner as the CAL's. The CB is a zero standard and is used to calibrate the instrument.

B10.12 Instrument Detection Limit (IDL) – The concentration equivalent to the analyte signal which is equal to three times the standard deviation of a series of 10 replicate measurements of the calibration blank.

B10.13 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.

B10.14 Water Sample – A sample taken from one of the following sources: drinking, surface, ground, storm runoff, industrial or domestic wastewater.

B10.15 Dissolved Analyte – The concentration of analyte in an aqueous sample that will pass through a 0.45 µm membrane filter assembly prior to sample acidification.

B10.16 Linear Dynamic Range (LDR) – The concentration range over which the instrument response to an analyte is linear.

B10.17 Internal Standard (IS) – A pure analyte(s) added to a sample, extract, or standards solution in known amount(s) and used to measure the relative responses of other method analytes and surrogates that are components of the same solution. The internal standard must be an analyte that is not a sample component.

B10.18 Rerun – QC sample is rerun as is without any change to the sample or how it exists in its current container; should be used when QC barely fails to meet requirements. Examples of when a rerun might be used are:

B10.18.1 Blank failures that exceed the MDL by less than the MDL value (so MDL is 0.002 mg/L and the blank is detected at 0.003 mg/L).

B10.18.2 DUP %RSD at 10-12% for greater than 20 time MDL and 25-30% for less than 20 times MDL.



B10.18.3 Spikes (either LFB or LFM) that fail by less than 2% high or low.

B10.19 Repour – when QC failures occur at limits beyond those where a rerun is allowed, or after a rerun has failed, a repour is to be completed. A repour involves pouring the sample into a new clean container for analysis (a new cuvette, vial, or sample cup). In some instances, a repour may not be applicable (i.e. metals digestion or TOC analysis).

B10.20 Reprepare – sample is taken back through the entire lab process. This means if the sample was digested, then it is redigested. If the sample had color agent added to it prior to analyzing, then a new aliquot of sample is repoured and the color agent added to it. If an aliquot of sample was filtered in the lab, then a new aliquot is filtered.

B10.21 Redigest – sample taken through the whole digestion process before reanalysis.

B10.22 Reanalyze – the analysis of a sample after it has been reprepared.

B10.23 SOP – Standard Operating Procedures.

B10.24 Critical Measurements – weights or volumes that are used in the calculation of a test result.

B10.25 RSE – Relative Standard Error. Used to determine the validity of a calibration curve. The RSE across the lab has been set at 20% or less; unless SOPs state otherwise.

B10.26 NIST – National Institute of Standards and Technology.

B10.27 Approved Signatories – Individuals allowed to sign documentation (either electronic or physical) on behalf of the Lab.

B10.28 Authorizing Signatories – Same as an approved signatory. Additionally, allowed to issue/authorize new documentations or revisions for use (refer to 3.2.1.13 of this document for additional information).

B10.29 Room Temperature – when an SOP states “room temperature” it means $20\pm 3^{\circ}\text{C}$ ($68\pm 5^{\circ}\text{F}$) unless otherwise defined in the SOP.

Additional terms can be found in the reference standards of –

TNI Standards

Standard Methods for the Examination of Water and Wastewater

Code of Federal Regulations Title 40

Environmental Protection Agency Methods

Refer to Lab SOPs for method specific terms as well as additional uses of terms listed above. When a SOP term and Quality Assurance Manual term do not have the same definition, then the SOP is to be used in place of the QAM for that document.



Appendix O – References

References:

1. Definition and Procedure for the Determination of the Method Detection Limit, CFR 40, Part 136, Appendix B, Revised July 1995.
2. Drinking Water Methods from Methods for the Determination of Organic Analytes in Drinking Water, EPA 600/4-88/039. 1988. Revised July 1991.
3. Drinking Water Methods from Methods for the Determination of Organic Analytes in Drinking Water-Supplement I, EPA 600/4-90/020, July 1990.
4. Drinking Water Methods from Methods for the Determination of Organic Analytes in Drinking Water-Supplement II, EPA 600/R-92/129, August 1992.
5. Inductively Coupled Plasma-Atomic Emission Spectrometric Method for Trace Element Analyses of Water and Wastes, CFR 40, Part 136, Appendix C, Revised July 1995.
6. Methods for Chemical Analyses of Water and Wastes (MCAWW), EPA 600/4-79-020, Revised March 1983.
7. Methods for the Determination of Metals in Environmental Samples-Supplement I, EPA 600/R-94-111, May 1994.
8. Methods for the Determination of Inorganic Substances in Environmental Samples, EPA 600/R-93-100, August 1993.
9. "Methods for Organic Chemical Analyses of Municipal and Industrial Wastewater," EPA 600/4-82-057, July 1982.
10. Methods for Organic Chemical analyses of Municipal and Industrial Wastewater, CFR 40, Part 136, Appendix A, July 1995.
11. "Methods for the Determination of Organic Analytes in Drinking Water", EPA 600/4-88/039, December 1988.
12. Methods for the Determination of Non-conventional Pesticides in Municipal and Industrial Wastewater - Volume I, EPA 821/R-93-010-A, August 1993.
13. Methods for the Determination of Non-conventional Pesticides in Municipal and Industrial Wastewater - Volume II, EPA 821/R-93-010-B, August 1993.
14. Method 1664: N-Hexane Extractable Material (HEM) and Silica Gel Treated N-Hexane Extractable Material (SGT-HEM) by Extraction and Gravimetry (Oil and Grease and Total Petroleum Hydrocarbons), EPA 821/B-94-0046, April 1995
15. Precision and Recovery Statements for Methods for Measuring Metals, CFR 40 Part 136, Appendix D, Revised July 1995
16. "Standard Methods for the Examination of Waste and Wastewater," 20th Ed. APHA-AWWA-WPCF, 1992.
17. Technical Notes on Drinking Water Methods, EPA 600/R-94-173, October 1994
18. A number of additional methods are summarized in the "AB 1803 Methods Manual" issued by the California Department of Health Services, 1994.
19. "Water Analysis Handbook," 4th Ed. HACH Company. 2003.
20. TNI Standard. 2016. NELAC Institute. Management and Technical Requirements for Laboratories Performing Environmental Analysis. EL-V1-ISO-2016-Rev2.0