QUALITY ASSURANCE PROJECT PLAN

for the

Stanislaus Multi-Agency Regional Storm Water Resource Plan

Grant Agreement No. D1612618

Prepared for:

State Water Resources Control Board

Submitted by:

Stanislaus County

Revision 2

January 2018

Prepared by:

WOODARD &CURRAN

GROUP A:
PROJECT MANAGEMENT

ELEMENT 1 TITLE AND APPROVAL SHEET

Quality Assurance Project Plan

for
The Stanislaus Multi-Agency Regional Storm Water Resource Plan

Grant Agreement No. D1612618

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State Water Resources Control Board

APPROVAL SIGNATURES

GRANT ORGANIZATION:

Title/Organization	Name	Signature	Date*
Project Director/ Stanislaus County	Matt Machado		
Project Manager/ Stanislaus County	Frederic Clark		
Contractor Project Manager/ Woodard & Curran	Hawkeye Sheene		
Contractor QA Officer/ Woodard & Curran	Kathleen Higgins		

STATE WATER RESOURCES CONTROL BOARD:

Title	Name	Signature	Date*
Grant Manager	Spencer Joplin		
Program Analyst	Kari Holzang		
QA Officer	Renee Spears		

** This is a contractual document. The signature dates indicate the earliest date when the project can start.*

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ELEMENT 3 DISTRIBUTION LIST

Table 1 identifies those individuals who will receive one (1) copy of the approved QAPP.

Table 1. QAPP Distribution List

Title:	Name (Affiliation):	Tel. No.:	QAPP No.:
Project Director	Matt Machado (Stanislaus County)	209-525-4153	02
Project Manager	Frederic Clark (Stanislaus County	209-525-4302	03
Contractor Project Manager	Hawkeye Sheene (Woodard & Curran)	415-321-3427	04
Contractor QA Officer	Kathleen Higgins (Woodard & Curran)	949-420-5313	05
SWRCB Grant Manager	Spencer Joplin (SWRCB)	916-341-5636	01
SWRCB Program Analyst	Kari Holzgang (SWRCB)	916-341-5461	06
SWRCB QA Officer	Renee Spears (SWRCB)	916-341-5583	07
Contractor Sampling Team Leader	Dylan Crawford (O'Dell Engineering)	209-571-1765	08
Chemistry Lab QA Officer	Cheryl Watson (Alpha Analytical, Inc.)	707-468-0401	09

ELEMENT 4 PROJECT/TASK ORGANIZATION

Involved Parties and Roles

This document is the Quality Assurance Project Plan (QAPP) for the Stanislaus Multi-Agency Regional Storm Water Resource Plan (SWRP). The SWRP is being developed to identify and prioritize multi-benefit storm water resource projects to improve regional water supply resilience, and to aid in the adaptation of infrastructure to climate change. Storm water quality data will be collected at key outfalls to assess potential contaminant loading from storm water to the County's surface receiving waters and groundwater basins. The results, in combination with existing water quality data from regional, county, and municipal monitoring programs, will help establish baseline water quality conditions to support watershed characterization, as well as project assessments and prioritization as part of the development of the SWRP. The monitoring task will adhere to the methods and standards identified in this document.

The State Water Resources Control Board (SWRCB) Grant Manager is Spencer Joplin. He will be responsible for administrative aspects of the project.

The SWRCB Quality Assurance (QA) Officer is Renee Spears. She will be responsible for the review and approval of the QAPP.

As Project Manager for the Stanislaus County, Frederic Clark will be responsible for completion of all project components, and the content and accuracy of reports, invoices, and other deliverables to the SWRCB.

Woodard & Curran is an environmental consulting firm contracted by Stanislaus County for professional services to complete the Stanislaus Multi-Agency Regional SWRP QAPP under Grant Agreement No. D1612618.

Woodard & Curran's responsibilities for this project include preparation of monitoring plans and quality plans for the project, field reconnaissance investigations, and implementing monitoring programs.

Hawkeye Sheene is Woodard & Curran's Project Manager. She will be responsible for all aspects of the project including day-to-day interactions with the Stanislaus County, development of the monitoring plan and quality plan, reporting, and coordination with sub-consultants.

Kathleen Higgins is Woodard & Curran's QA Officer. She will be responsible for the quality assurance and quality control (QA/QC) procedures found in the QAPP as part of the field sampling and analysis. She will also work with the laboratory QA Officer by communicating all QA/QC issues contained in this QAPP to the laboratory. She will also coordinate with the Sampling Leader to integrate data and ensure work is complete in accordance with this QAPP.

Dave Griffith is O'Dell Engineering's Sampling Team Leader. He will be responsible for the organization and training of field staff, scheduling of sampling days, sampling preparation and implementation, and sample delivery to the laboratory.

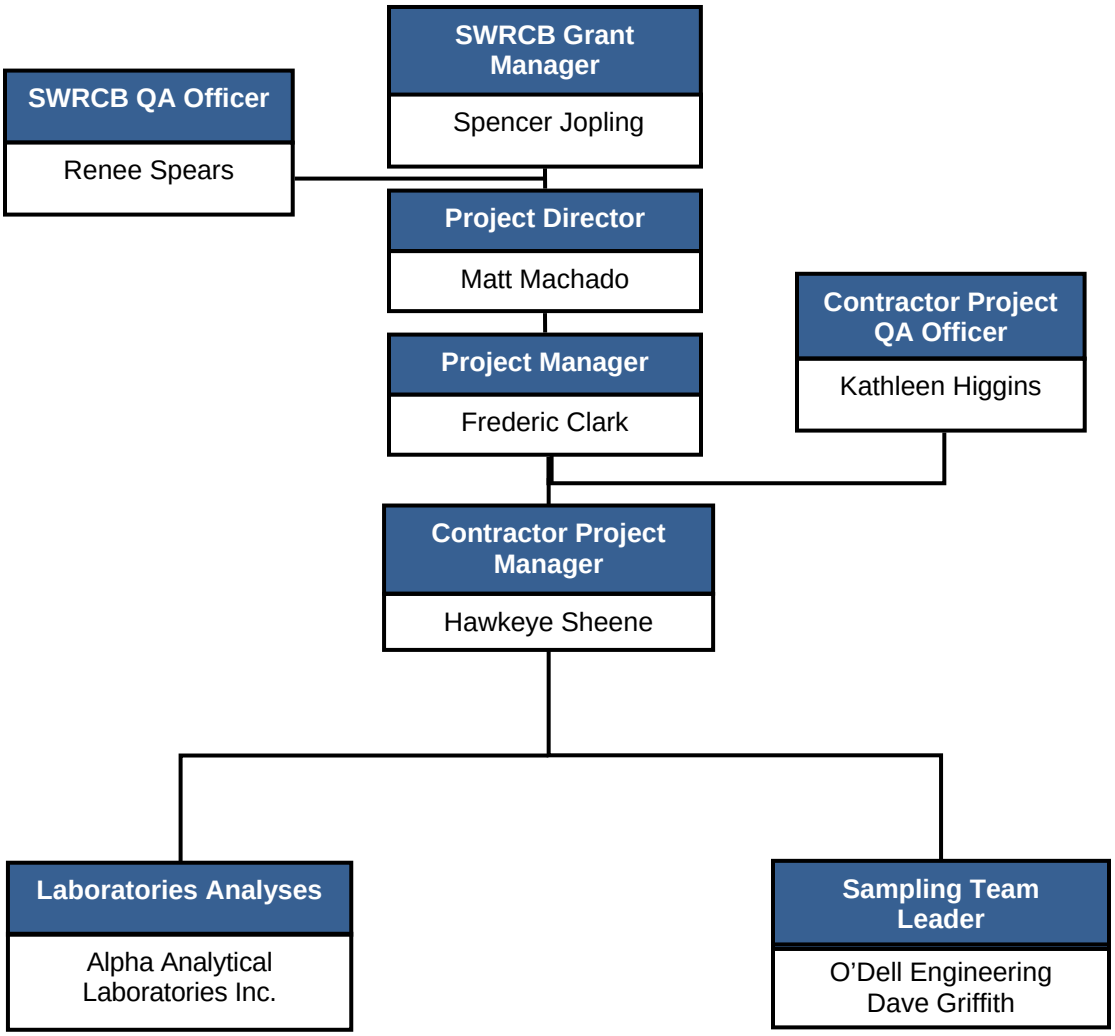
Cheryl Watson will assume the position of Alpha Analytical Laboratory's QA officer.

Table 2 identifies the key members of the project team, their affiliation and current contact information.

Table 2. Personnel Responsibilities and Contact Information

Name	Organizational Affiliation	Title	Contact Information (Telephone number, email and physical address.)
Matt Machado	Stanislaus County	Project Director	machadom@stancounty.com 1716 Morgan Road Modesto, CA 95358 209-525-4153
Frederic Clark	Stanislaus County	Project Manager	clarkf@stancounty.com 1010 10th Street, Suite 4204 Modesto, CA 95354 209-525-4302
Hawkeye Sheene	Woodard & Curran	Contractor Project Manager	hsheene@woodardcurran.com 101 Montgomery Street, Ste 1850 San Francisco, CA 94104 415-321-3400
Kathleen Higgins	Woodard & Curran	Contractor QA Officer	khiggins@woodardcurran.com 15510-C Rockfield Blvd, Suite 200 Irvine, CA 92618 949-420-5313
Dave Griffith	O'Dell Engineering	Contractor Sampling Team Leader	1165 Scenic Drive, Suite B Modesto, CA 95350 209-571-1765
Cheryl Watson	Alpha Analytical Laboratories, Inc.	Chemistry Lab QA Officer	cwatson@alpha-labs.com 9090 Union Park Way, Suite 113 Elk Grove, Ca 95624 707-468-0401

Figure 1. Organization Chart



Quality Assurance Officer Role

The Project QA Officer is responsible for the overall quality of the effectiveness assessment data produced and reported. The responsibilities listed in this section are that of the Project QA Officer's. Specific duties of the Project QA Officer include:

- Conducting audits of ongoing tests, data packages, and completed reports.
- Conducting audits of the routine quality control documentation of laboratory procedures.
- Communicating potential quality control problems to the staff and ensuring that problems are resolved.
- Issuing Quality Assurance Reports to management.
- Maintaining a current Quality Assurance Manual.
- Issuing Quality Assurance Project Plans as required.
- The Project QA Officer also ensures that data reported are in compliance with the Quality Assurance Manual and appropriate protocols.

The Project QA Officer is knowledgeable in the quality system standard defined under NELAC.

The Project QA Officer will be responsible for the QA/QC procedures in this Quality Assurance Project Plan (QAPP) as part of the sampling and field analysis. The Project QA Officer will report any data quality issues to the Project Manager, who will report these issues to the appropriate personnel as they pertain to the water quality testing or the effectiveness assessment program.

Persons Responsible for QAPP Update and Maintenance

The Project Manager, under the direction, supervision and review of the SWRCB QA Officer, will be responsible for making the changes, submitting drafts for review, preparing a final copy, and submitting the final copy for signature. The Project Manager will coordinate and consolidate changes to the QAPP in consultation with the Project and Laboratory QA Officers. Project work must be halted while revisions to the QAPP are made, unless authorized by the SWRCB QA Officer.

Approval History

The initial QAPP was submitted to the SWRCB on September 22, 2017. The document was revised in accordance with the SWRCB’s requests and then resubmitted on January 10, 2018. Any subsequent changes will require revision to this document prior to it becoming a final version. A final approved QAPP consists of a final document containing dated and signed authorization of the signatory approval page.

ELEMENT 5 PROBLEM DEFINITION/BACKGROUND

Problem Statement

The Stanislaus Multi-Agency Regional Storm Water Resource Plan (SWRP) planning area includes portions of the Lower San Joaquin River watershed, the Tuolumne River watershed downstream of Don Pedro Reservoir, and the southern half of the Stanislaus River watershed downstream of New Melones Reservoir. Water demand for agricultural and urban users in most of the planning area is met through conjunctive use of surface and groundwater (approximately 72% and 28%, respectively). The current drought has resulted in stress to groundwater resources; however, in the portions of the planning area where surface water is available, groundwater levels have generally recovered after past droughts. The exception may be in the portions of the Westside San Joaquin IRWMP area, where surface water deliveries from the State and Federal water projects have become unreliable. In addition, there is concern that pending requirements for increased flow in the Tuolumne and Stanislaus Rivers under proposed Basin Plan Amendments will put increased demand on groundwater resources. Of more immediate concern are overdraft conditions in the eastern part of the plan area, where agricultural water demand is met almost entirely from groundwater and there has been a trend toward conversion of rangeland to permanent crops, including nut trees and grape vines. The western watershed area is mostly undeveloped rangeland. Outside of this area, agricultural land and rangeland constitute a major fraction of the SWRP planning area (45% and 36% respectively), with urban land of varying density constituting 13% of the area.

Water quality concerns in the major rivers (Stanislaus and Tuolumne, and downstream in the Lower San Joaquin) include organochlorine pesticides (diazinon and chlorpyrifos) and organic carbon, which contributes to low dissolved oxygen levels. These are managed and tracked through a Central Valley-wide Total Maximum Daily Load (TMDL) for pesticides, and a TMDL for the San Joaquin River in the Stockton Deep Water Shipping Channel (DWSC) for low dissolved oxygen. Several additional water quality impairments are identified in the Regional Board's 303(d) list, which may be the basis of TMDLs in the future. These include: E. coli, salinity, toxicity, and pH on Del Puerto Creek; E. coli, pesticides and toxicity on Dry Creek; E. coli, salinity, pesticides and toxicity on Ingram Creek, E. coli and salinity on Salado Creek; boron, mercury, pesticides and toxicity on San Joaquin River between the Merced and Tuolumne Rivers; salinity, mercury, pesticides, and toxicity on San Joaquin River between the Stanislaus and Tuolumne Rivers; mercury, pesticides, and toxicity in the Lower Stanislaus River; and mercury, pesticides, and toxicity in the Lower Tuolumne River.

The SWRP is being developed to identify and prioritize multi-benefit storm water resource projects to improve regional water supply resilience and aid in the adaptation of infrastructure to climate change. A focus of the SWRP will be projects that augment groundwater recharge to address groundwater overdraft, while also enhancing flood protection, water quality, habitat, and community values. Objective criteria for project evaluation will be developed based on a county-wide assessment of storm water quality and resources, topography, soil conditions, habitat and community needs to quantify project opportunities and benefits.

Storm water quality data will be collected at key outfalls to assess potential contaminant loading from storm water to the County's surface receiving waters and groundwater basins. The results, in combination with existing water quality data from regional, county, and municipal monitoring programs, will help establish baseline water quality conditions to support watershed characterization, as well as project assessments and prioritization as part of the development of the SWRP.

Decisions or Outcomes

The purpose of the SWRP Storm Water Quality Monitoring task is to provide water quality data, in combination with existing data from regional, county, and municipal monitoring programs, to help establish baseline water quality conditions to support watershed characterization and project assessment as part of the development of the SWRP.

Samples will be collected at key outfalls over three storm events in the 2017/2018 rainy season. As the project progresses, there may be a need to add or remove sampling sites and to adjust the timing of the sampling events. This monitoring plan will be updated with changes to the locations and schedule as needed by the Contractor Project Manager.

Storm water monitoring described in this plan must take place early in the 2017/2018 rainy season in order for the resulting data to be included in watershed analyses and characterization in the SWRP. If the requisite storm events do not occur and sampling cannot take place in this time frame, the Monitoring Plan and QAPP will serve as guidelines to assess and incorporate existing monitoring data into the SWRP watershed analyses and characterization process, as well as offer guidance for future monitoring that may take place during later SWRP implementation.

Water Quality and Regulatory Criteria

The monitoring for the SWRP, though not regulation-driven, is being performed to support decision-making in watershed characterization and projects assessment and prioritization. Results from the water quality analysis, as part of the assessment, will be compared to potentially applicable water quality criteria.

ELEMENT 6 PROJECT/TASK DESCRIPTION

Work Statement and Produced Products

This storm water monitoring element of the SWRP will consist of sampling at key outfalls over three storm events in the 2017/2018 rainy season. Storm water monitoring constituents were selected based on established TMDLs, 303(d) listed water body impairments, as well as the results of storm water sampling and analysis by the City of Modesto as required by their MS4 Permit R5-2015-0025. A range of pollutants will be analyzed, including bacteria, metals, organics, nutrients, pesticides and general water chemistry parameters (Table 3). Site selection criteria are described in the project monitoring plan (Appendix A). The monitoring outfall locations are identified in Table 5. The monitoring constituents and locations may be modified based on initial monitoring results or other relevant sampling data. The monitoring plan and QAPP will be updated as needed.

All samples will be collected, transported, processed and analyzed in accordance with U.S. EPA requirements (40 Code of Federal Regulations, Section 136) and SWAMP protocols. Grab samples will be collected for the analytes tested in the field: pH, temperature, specific conductivity, and dissolved oxygen, as well as for analytes that require separate sampling protocols and containers (oil & grease, methyl mercury, and bacteria). For all other constituents, a composite sample will be collected using a minimum of 4 grab samples collected in 20-minute intervals during the first 24 hours of the storm water discharge, during daylight hours. Sampling will comply with all safety training. After the storm event, the discrete samples will be composited into one time-weighted composite for chemistry analysis. Samples will be kept under chain of custody (COC) and delivered to the appropriate laboratory within the required holding time. Bacteria samples will be kept on ice and stored in a cooler until analysis. Samples collected will be analyzed using the specified methods and reporting limits as listed in Table 14.

Monitoring task also includes information management for the resulting sampling data, data analysis, and a final report. Information management will ensure consistency with the State's Surface Water Ambient Monitoring Program (SWAMP). The written report will provide a description of all methods and interpretation of results. The product for this task will include a SWAMP compliant database of monitoring results and a written final monitoring report.

Table 3. Storm Water Monitoring Constituent List

Constituent	Analytical Method[1]	Minimum Level	Units
Bacteriological			
E. coli	SM 9221F	1.1	MPN/100 mL
Fecal coliform	SM 9221E	1.8	MPN/100 mL
Conventional			
Dissolved oxygen	Field	5	mg/L
Oil and grease	EPA 1664	1.4	mg/L
pH	Field	0.1	Std. units
Temperature	Field	None	°C
General			
Biochemical oxygen demand (BOD)	SM5210B	2.0	mg/L
Chemical oxygen demand (COD)	SM5220D	9.0	mg/L
Nitrate-nitrite (as N)	Calculation	0.0086	mg/L
Specific conductivity	Field	1.0	µmhos/cm
Total ammonia (as N)	SM4500NH3C	0.1	mg/L
Total dissolved solids (TDS)	SM2540C	5.0	mg/L
Total organic carbon (TOC)	SM5310C	0.2	mg/L
Total phosphorus	SM4500-PE	0.011	mg/L
Total suspended solids (TSS)	SM2540D	0.3	mg/L
Turbidity	EPA 180.1/Field	0.1	NTU
Metals			
Aluminum, Total	EPA 200.8	5.0	µg/L
Copper, Total	EPA 200.8	0.4	µg/L
Iron, Total	EPA 200.8	10	µg/L
Lead, Dissolved	EPA 200.8	0.060	µg/L
Lead, Total	EPA 200.8	0.060	µg/L
Mercury, Total	EPA 1631	0.200	ng/L
Zinc, Total	EPA 200.8	2.0	µg/L
Methyl mercury	EPA 1630	0.0200	ng/L
Organophosphate Pesticides			
Chlorpyrifos	EPA 614	0.30	µg/L
Diazinon	EPA 614	0.01	µg/L

[1] Or other approved EPA or Standard Method meeting the required minimum level.

Project Schedule

Table 4 details the project's schedule, including start and end dates of major tasks, required deliverables, and the deliverables' due dates.

Table 4. Project Schedule

Activity	Date (MM/DD/YYYY)		Deliverable	Deliverable Due Date
	Anticipated Date of Initiation	Anticipated Date of Completion		
QAPP & Monitoring Plan	8/15/2017	9/29/2017 Version 1 1/08/2018 Revision 2	QAPP and MP	9/29/2017 1/08/2018
Wet Weather Monitoring	January 2018	February 2018	N/A	N/A
Monitoring Report	February 2018	March 2018	Monitoring Report	March 2018

Geographic Location

The Stanislaus Multi-Agency Regional SWRP planning area aligns with the Stanislaus County boundaries (Figure 2) and includes portions of the Lower San Joaquin River watershed, the Tuolumne River watershed downstream of Don Pedro Reservoir, and the southern half of the Stanislaus River watershed downstream of New Melones Reservoir. This planning area was chosen to facilitate regional planning and evaluation based on significant overlap with the East Stanislaus and Westside San Joaquin Integrated Regional Water Management Plan (IRWMP) areas, as well as the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA), Turlock Groundwater Basin Association (TGBA), and San Luis & Delta-Mendota Water Authority (SLDMWA) groundwater management plan area. The SWRP planning area includes the cities of Modesto, Turlock, Hughson, Ceres, Oakdale, Newman, Waterford, Riverbank and Patterson. The planning area also includes 10 water and irrigation districts, and a number of Community Service Districts that deliver water to their constituents. The western watershed area is mostly undeveloped rangeland. Outside of this area, agricultural land and rangeland constitute a major fraction of the SWRP planning area (45% and 36% respectively), with urban land of varying density constituting 13% of the area.

Site identification, location, receiving water, and land use are summarized in Table 5. An overview of the monitoring locations and surface waters are shown in Figure 3. Land uses and monitoring locations are shown in Figure 4.

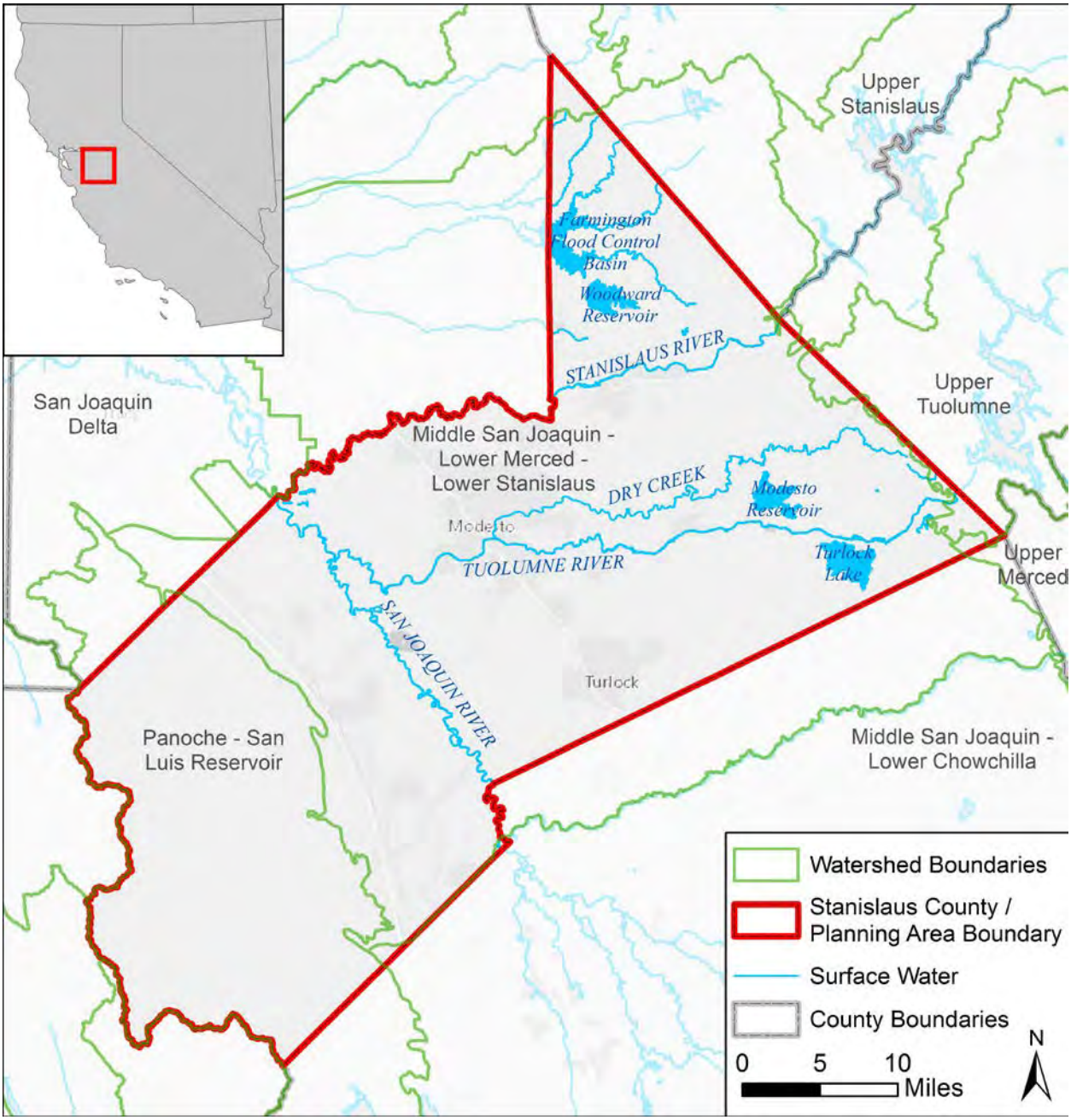


Figure 2. Map of Stanislaus Regional Multi-Agency SWRP Planning Area Major Waterbodies and Watersheds

Table 5. Storm Water Outfall Monitoring Locations

Site ID	Location	Approximate Coordinates		Receiving Water	Land Use
		Latitude	Longitude		
BT-001	Beard Tract - Mariposa at Ag Field	37.62181	-120.934	Tuolumne River	Industrial, Suburban Residential, Commercial
BT-002	Beard Tract - McClure at Gilton Facility	37.62151	-120.93	Tuolumne River	Industrial, Suburban Residential, Commercial
BT-003	Beard Tract - Codoni at Railroad	37.62197	-120.911	Tuolumne River	Industrial, Suburban Residential, Commercial
STR-008	Salida Community	37.73029	-121.109	Stanislaus River	Suburban Residential, Commercial
TUO-001C	Santa Fe Ave. Bridge	37.62401	-120.900	Tuolumne River	Suburban Residential, Commercial, Open Space
TUO-003	9th Street Bridge Region	37.62707	-120.987	Tuolumne River	Industrial, Urban Residential, Commercial
LSC-001	Little Salado Creek at Crows Landing	37.41120	-121.114	San Joaquin River	Agricultural, Industrial, Open Space

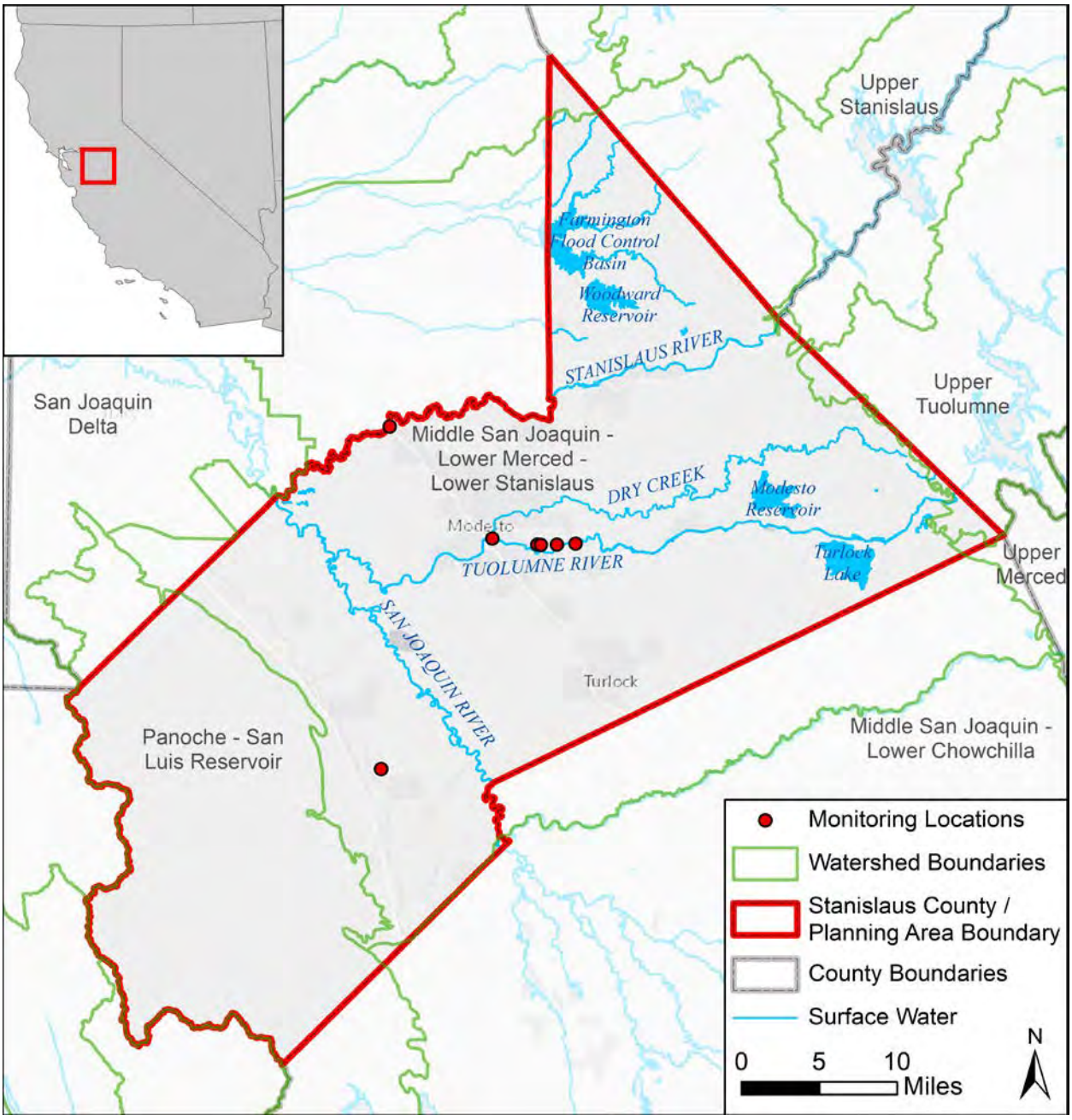


Figure 3. Monitoring Locations Overview Map

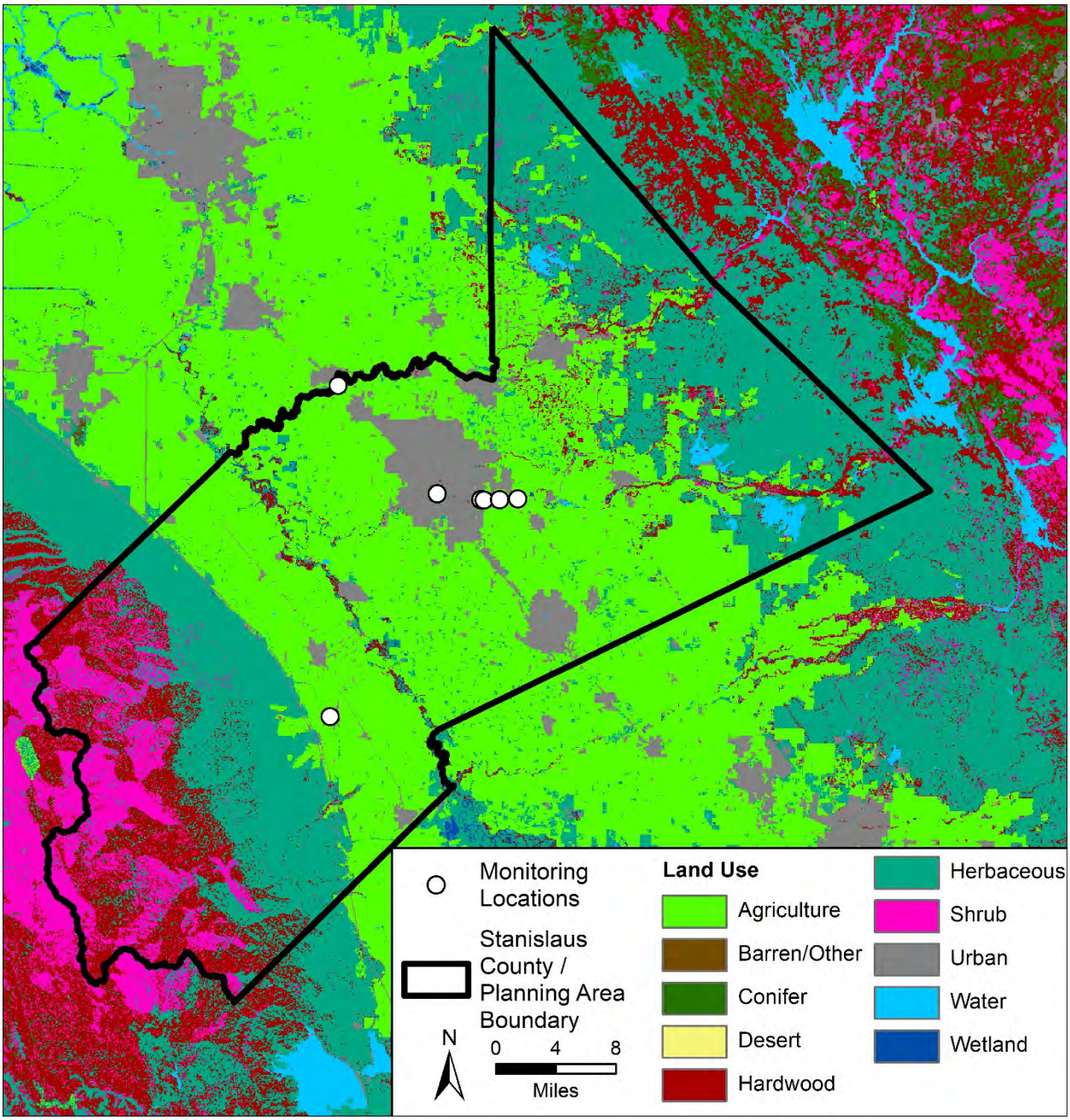


Figure 4. Land Use and Monitoring Locations Map

Constraints

The main monitoring constraint for this project is sampling wet weather events. Three storms are planned, but sampling teams are at the mercy of the weather. Sampling teams will be properly trained in weather forecasting, storm activation, and minimization of false starts, but have no control over drought conditions should they occur. Secondarily, the storm water monitoring described in this plan must take place early in the 2017/2018 rainy season in order for the resulting data to be included in watershed analyses and characterization in the SWRP in early 2018. If the requisite storm events do not occur and sampling cannot take place in this time frame, the Monitoring Plan and QAPP will serve as guidelines to assess and

incorporate existing monitoring data into the SWRP watershed analyses and characterization process, as well as offer guidance for future monitoring that may take place during later SWRP implementation. The monitoring schedule is also constrained by the need to sample during daylight hours for the purposes of health and safety of sampling teams and due to the analytical laboratory's hours of analyses, from 8 a.m. to 5 p.m. Monday through Friday.

ELEMENT 7 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

Data quality objectives (DQO) define the appropriate type of data and specify tolerable levels of potential decision errors that will be used to establish the quantity and quality of data required to support the project objectives.

Data Quality Indicators

Data quality indicators (DQI) are criteria used to interpret the degree of the data's acceptability or utility. The principal DQIs are precision, accuracy, representativeness, comparability, completeness, and sensitivity. The DQIs for the Program are summarized by category in Table 6.

Table 6. Summary of Data Quality Indicators

Measurement or Analysis Type	Applicable Data Quality Indicator
Field Measurements	Precision, Accuracy, and Completeness
Chemistry Analyses	Precision, Accuracy, Completeness, and Representativeness
Microbiological Analyses	Precision, Accuracy (presence/absence), and Completeness
Trace Metals Analyses	Precision, Accuracy, Representativeness, and Completeness

Precision is defined as the measure of agreement among repeated measurements of the same property under identical or substantially similar conditions, calculated as either the range or the standard deviation. The precision of instrument-related field measurements will be controlled using the same analytical instrument in the field to replicate each field measurement of each water sample three times. The replicated field measurements will be reported as the mean, and the precision will be calculated as the standard deviation of the measurements. The precision of chemistry laboratory measurements will be controlled by comparison of the sample to a laboratory matrix spike / matrix spike duplicate (MS/MSD). Precision will be measured by the degree of agreement between the sample and MS/MSD results. Only samples with a ±25% relative percent difference (RPD) will be accepted.

Accuracy describes how close the measurement is to its true value. The accuracy of chemical measurements in this study applies to laboratory control standards and matrix spike samples. The accuracy of chemical measurements is quantified as percent recovery. Accuracy objectives for toxicity measurements focus on reference toxicant results. Accuracy for toxicity measurements is quantified relative to the mean and standard deviation of previous reference toxicant exposures. Accuracy criteria for bacterial testing will be based on presence/absence testing rather than numerical limits owing to the difficulty in preparing solutions of known bacterial concentration.

Representativeness is a qualitative term that expresses the degree to which the sample represents a characteristic of the environmental condition. Best professional judgement (BPJ) will be used in the field to evaluate whether measurements are made and physical samples collected in such a manner that the resulting data appropriately reflect the environment or condition being measured or studied. For example, a sampling team may choose not to take measurements at a location that experienced a debris flow from a slumped bank, as the results would not represent an accurate characterization of the discharge. Sample

selection and use of approved/documented analytical methods will control to the best extent possible that the measurement data represent the conditions at the investigation site.

Data collected as part of previous projects and included as part of this SWRP development process must meet minimum acceptance criteria. Acceptance criteria will be based on the implementation of acceptable and recognized QA/QC procedures. Acceptance criteria of previously collected data will be based on documentation provided with the previous data that acceptable standard QA/QC procedures were followed. Acceptable data must have proper sample collection and handling methods, sample preparation and analytical procedures, holding times, stability issues, and QA protocols.

Completeness describes the success of sample collection and laboratory analysis, which should be sufficient to fulfill the statistical criteria of the project. Completeness is measured as the fraction of samples collected and/or analyzed relative to the quantity targeted in the study design. While no specific statistical criteria have been established for this study, it is expected that 90% of all measurements could be taken when anticipated. This accounts for adverse weather conditions, safety concerns, and equipment problems. A loss of 10% of the samples in this study would represent a minimal loss in statistical power to address the study objectives.

Measurement Quality Objectives

Measurement quality objectives (MQO) are the individual performance criteria or acceptance goals that correspond to each of the DQIs. The MQOs for field measurements to be taken are summarized in Table 7. The MQOs for laboratory measurements are summarized in Table 8.

Table 7. Measurement Quality Objectives for Field Measurements

Group	Parameter	Precision	Accuracy	Representativeness	Completeness
Water Quality Analyses	Conductivity	Duplicate measurements will be collected; RPD <10%	Calibration Standards within ± 5% of the expected range of the certified value.	Samples collected from representative sample location. Appropriate Sampling Container	90%
	DO	Duplicate measurements will be collected; RPD <10%	Per manufacturers specifications.	Samples collected from representative sample location. Appropriate Sampling Container	90%
	pH	Duplicate measurements will be collected; RPD <10%	Calibration Standards within ± 5% of the expected range of the certified value.	Samples collected from representative sample location. Appropriate Sampling Container	90%
	Temperature	Duplicate measurements will be collected; RPD <10%	Per manufacturers specifications.	Samples collected from representative sample location. Appropriate Sampling Container	90%

Group	Parameter	Precision	Accuracy	Representativeness	Completeness
	Turbidity	Duplicate measurements will be collected; RPD <10%	Calibration Standards within ± 5% of the expected range of the certified value.	Samples collected from representative sample location. Appropriate Sampling Container	90%
	Flow	Measurements will be collected at the beginning and end of sampling	Measurements estimated within ± 20% of the expected value range.	Flow data collected at representative sample location.	90%

Table 8. Measurement Quality Objectives for Laboratory Measurements

Group	Parameter	Precision	Accuracy	Representativeness	Completeness
Chemistry Analyses	**Conventional Analytes in Water:** Oil & Grease, Total Hardness (as CaCO3), TSS	RPD<25% (N/A if native concentration of either sample<RL)	80-120% recovery	Lab sample replicates per 20 samples or analytical batch (whichever is more frequent) Field duplicate 5% of total project sample count	90%
Chemistry Analyses	**Inorganic Analytes in Water:** Total (water and tissue) & Dissolved Trace Metals (water only)	RPD<25% (N/A if native concentration of either sample<RL)	Standard Reference Materials (SRM, CRM, PT) 75-125% recovery	Lab sample replicates per 20 samples or analytical batch (whichever is more frequent) Field duplicate 5% of total project sample count	90%
Chemistry Analyses	**Synthetic Organic Compounds in Water** Organophosphate Pesticides	Water: RPD<25% (N/A if native concentration of either sample<RL)	Standard Reference Materials: 70-130% recovery if certified, otherwise 50-150% recovery; Matrix spikes: 50-150% recovery, or based on 3x the standard deviation of lab's actual method recoveries	Lab duplicate per method; Field duplicate 5% of total project sample count	90%
Bacterial Analyses	Total coliforms, Fecal coliforms, Enterococci	RPD<25% (N/A if native concentration of either sample<RL)	Positive control and reference material = 80-120% recovery Negative control = no growth on filter	Lab sample replicates per 20 samples or analytical batch (whichever is more frequent) Field duplicate 5% of total project sample count (coliforms: on per 25 tube dilution tests)	90%

ELEMENT 8 SPECIAL TRAINING NEEDS/CERTIFICATION

Specialized Training or Certifications

Field Sampling

Field crews will be trained on all procedures to ensure consistent documentation and accurate assessments of field collection and processing conditions. All field personnel will be trained in proper field sampling and sample handling techniques prior to each sampling event, including collection, handling/storage and COC procedures. These techniques will be reviewed prior to the sampling event. Sampling will follow the SWAMP Standard Operating Procedures (SOP) for Conducting Field Measurements and Field Collections of Water and Bed Sediment Samples in SWAMP, MPSL-DFG Field SOP 1.0. Field crews will be trained on field safety protocols prior to each sampling event.

Overall Training Responsibility

Kathleen Higgins is Woodard & Curran's QA Officer. She will be responsible for the QA/QC procedures, including training, found in this QAPP as part of the sampling and field analysis.

Analytical Laboratory

Alpha Analytical Laboratories is certified by the California Environmental Laboratory Accreditation Program (ELAP) for the analyses of inorganics, toxic chemical elements and organics in wastewater and tissues (Certificate No. 1551).

Training and Certification Documentation

All personnel are responsible for complying with all QA/QC requirements that pertain to their organizational/technical function. Each technical staff member must have a combination of experience and education to adequately demonstrate a specific knowledge of their function and a general knowledge of laboratory operations, test methods, QA/QC procedures, and records management.

Field Sampling

Field personnel training will be documented and records kept in the project's files at Woodard & Curran's offices.

Analytical Laboratory

Section 1.2 of Alpha Analytical Laboratories' Quality Manual (Appendix B) details their training program. Alpha Analytical Laboratories maintains records of their training program.

Training Personnel

The Contractor Project Manager and Sampling Lead will provide training for field personnel in proper field sampling techniques prior to work initiation to ensure consistent and appropriate sampling, sampling handling/ storage, and COC procedures. Documentation of the type of training, who provided the training, who was trained, and dates of training will be provided.

ELEMENT 9 DOCUMENTS AND RECORDS

O'Dell Engineering will document and track the aspects of the sample collection process, including generating field logs at each site and COC forms for the samples collected. COC forms will accompany water samples to the appropriate laboratory for analysis.

Data received are kept as received and maintained in Woodard & Curran's database system; data are copied onto the hard disk for editing as needed based on error checking and verification procedures. Woodard & Curran will maintain a centralized database of information collected during this project. The database will include field observations, data sheets, COC records, and analytical results. The Contractor Project Manager, Ms. Sheene, will maintain this database. The final electronic data deliverable (EDD) will be in a format that matches SWAMP requirements following the SWAMP Information Management Plan (MPSL, 2005). After verification, data files are moved to project specific folders on Stanislaus County servers for storage. All original data sheets, all statistical worksheets, all reports produced are accumulated in project specific folders that are maintained on Stanislaus County servers after the report has been submitted. Final report text and tables are also stored on CD. This document details the format and structure of the data flow, verification, and validation processes.

Copies of this QAPP will be distributed to the parties identified previously in Table 1. Updates to this QAPP will be distributed in like manner, and previous versions will be discarded from the project file. Woodard & Curran's QA Officer (Ms. Higgins) or Project Manager (Ms. Sheene) will be responsible for distributing an updated version of the QAPP.

Copies of the final report, including laboratory results and field records, will be maintained for a minimum of five years after project completion. The final report will be formatted as electronic and/or hard copy documents. The basic report will include a header containing the project name, date prepared, and draft or final version designation. Electronic data deliverables will be reported in tabular electronic format and can be formatted to meet client requests. Table 9 documents record retention and archival information.

Table 9. Document and Record Retention, Archival, and Disposition Information.

Documents	Identify Type Needed	Retention	Archival	Disposition
Sample Collection Records	Chain-of-Custody	Paper	Notebook	Minimum 5 years
Field Records	Field Observation Forms	Paper	Notebook	Minimum 5 years
Analytical Records	Lab Notebooks	Paper	Notebook	Minimum 5 years
	Lab Results QA/QC	Paper/Electronic	Notebook/Excel	Minimum 5 years
	Electronic Data File	Electronic	Database	Minimum 5 years
Data Records	Data Entry	Electronic	Database	Minimum 5 years
Assessment Records	QA/QC Assessment	Paper/Electronic	Document	Minimum 5 years
	Final Report	Paper/Electronic	Document	Minimum 5 years

GROUP B:
DATA GENERATION AND ACQUISITION

ELEMENT 10 SAMPLING PROCESS DESIGN

The primary purpose of the SWRP Storm Water Quality Monitoring task is to provide water quality data, in combination with regional, county, and municipal monitoring programs, to help establish baseline water quality conditions to support watershed characterization and project assessment as part of the development of the SWRP. Samples will be collected at seven key outfalls (Table 5) over three storm events in the 2017/2018 rainy season.

Sampling sites were selected in an effort to characterize potential storm water pollutant loading to priority receiving waters and groundwater basins. Site selection considerations included land uses, priority drainages, and importance or nearness to listed receiving waters. Sites include identified County priority outfalls, currently sampled for dry weather flows each year, as well as a location near a potential groundwater recharge project with no existing water quality data records. Site identification, location, receiving water, and land use are summarized in Table 5. An overview of the monitoring locations and surface waters are shown in Figure 3. Monitoring locations related to land use is shown in Figure 4. More information regarding sites selection criteria is available in the Monitoring Plan (Appendix A).

As the project progresses, there may be a need to add or remove sampling sites and to adjust the timing of the sampling events. The monitoring plan will be updated with changes to the locations and schedule as needed.

Table 10. Number and Frequency of Water Samples

Site ID	Location	Approximate Coordinates		Number of Storms	Total Number of Chemistry Samples
		Latitude	Longitude		
BT-001	Beard Tract - Mariposa at Ag Field	37.62181	-120.934	3	3
BT-002	Beard Tract - McClure at Gilton Facility	37.62151	-120.930	3	3
BT-003	Beard Tract - Codoni at Railroad	37.62197	-120.911	3	3
STR-008	Salida Community	37.73029	-121.109	3	3
TUO-001C	Santa Fe Ave. Bridge	37.62401	-120.900	3	3
TUO-003	9th Street Bridge Region	37.62707	-120.987	3	3
LSC-001	Little Salado Creek at Crows Landing	37.41120	-121.114	3	3

Storm Water Sampling Methodology

A wet weather sampling event will be defined as an event with 0.2 inches of rainfall. Storm events will be considered viable for mobilization if at least 0.2 inches of rainfall is forecast with at least a 70% probability within 72 hours prior to the event. Three wet weather outfall discharge sampling events will be conducted during the 2017/2018 rainy season. The first qualifying storm event of the year after October 1st will be

targeted. Qualifying storm events monitored shall be preceded by at least three days of dry weather. Storm forecasts can be obtained from the National Weather Service website (http://www.wrh.noaa.gov/sgx/) or an equivalent source.

During each wet weather monitoring event, narrative descriptions and field observations shall be recorded at each monitoring location. Narrative descriptions and observations include:

- Sampling location identified by coordinates and street location
- Date, time and duration of the storm event sampled
- Ambient temperature and current weather conditions
- Rainfall estimates of the storm event
- Duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event

Flow estimation or measurement will be performed using data from nearby United States Geological Survey (USGS) gauging stations, or flow rates may be measured or estimated in accordance with the United States Environmental Protection Agency (USEPA) Storm Water Sampling Guidance Document (EPA-833-B-92-001).

All samples will be collected, transported, processed and analyzed in accordance with SWAMP protocols. Grab samples will be collected for the analytes tested in the field: pH, temperature, specific conductivity, and dissolved oxygen. For all other constituents, time-weighted composite samples will be collected using a minimum of 4 grab samples collected at 20-minute intervals, during the first 24 hours of the storm water discharge. After the storm event, the discrete samples will be composited into one time-weighted composite for chemistry analysis. Oil & grease, methyl mercury, and bacteria samples will be collected in separate, analyte-specific containers and composited separately. Samples will be kept under COC and delivered to the appropriate laboratory within the required holding time. Bacteria samples will be kept on ice and stored in a cooler until analysis. Bacteria samples have a 6-hour holding time. Sample runners may be used to ensure that bacteria samples and chemistry samples reach their respective analytical laboratories within the designated sample holding times.

Critical Information

The focus of the monitoring program will be to collect water quality data at key outfalls to assess potential contaminant loading from storm water to the County's surface receiving waters and groundwater basins. The results, in combination with existing water quality data from regional, county, and municipal monitoring programs, will help establish baseline water quality conditions to support watershed characterization, as well as project assessments and prioritization as part of the development of the SWRP.

Supplementary qualitative observations will be made in the field of water quality characteristics and runoff and will be documented through photographs.

Natural Variability

This program will collect data in order to assess potential contaminant loading from storm water to the County's surface receiving waters and groundwater basins. The results, in combination with existing water quality data from regional, county, and municipal monitoring programs, will help establish baseline water quality conditions to support watershed characterization, as well as project assessments and prioritization as part of the development of the SWRP. In order to accomplish this goal, water quality must be measured over various spatial and temporal scales.

Natural variability may influence the assessment through storm variability in rainfall patterns, which could result in a range of pollutant loading responses in this system. However, this program intends to provide a representative assessment of water quality conditions in Stanislaus County by monitoring three wet weather events at locations across the county. Rainfall will be monitored in the watershed through local rainfall gauges.

Sources of Bias

Bias is defined as the systematic or persistent distortion of a measurement process that causes errors in one direction. One potential source of bias for this project is choice of storms for the sampling events. Storm events are variable by nature which means that predicted rainfall, actual rainfall, and runoff volume will vary among storm events. The goal of this project is to choose storm events that are large enough to produce sufficient rainfall and runoff volume. By sampling three storms over the course of the study, sources of bias will be minimized to the maximum extent practicable.

ELEMENT 11 SAMPLING METHODS

This section describes the sampling procedures that will be implemented as part of monitoring. Sampling will follow the SWAMP SOP for Conducting Field Measurements and Field Collections of Water and Bed Sediment Samples in SWAMP, MPSL-DFG Field SOP 1.0, as well as Method 1669 Sampling Ambient Water for Determination of Metals at EPA Water Quality Criteria Levels.

Sample containers and preservatives are identified in Table 11. Appropriate precleaned sample containers provided by the laboratory will be used. Sample bottles and caps will be protected from contact with solvents, dust, or other contaminants. Sample bottles for this project will not be reused.

The Sampling Team Leader has responsibility for assessing the safety of sampling teams. For each site, a two-person team will conduct all sampling, and sampling teams will have access to a cellular phone to alert rescue agencies should an accident occur. Sampling will be postponed if sampling teams determine that the conditions are unsafe.

Failure to collect a sample due to safety concerns or technical issues will be promptly reported to the Project Manager, who will determine if any corrective action is needed and arrange to collect a replacement sample (if possible). The Quality Assurance Officer will document sampling failures and the effectiveness of corrective actions.

Flow Monitoring

Flow estimation or measurement will be performed using data from nearby United States Geological Survey (USGS) gauging stations, or flow rates may be measured or estimated in accordance with the United States Environmental Protection Agency (USEPA) Storm Water Sampling Guidance Document (EPA-833-B-92-001) using one of the methods described below.

- **Bottle Filling Method**—The bottle filling method requires that a known volume of water be collected within a known period of time in order to estimate flow volumes. This method will most likely be used at storm drain outlets. This test should be performed in triplicate for accuracy.
- **Leaf Method**—The leaf method will be used for occasions when water depth is less than 2 inches. An object of neutral buoyancy (e.g., an orange peel or leaf) is floated in the main channel of the observed flow and its transport is timed over a specified distance. This technique must be performed in triplicate to ensure accuracy.

Sample collection for Laboratory Analysis

- **Water Sample Collection for Chemistry Analysis**
  Field scientists wearing clean, disposable gloves will collect water grab samples of outfall flow in containers specified in Table 11. Chemistry and conventional water samples for analysis will be collected from the horizontal and vertical center of the outfall flow if possible. Care will be taken to avoid contaminating the sample with debris. Methyl mercury sampling will be collected per EPA Method 1669 using “Clean Hands, Dirty Hands” method. Samples undergoing field analyses will be immediately analyzed. All remaining samples will be stored on ice in a covered cooler in the field and during pick-up and delivery to Alpha Analytical laboratory. COC forms for samples will be submitted to the laboratory. Sample volume, sample container, and preservation requirements for chemistry analyses are presented in Table 11.

- **Water Sample Collection for Bacterial Analysis**
  Field scientists wearing clean, disposable gloves will collect bacterial grab samples in sterile, plastic containers. Sampling containers are kept in clear Ziploc™ bags until use. The bag will be opened, and the sampling container will be opened with the lid held face-down to prevent any airborne contamination. The bottle will be submerged open-end down in the outfall flow below the water's surface. The bottle will then be turned face-up, allowed to fill and then drained to the 100-ml volume. The bottle will then be closed and placed back in the Ziploc™ bag, and the bag will be sealed. The contaminated gloves are removed. Samples will be stored on ice in a covered cooler in the field and during pick-up and delivery to the laboratory. COC forms (Appendix C) for samples are submitted to the laboratory. Laboratory analysis will begin as quickly as possible and always within the maximum holding time of six hours. Sample volume, sample container, and preservation requirements for indicator bacteria are presented in Table 11.

Compositing Samples

Water samples will be time-weight composited due to the impracticality of obtaining flow data from outfall flow. The time between samples will be used to normalize the volume of water composited from each sample. Composite samples will be collected using a minimum of 4 grab samples collected in 20-minute intervals, during the first 24 hours of the storm water discharge. After the storm event, the discrete samples will be composited into one time-weighted composite for chemistry analysis.

All samples will be kept under COC and delivered to the appropriate laboratory within the required holding time. Bacteria samples will be kept on ice and stored in a cooler until analysis.

Laboratory Analysis

Laboratory analysis will be performed as specified in Element 13.

Table 11. List of Analytes with Sample Volume, Container Type and Preservation

Analyte	Method	MDL	Units	Volume/ Container	Preservation	Holding Time
Conventional Water Analysis						
Oil and grease (HEM)	EPA 1664A	1.4	mg/L	1-L glass jar with Teflon lid-liner	Cool ≤6°C, HNO_3 or H_2SO_4 to pH<2	28 Days
General Chemistry in Water Analysis						
Alkalinity	SM 2320B	1.0	mg/L	950 mL polyethylene bottle	Cool ≤6°C	14 Days
Biochemical oxygen demand (BOD)	SM 5210B	2.0	mg/L	4-L polyethylene cubitainer	Cool ≤6°C	48 hours
Chemical oxygen demand (COD)	SM 5220D	9.0	mg/L	1-L	Cool ≤6°C, HNO_3 or H_2SO_4 to pH<2	28 Days
Nitrate + Nitrite (as N)	Calculation	0.0086	mg/L	500 mL polyethylene bottle	Cool ≤6°C, H_2SO_4	7 Days (unacidified) or 28 Days (acidified)
Total ammonia (as N)	SM 4500NH3C	0.1	mg/L	500 mL polyethylene bottle	Cool ≤6°C, H_2SO_4	48 Hours (unacidified) or 28 Days (acidified)

Table 11. List of Analytes with Sample Volume, Container Type and Preservation

Analyte	Method	MDL	Units	Volume/ Container	Preservation	Holding Time
Total dissolved solids (TDS)	SM 2540C	5.0	mg/L	950 mL polyethylene bottle	Cool ≤6°C	7 Days
Total organic carbon (TOC)	SM 5310C	0.2	mg/L	125 mL Amber Glass	Cool ≤6°C, H_2SO_4	Hours to preserve/28 Days
Total phosphorus	SM 4500-PE	0.011	mg/L	500 mL polyethylene bottle	Cool ≤6°C, H_2SO_4	48 Hours (unacidified) or 28 Days (acidified)
Total suspended solids (TSS)	SM 2540-D	0.5	mg/L	2000 mL HDPE	Cool ≤6°C	7 days
Turbidity	EPA 180.1/Field	0.1	NTU	950 mL Amber HDPE	Cool ≤6°C	48 Hours
Total and Dissolved Trace Metals in Water Analysis						
Aluminum (Al), Total	EPA 200.8	5.0	µg/L	60 mL polyethylene bottle	Cool ≤6°C, HN03	48 hours to preserve/6 months analysis
Copper (Cu), Total	EPA 200.8	0.4	µg/L	60 mL polyethylene bottle	Cool ≤6°C, HN03	48 hours to preserve/6 months analysis
Iron, Total	EPA 200.8	10	µg/L	60 mL polyethylene bottle	Cool ≤6°C, HN03	48 hours to preserve/6 months analysis
Lead (Pb), Dissolved	EPA 200.8	0.060	µg/L	60 mL polyethylene bottle	Cool ≤6°C, HN03	48 hours to preserve/6 months analysis
Lead (Pb), Total	EPA 200.8	0.060	µg/L	60 mL polyethylene bottle	Cool ≤6°C, HN03	48 hours to preserve/6 months analysis
Mercury (Hg), Total	EPA 200.8	0.200	ng/L	4-L Amber Glass	Room temperature, HCl	48 hours to preserve/90 days analysis
Zinc (Zn), Total	EPA 200.8	2.0	µg/L	60 mL polyethylene bottle	Cool ≤6°C, HN03	48 hours to preserve/6 months analysis
Methyl mercury	EPA 1630	0.0200	ng/L	4-L Amber Glass	Cool ≤6°C, HCL	48 hours to preserve/6 months analysis
Organophosphate Pesticides in Water Analysis						
Chlorpyrifos	EPA 8141A	0.30	µg/L	1-L Amber Glass	Cool ≤6°C	7 days to extract/40 days to analyze
Diazinon	EPA 8141A	0.30	µg/L	1-L Amber Glass	Cool ≤6°C	7 days to extract/40 days to analyze
Indicator Bacteria Samples						
Fecal coliforms	SM 9221 B and E	1.8	MPN/ 100 mL	125-mL HDPE plastic	Cool ≤10°C	8 Hours
E. coli	SM 9221 F	1.1	MPN/ 100 mL	125-mL HDPE plastic	Cool ≤10°C	8 Hours

Field Data Collection

Field personnel will record site information, flow measurements, ambient weather conditions and temperatures at times of sampling. All field data will be recorded on waterproof paper field data sheets with permanent black waterproof ink pens whenever practicable. If impractical (e.g., when data sheets get wet due to rain), pencils and hard plastic slates can be substituted. In either case, erasures and write-overs of

recording errors will not be permitted. Errors will be clearly lined through with a single line and then initialed, and the correct entry placed on the next blank line. Any data recorded on slates, will be photocopied and archived at Woodard & Curran, with the original slate maintained by sampling lead at O'Dell Engineering until one year after completion of the project. All field log entries will be made legibly. Each field data sheet will be signed by the data recorder. The field supervisor will review all data sheets and the log book at the completion of each station to ensure the data are complete, legible, and recorded properly. The field supervisor will note in the field log book that the data sheets have been reviewed and found in order.

Photo Documentation

Field personnel will also collect visual observational data including photographic records of the sampling locations, records of the water appearance, odor, *etc*. All photos will be logged with date, time and location.

Equipment Decontamination and Cleaning

QA/QC for sampling processes begins with proper collection of the samples to minimize the possibility of contamination. Water samples will be collected in laboratory-certified, contaminant-free bottles. Bottles are thoroughly washed and rinsed with acid before reuse according to EPA procedures. Appropriate sample containers and field measurement and sampling gear are transported to the sample site according to the appropriate SOP. Water velocity, temperature, pH, conductivity, and DO, as well as other field data, are measured and recorded using the appropriate equipment, and then equipment is decontaminated. Samples are put on ice and appropriately shipped to the processing laboratories.

The chemistry and microbial analysis of the samples will be performed under the guidelines of the QA/QC programs established by Alpha Analytical Laboratories. The SOPs are included in Appendix B.

Equipment and Support Facilities

Alpha Analytical Laboratories will be the only support facility used during this project.

Corrective Action for Field Measurements

The field sampling staff has primary responsibility for responding to failures in the automated sampling or measurement systems. Deviations from defined protocols and the project QAPP are documented in the comment section of field notes. Data problem resolution is discussed in detail in Element 20 of this document. If any equipment fails, field personnel will report the problem in the comment section of their field notes and will not record data values for the variables in question. Actions will be taken to replace or repair broken equipment prior to the next field use. No datum will be entered into the project database that is known to be collected using any faulty equipment. It is the combined responsibility of the members of the sampling crew to determine if the performance requirements of the specific sampling method have been met and to collect an additional sample if required. Any deviations from field protocols defined in the project QAPP will be reported to the Project Manager immediately and a summary will be stored in a Corrective Action binder by the Woodard & Curran Project Manager.

ELEMENT 12 SAMPLE HANDLING CUSTODY

Water Quality Samples

Analytical water quality samples will be labeled with the project name, site location, date and time collected, analyses to be performed, and sample preservatives, if any. Samples will be stored and transported on ice, maintaining 4°C, until processed. Samples will be delivered, under COC, to the laboratory, and analyses initiated within specified holding times, as outlined in Table 12 and Table 12.

Water chemistry and bacteria samples will be couriered to Alpha Analytics by O'Dell Engineering staff. Samples will be kept on ice from the time of sample collection until delivery to the laboratory. Exposure to sunlight will be avoided, as ultraviolet rays can be detrimental to bacteria, resulting in unreliable analytical results. Samples are placed in a cooler with a closed lid immediately following collection.

Each field sample is uniquely identified with a sample label written or printed in indelible ink. Sample containers are identified with the project title, appropriate identification number, the date and time of sample collection, and preservation method.

Table 12. Sample Holding Times and Preservation Methods

Analyte	Holding Time	Preservation
Oil & Grease	28 days	HNO3; stored on ice
Alkalinity	14 Days	Stored on ice
Biochemical oxygen demand (BOD)	48 Hours	Stored on ice
Chemical oxygen demand (COD)	28 Days	HNO3; stored on ice
Total ammonia (as N)	48 hours (unacidified)/28 days (acidified)	Stored on ice; acid preservation performed in Lab.
Total dissolved solids (TDS)	7 days	Stored on ice
Total organic carbon (TOC)	2 hours for preservation/28 Days	HCl; stored on ice
Total phosphorus	48 hours (unacidified)/28 days (acidified)	Stored on ice; acid preservation performed in Lab.
Total Suspended Solids	7 Days	Stored on ice
Turbidity	48 Hours	Stored on ice
Total and Dissolved Trace Metals	48 hours for preservation/6 months for analysis	Stored on ice; filtered and preserved in Lab.
Total and Dissolved Mercury	48 hours for preservation/90 days for analysis	HCl; stored at room temperature
Total and Dissolved Methylmercury	48 hours for preservation/6 months for analysis	HCl; stored on ice
Organophosphate Pesticides	7 days for extraction/40 days for analysis	Stored on ice
Fecal Coliforms	8 Hours	Cool, less than 10 degrees C, sodium thiosulfate
E. Coli	8 Hours	

Chain-of-Custody Procedures

Samples will be considered in custody if they are (1) in the custodian's possession or view, (2) retained in a secured place (under lock) with restricted access, or (3) placed in a container and secured with an official seal such that the sample could not be reached without breaking the seal. The principal documents used to identify samples and to document possession will be COC records (Appendix C), field logbooks, and field tracking forms. COC procedures will be used for samples throughout the collection, transport, and analytical process.

COC procedures will be initiated during sample collection. A COC record will be provided with each sample or group of samples. Each person who will have custody of the samples will sign the form and ensure the samples will not be left unattended unless properly secured. Documentation of sample handling and custody includes the following:

- Sample identifier.
- Sample collection date and time.
- Any special notations on sample characteristics or analysis.
- Initials of the person collecting the sample.
- Date the sample was sent to the analytical laboratory.
- Shipping company and waybill information.

Completed COC forms will be placed in a plastic envelope and kept inside the cooler containing the samples. Once delivered to the analytical laboratory, the COC form will be signed by the person receiving the samples. The condition of the samples will be noted and recorded by the receiver. COC records will be included in the final reports prepared by the analytical laboratories and are considered an integral part of the report.

ELEMENT 13 ANALYTICAL METHODS

Field Analytical Methods

Field samples will be collected in appropriate pre-cleaned containers and aliquoted into glass, polyethylene, or Teflon™ sample containers appropriate for the analyses to be performed, or they will be collected directly into the sample containers, if appropriate. Each sample container will be affixed with a label including the station ID, sample code, matrix type, analysis type, project ID, and date and time of collection (containers will be pre-labeled in most cases). Grab sample poles may also be used.

The YSI 556 MPS Multi Probe System (YSI 566) will be used to measure pH, conductivity, temperature, and DO in the field. Operation will be conducted as per manufacturer instructions. Calibrations and replicates will be performed and recorded in field log book to ensure accurate functionality of the probe. Fresh, unexpired calibration solutions (or buffers) that have not been left open or re-used will be used exclusively for calibration.

Table 13 details the analytical methods for parameters measured in the field.

Table 13. Field Analytical Methods

Analyte	MDL	Units	Analytical Method	
			Analytical Method/SOP	Modified for Method (Yes/No)
Conductivity	1.0	µmhos/cm	SWAMP QA Management Plan - Field Collection of Water Samples	No
DO	5.0	mg/L		No
pH	0.1	Std. units		No
Temperature	NA	˚C		No

Laboratory Analytical Methods

Inductively coupled plasma-mass spectrometry (ICP-MS, EPA 200.8) will be used to analyze concentrations of trace metals in water samples. Gas Chromatography (GC, EPA 8141A) will be used to analyze concentrations of organophosphate pesticides in water samples.

The chemical and microbiological laboratory analytical methods to be used are listed in Table 13. Sample analysis turnaround time is standard for laboratories.

Table 14. Laboratory Analytical Methods

Analyte	Laboratory / Organization	MDL	Units	Analytical Method	
				Method	Modified for Method (Yes/No)
Conventional Water Analysis					
Oil & Grease	Alpha Analytical	1.4	mg/L	EPA 1664A	No
General Chemistry in Water Analysis					
Alkalinity	Alpha Analytical	1.0	mg/L	SM 2320B	No
Biochemical oxygen demand (BOD)	Alpha Analytical	2.0	mg/L	SM 5210B	No
Chemical oxygen demand (COD)	Alpha Analytical	9.0	mg/L	SM 5220D	No
Nitrate + Nitrite (as N)	Alpha Analytical	0.0086	mg/L	Calculation	No
Total ammonia (as N)	Alpha Analytical	0.1	mg/L	SM 4500NH3C	No
Total dissolved solids (TDS)	Alpha Analytical	5.0	mg/L	SM 2540C	No
Total organic carbon (TOC)	Alpha Analytical	0.2	mg/L	SM 5310C	No
Total phosphorus	Alpha Analytical	0.011	mg/L	SM 4500-PE	No
Total suspended solids (TSS)	Alpha Analytical	0.5	mg/L	SM 2540-D	No
Turbidity	Alpha Analytical	0.1	NTU	EPA 180.1/Field	No
Total and Dissolved Trace Metals in Water Analysis					
Aluminum	Alpha Analytical	5.0	µg/L	EPA 200.8	No
Copper (Cu)	Alpha Analytical	0.4	µg/L	EPA 200.8	No
Iron (Fe)	Alpha Analytical	10	µg/L	EPA 200.8	No
Lead (Pb)	Alpha Analytical	0.06	µg/L	EPA 200.8	No
Mercury (Hg)	Alpha Analytical	0.2	ng/L	EPA 200.8	No
Zinc (Zn)	Alpha Analytical	2.0	µg/L	EPA 200.8	No
Methyl mercury	Alpha Analytical	0.02	ng/L	EPA 1630	No
Organophosphate Pesticides in Water Analysis					
Chlorpyrifos	Alpha Analytical	0.30	ng/L	EPA 8141A	No
Diazinon	Alpha Analytical	0.30	ng/L	EPA 8141A	No
Indicator Bacteria					
Fecal coliforms	Alpha Analytical	1.8	MPN/ 100 mL	SM 9221 B and E	No
E. Coli	Alpha Analytical	1.1	MPN/ 100 mL	SM 9221 F	No

Sample Disposal

Proper disposal of all waste is an important component of laboratory activities. Upon completion of analyses, any remaining samples analyzed for water chemistry or indicator bacteria will be disposed of as per the Alpha Analytical Laboratories Quality Manual in Appendix B.

Corrective Action

Laboratory staff members have the primary responsibility for reporting failures in the laboratory or measurement systems to the Laboratory Manager. The Laboratory Manager is responsible for reporting failures or potential problems to the PM. Deviations from defined protocols and the project QAPP are documented in the comment section of bench notes. Data problem resolution is discussed in detail in Element 20 of this document. If any equipment fails, laboratory personnel will report the problem in the

comment section of their notes and will not record data values for the variables in question. Actions will be taken to replace or repair broken equipment prior to the next use. No data will be entered into the project database that is known to be collected with faulty equipment. It is the combined responsibility of all members of the laboratory staff to determine if the performance requirements of the specific laboratory method have been met, and to collect additional samples if required. Any deviations from standard task protocols will be reported to the Laboratory Manager immediately. The PM, in conjunction with the Project QA Officer will determine if all analytical and data QC procedures for reasonableness, accuracy, and clerical errors have been met. In an out-of-control event, the PM works with the analyst and QA Officer to solve the problem and prevents the reporting of suspect data by stopping work on the analysis in question and insuring that all results that are suspect are repeated, if possible, after the source of the error is determined and remedied. Clients are notified in writing when their work is affected by an out-of-control event or results of an internal audit. If a QC measure is out-of-control and the data are to be reported, qualifiers are reported together with sample results.

ELEMENT 14 QUALITY CONTROL

Field Measurements

QA/QC for sampling processes begins with proper collection of the samples to minimize the possibility of contamination. Water samples will be collected in laboratory-certified, contaminant-free bottles. The bottles are thoroughly washed and rinsed with acid before reuse according to EPA procedures. Appropriate sample containers and field measurement and sampling gear are transported to the sample site according to the appropriate SOP. Temperature, pH, conductivity, and DO, as well as other field data, are measured and recorded using the appropriate calibrated equipment and reviewed immediately using BPJ to ensure accurate measurement of parameters. Collected samples are put on ice and appropriately shipped to the processing laboratories. The following items present repeatable methods to ensure data quality.

Personnel safety is a concern during wet weather events. Field measurements or sample collection will be made as grab samples from a safe location near the storm drain entrance. Under no circumstances will personnel enter the water during a storm event.

Chemistry samples will be time-weight composited. Composite samples will be collected using a minimum of 4 grab samples collected in 20-minute intervals, during the first 24 hours of the storm water discharge. After the storm event, the discrete samples will be composited into one time-weighted composite for chemistry analysis. Time between samples will be used to normalize the volume of water composited from each sample. Samples will be kept under COC and delivered to the appropriate laboratory within the required holding time. Bacteria samples will be kept on ice and stored in a cooler until analysis within six hours of sample collection.

Field crews will ensure that sampling bottles are being filled properly and to capacity. Bottles will be kept on ice during the storm event and placed into coolers along with completed COC for transfer to the analytical laboratories. A field log will be completed at each site for each storm event. The field data log sheets will include empirical observations of the site and water quality characteristics. Appropriate duplicate sampling will be conducted to ensure repeatability of results. Field blanks will be used to validate correct instrumentation function.

Chemistry Analyses

QA/QC for sampling processes begins with proper collection of the samples to minimize the possibility of contamination. Water samples are first collected in laboratory-certified, contaminant-free bottles, placed on ice in the dark, and transported to the laboratory within the required holding time.

The chemistry analysis of the samples will be performed under the guidelines of the QA/QC programs established by Alpha Analytical Laboratories. These plans include laboratory duplicates and matrix spike and matrix spike duplicates (MS/MSD). The Quality Manual for Alpha Analytical can be found in Appendix B.

Alpha Analytical Laboratories employs replicate spike analyses to determine the precision and accuracy of an analysis when some or all of the parameters being determined are below the detection limit. The replicate spike procedure involves analyzing the sample and two portions of the sample spiked with a measured portion of the same analyte. Relative precision of the spikes can be determined as well as the accuracy of the analysis. Spike concentrations are sufficient to eliminate the bias that would be created by the undetectable quantity of the parameter being determined. Also, one set of duplicate samples or spike

duplicates, a Laboratory Control Material (LCM) or Certified Reference Material (CRM) sample, and a method blank are analyzed with each batch of samples. Procedures and calculations for the MS/MSD recovery can be found in Appendix B.

The ongoing evaluation of relative precision and accuracy of performance is accomplished by the generation of control charts. Employing a minimum of 20 results, control limits are generated using the mean and standard deviation of the data set. Upper and lower “warning" limits are twice the standard deviation from the mean of the set of results for accuracy charts and twice the standard deviation from the origin for precision charts. Upper and lower "out-of-control" limits are three times the standard deviation from the mean for accuracy charts and three times the standard deviation from the origin for precision charts. When relative precision or accuracy results suggest atypical performance, laboratory staff initiates an investigation into the problem. If a sample result is outside the out-of-control limits, the sample is reanalyzed. If samples cannot be reanalyzed, the result is flagged.

Alpha Analytical reports the relative standard deviation (RSD) and the RPD for QA/QC analysis performed. The RSD is a measure of the reproducibility of an analysis. This is determined by dividing the standard deviation (of an individual sample rather than the population) by the mean for the same set and then multiplying by 100%.

Relative Percent Difference
A measure of precision is calculated using the following formula:

$$Rd\% = \frac{X_1 - X_2}{X_{ave}} \times 100$$

where

X_1 = concentration observed with the first detector or equipment
X_2 = concentration observed with the second detector, equipment, or absolute value

X_{ave} = average concentration = $\frac{(X_1 + X_2)}{2}$

Corrective action is taken when an analysis is deemed suspect for some reason. These reasons include exceeding RPD ranges and/or problems with spike recoveries or blanks. The corrective action will vary on a case-by-case basis, but at a minimum involves the following:

- A check of procedures.
- A review of documents and calculations to identify possible errors.
- Correction of errors.
- A re-analysis of the sample digest, if sufficient volume is available, to determine if results can be improved.
- A complete reprocessing and re-analysis of additional sample material, if sufficient volume is available and if the holding time has not been exceeded.

Microbial Bacterial Analyses

QA/QC for sampling processes begins with proper collection of the samples to minimize the possibility of contamination. Water samples are first collected in laboratory-certified, contaminant-free bottles, placed on

ice in the dark, and transported to the laboratory within the required 6-hour holding time. For bacterial sampling, sterile, bacteria-free containers will be used. Field blanks will be collected at a rate of one sample per sampling event. Field blanks are used to ensure that no contamination originating from the collection, transport, or storage of environmental samples occurs. A field blank consists of analyte-free water that is poured into the sample collection device and sub-sampled for analyses to verify that field cleansing procedures are adequate and sample handling and transportation does not introduce any analytes of interest. One sterile field blank will be collected by each sampling field scientist during each sampling event to ensure sterile techniques.

ELEMENT 15 INSTRUMENT / EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

Field Sampling Equipment

Prior to conducting field sampling, field technicians will be responsible for preparing sampling kits that include field logs, COC forms, sample labels, sampling bottles, decontamination equipment and tools. Field measurement equipment will be checked for operation in accordance with the manufacturer's specifications. Equipment will be inspected prior to use and when returned from use for damage. Instrumentation malfunctions are immediately noted in the instrument logbook and the supervisor is notified. If a critical measurement is found to be out-of-compliance during analysis, the results of that analysis will not be reported, corrective action will be taken and documented, and the analysis will be repeated. References for the testing, inspection, and maintenance of sampling equipment and analytical instruments are provided in Table 15.

Table 15. Testing, Inspection, and Maintenance of Sampling Equipment and Analytical Instruments

Equipment / Instrument	Responsible Person	Frequency	Reference
YSI 556 MPS Multi Probe System	Dylan Crawford O'Dell Engineering	Prior to and following each use.	User Manual https://www.johnmorrisgroup.com/Content/Attachments/114441/99600-xx.pdf
Lab equipment	Cheryl Watson Alpha Analytical Laboratories	Refer to QA Manual	Appendix B

Analytical Laboratory Instruments

Alpha Analytical maintains its equipment in accordance with its SOPs which include those specified by the manufacturer and those specified by the method. Alpha Analytical' QAPP specifies equipment and system evaluations (Appendix B).

ELEMENT 16 INSPECTION / EQUIPMENT CALIBRATION AND FREQUENCY

All equipment and instruments are operated and calibrated according to manufacturer recommendations as well as by criteria defined in individual SOPs. Operation and calibration will be performed by properly trained personnel. Documentation of routine and special calibration information will be recorded in appropriate logbooks and reference files. If a measurement is found to be out of compliance during analysis, the results of that analysis will not be reported, corrective action will be taken and documented, and, if possible, the analysis will be repeated.

ELEMENT 17 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

It is the duty of each staff member responsible for equipment ordering to inspect equipment and materials for quality and report any equipment or materials that do not meet acceptance criteria to the appropriate Laboratory Manager and/or QA Officer. Upon receipt of materials or equipment, a designated employee receives and signs for the materials. The items are reviewed to ensure the shipment is complete, and they are then delivered to the proper storage location. Chemicals are dated upon receipt. Supplies are stored appropriately and are discarded on expiration date. The equipment and supplies purchased for use in field sampling activities will be inspected for damage as they are received. Confirmation that sample bottles are laboratory-certified clean will be made when received by review of provided manufacturer's certification sheets.

Equipment and material specifications used by Alpha Analytical Laboratories are outlined in the laboratory's SOPs and policies (Appendix B). Critical supplies and consumables will be overseen by the Laboratory QA Officer, Cheryl Watson.

ELEMENT 18 NON-DIRECT MEASUREMENTS

Weather forecasting information will be obtained from the National Weather Service (http://www.wrh.noaa.gov/lox/).

ELEMENT 19 DATA MANAGEMENT

Data will be maintained as previously described in Element 9.0. The original data sheets, statistical worksheets, and reports produced will be accumulated into project-specific files that are maintained at Woodard & Curran's office.

Woodard & Curran will document and track the aspects of the sample collection process, including field logs at each site and COC forms for the samples collected. COC forms will accompany water samples to the appropriate laboratory for analysis. Alpha Analytical will perform the chemistry-related analyses. The laboratory will document and track the aspects of sample receipt and storage, analyses, and reporting. Further details of the laboratory's data management protocols are provided in Appendix B.

Woodard & Curran will maintain a database of information and control documents collected in this project. The final electronic data deliverable will be in a SWAMP-compatible format, following requirements of the *SWAMP Information Management Plan* (MPSL, 2005).

After verification and final database establishment, the raw data files and databases will be copied onto CD for on-site storage. The original data sheets, statistical worksheets, and reports produced will be accumulated into project-specific files that are maintained at Woodard & Curran' office. Final report text and tables will also be stored on disk. After data submissions, directories will be stored with Stanislaus County. In-house copies of data files will be made on CD when submitted. Records will be maintained for at least five years.

Laboratory results will be stored in a database system at the laboratory's main office and will be provided to Woodard & Curran both electronically and by hard copy. Data received from outside contractors will be kept exactly as received (on original CD) and will be copied onto the hard disk for editing, as needed, based on error checking and verification procedures.

Persons responsible for maintaining records for this project are as follows:

- Hawkeye Sheene, Woodard & Curran's Project Manager, will oversee the operations of the project and will arbitrate any issues relative to records retention and any decisions to discard records and will maintain the sample collection, sample transport, COC and field analysis forms and the database.
- Cheryl Watson, Alpha Analytical Laboratories QA Officer, will maintain analytical records.

GROUP C:
ASSESSMENT AND OVERSIGHT

ELEMENT 20 ASSESSMENTS AND RESPONSE ACTIONS

The Project Manager will be responsible for completion of all project components and the content and accuracy of the final report. Woodard & Curran's Project Manager will be responsible for the day-to day oversight of the project and for implementing monitoring programs. All reviews of the data will be made by Woodard & Curran's QA Officer and may include the SWRCB QA Officer if necessary. Woodard & Curran's QA Officer will conduct systematic reviews of the data for the specified DQOs every time data packages are delivered to and entered into the database. Any data issues that arise will be relayed to Woodard & Curran's Project Manager and the Project Manager. Depending on the observed discrepancy, Woodard & Curran's Project Manager and/or the Project Manager will determine how the deviation may impact data quality and what corrective actions will be taken. Woodard & Curran's QA Officer has the power to halt all sampling and analytical work if the deviation(s) noted are considered detrimental to data quality. Data issues that cannot be corrected will be documented by Woodard & Curran's QA Officer, flagged in the database, acknowledged and explained in the final report.

ELEMENT 21 PROJECT REPORTS

The Project Manager is responsible for preparation and submittal of project reports. Table 16 outlines the schedule of reports due to the Project Director and Grant Manager.

Table 16. Management Reports

Report	Person Filing Report	Report Recipient	Deliverable Due Date
QAPP & Monitoring Plan	Consultant Project Manager Hawkeye Sheene	Grant Manager Spencer Joplin	9/29/2017
Monitoring Report	Consultant Project Manager Hawkeye Sheene	Grant Manager Spencer Joplin	March 2018

GROUP D:
DATA VALIDATION AND USABILITY

ELEMENT 22 DATA REVIEW, VERIFICATION AND VALIDATION

Laboratory validation and verification of the data generated is the responsibility of the laboratory. The laboratory manager will maintain analytical reports in a database format as well as all QA/QC documentation for the laboratory. Woodard & Curran's QA Officer will review all data packages received for adherence to DQOs and QA/QC practices cited in this QAPP. All COC forms will be reviewed to ensure that proper procedures were followed during the collection, transport, and delivery of samples to the appropriate laboratories including verifying that test initiation took place within the required holding times.

If data fails to meet all measurement quality objectives, then the corrective action process will be initiated. This process includes reviewing the original field and laboratory procedures to determine the cause of the data deviations, an evaluation of the severity of the field or laboratory deviations and its impact on the study conclusions, and whether resampling or reanalysis of the samples is necessary. All data that failed to meet the measurement quality objectives will be documented on the original field and/or laboratory sheets as well as in the project database. All deviations will be documented by Woodard & Curran's Project Manager in the monitoring report

ELEMENT 23 VERIFICATION AND VALIDATION METHODS

After each survey, field data sheets are removed from the field log books, and sheets are checked for completeness and accuracy by the QA Officer or Project Manager. Appropriate field sheets must be present. If there are any questions, clarification from the Sampling Team Leader is obtained as soon as possible. Field data sheets and the field logbook are filed.

Laboratory verification and validation of the data generated is the responsibility of the laboratory. Initial review of data is done by an analyst for acceptability of quality control measures and accuracy of the data. After initial review, the Laboratory QA Officer or Laboratory Manager conducts a second review and considers all manual transfers and calculations of data in detail and spot checks all electronic transfers of data. Final reports are compared to raw data either directly or through several reviewed steps.

In the data review process, the data are compared to information such as the sample's history, sample preparation, and QC sample data to evaluate the validity of the results. Corrective action is minimized through the development and implementation of routine internal system controls. Analysts are provided with specific criteria that must be met for each procedure, operation, or measurement system.

Data tables for the report are created and printed. Tables are reviewed for any errors or irregularities; if any are found it may be necessary to correct and reestablish the databases. Tables are submitted to Woodard & Curran’s Project Manager for review, who is responsible for the generation of drafts of the report. The Project Manager has final oversight on the submission of the final report.

ELEMENT 24 RECONCILIATION WITH USER REQUIREMENTS

The quality assurance personnel will review data after each event to determine if data quality objectives (DQOs) have been met. If data do not meet the project's specifications, the quality assurance personnel will review the errors and determine if the problem is due to sampling techniques or other factors and will suggest corrective action. If specific DQOs are not achievable, the quality assurance personnel will recommend appropriate modifications. Any revisions would need approval by the Woodard & Curran Project Manager, the Project Manager, and the SWQCB Grant Manager.

Data produced as part of this project will be reviewed following the completion of data validation and verification procedures. Through the performance of data validation and verification procedures, the relative uncertainty of the validated data will be determined based on the type and frequency of data validation and verification issues. The reporting confidence of data collected as part of this project will be reported with the data. Data flagged with validation or verification issues will be qualified to data users. Data reported as part of this project will be submitted to the SWAMP database.

APPENDIX A

Stanislaus Multi-Agency Regional Storm Water Resource Plan

Monitoring Plan

Appendix A

MONITORING PLAN

for the

Stanislaus Multi-Agency Regional Storm Water Resource Plan

Grant Agreement No. D1612618

Prepared for:

State Water Resources Control Board

Submitted by:

Stanislaus County

September 2017

Prepared by:

WOODARD &CURRAN

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1 Introduction

The Stanislaus Multi-Agency Regional Storm Water Resource Plan (SWRP) is being developed to identify and prioritize multi-benefit storm water resource projects to improve regional water supply resilience and aid in the adaptation of infrastructure to climate change. A focus of the SWRP will be projects that augment groundwater recharge to address groundwater overdraft, while also enhancing flood protection, water quality, habitat, and community values. Objective criteria for project evaluation will be developed based on a county-wide assessment of storm water resources, topography, soil conditions, habitat and community needs to quantify project opportunities and benefits.

Storm water quality data will be collected at key outfalls to assess potential contaminant loading from storm water to the County's surface receiving waters and groundwater basins. The results, in combination with existing water quality data from regional, county, and municipal monitoring programs, will help establish baseline water quality conditions to support watershed characterization, as well as project assessments and prioritization as part of the development of the SWRP.

2 Background

The Stanislaus Multi-Agency Regional SWRP planning area aligns with the Stanislaus County boundaries (Figure 3-1) and includes portions of the Lower San Joaquin River watershed, the Tuolumne River watershed downstream of Don Pedro Reservoir, and the southern half of the Stanislaus River watershed downstream of New Melones Reservoir. This planning area was chosen to facilitate regional planning and evaluation based on significant overlap with the East Stanislaus and Westside San Joaquin Integrated Regional Water Management Plan (IRWMP) areas, as well as the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA), Turlock Groundwater Basin Association (TGBA), and San Luis & Delta-Mendota Water Authority (SLDMWA) groundwater management plan area. The SWRP planning area includes the cities of Modesto, Turlock, Hughson, Ceres, Oakdale, Newman, Waterford, Riverbank and Patterson. The planning area also includes 10 water and irrigation districts, and a number of Community Service Districts that deliver water to their constituents. The western watershed area is mostly undeveloped rangeland. Outside of this area, agricultural land and rangeland constitute a major fraction of the SWRP planning area (45% and 36% respectively), with urban land of varying density constituting 13% of the area.

Water demand for agricultural and urban users in most of the planning area is met through conjunctive use of surface and groundwater (approximately 72% and 28%, respectively). The current drought has resulted in stress to groundwater resources; however, in the portions of the planning area where surface water is available, groundwater levels have generally recovered after past droughts. The exception may be in the portions of the Westside San Joaquin IRWMP area, where surface water deliveries from the State and Federal water projects have become unreliable. In addition, there is concern that pending requirements for increased flow in the Tuolumne and Stanislaus Rivers under proposed Basin Plan Amendments will put increased demand on groundwater resources. Of more immediate concern are overdraft conditions in the eastern part of the plan area, where agricultural water demand is met almost entirely from groundwater and there has been a trend toward conversion of rangeland to permanent crops, including nut trees and grape vines.

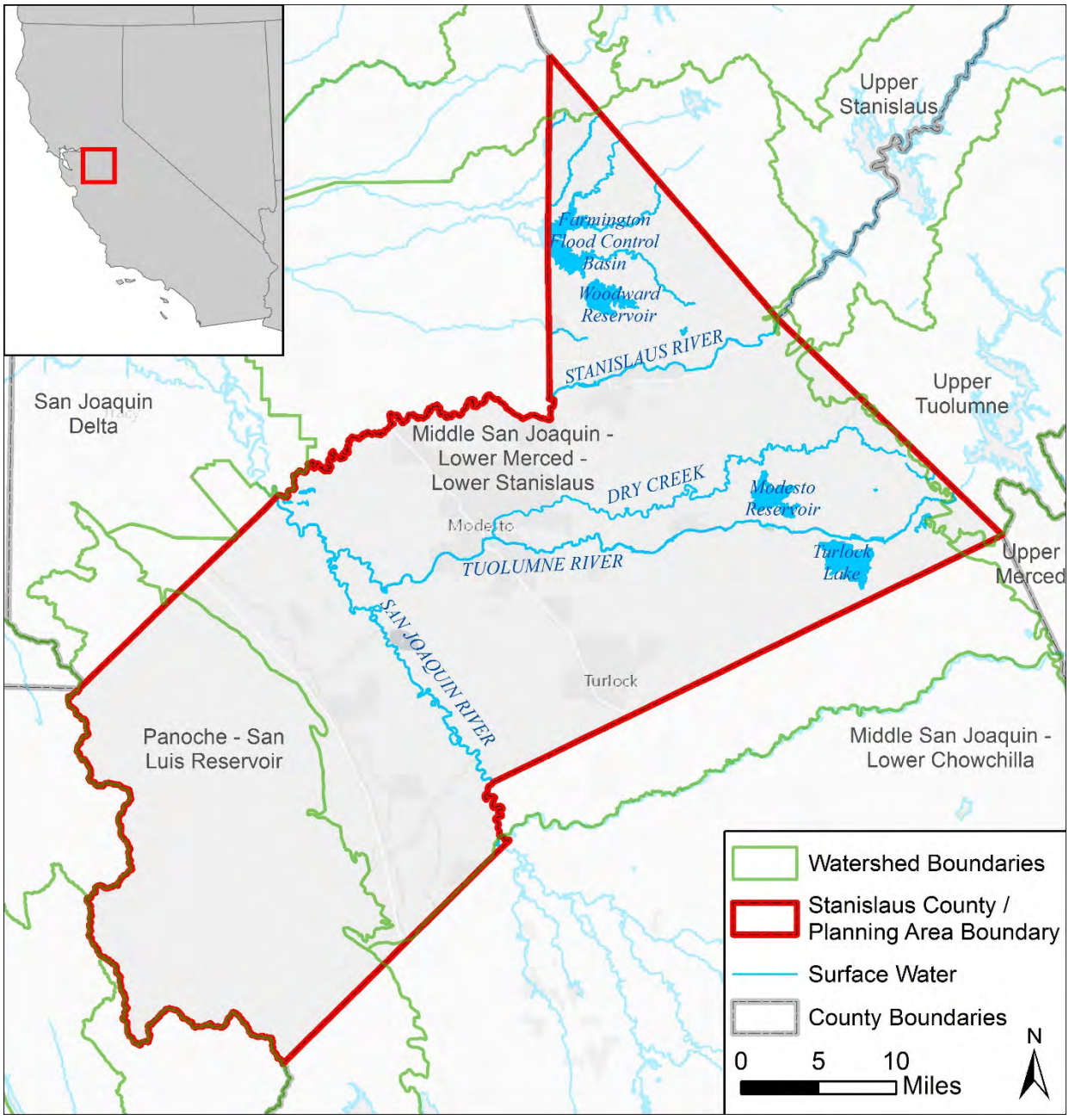
Water quality concerns in the major rivers (Stanislaus and Tuolumne, and downstream in the Lower San Joaquin) include organochlorine pesticides (diazinon and chlorpyrifos) and organic carbon, which contributes to low dissolved oxygen levels. These are managed and tracked through a Central Valley-wide Total Maximum Daily Load (TMDL) for pesticides, and a TMDL for the San Joaquin River in the Stockton Deep Water Shipping Channel (DWSC) for low dissolved oxygen.

Several additional water quality impairments are identified in the Regional Board's 303(d) list, which may be the basis of TMDLs in the future. These include: E. coli, salinity, sediment and unknown toxicity, and pH on Del Puerto Creek; E. coli, pesticides and unknown toxicity on Dry Creek; E. coli, salinity, pesticides and toxicity on Ingram Creek, E. coli and salinity on Salado Creek; boron, mercury, pesticides and unknown toxicity on the San Joaquin River between the Merced and Tuolumne Rivers; salinity, mercury, pesticides, and unknown toxicity on the San Joaquin River between the Stanislaus and Tuolumne Rivers; mercury, pesticides, and unknown toxicity in the Lower Stanislaus River; and mercury, pesticides, and unknown toxicity in the Lower Tuolumne River.

3 Overview

Woodard & Curran prepared this monitoring plan for use by O'Dell Engineering personnel. O'Dell Engineering personnel are responsible for coordinating and performing the sampling events, including providing sampling equipment, obtaining sample bottles from the lab, taking field notes, and ensuring delivery of the samples to the analytical laboratories. The following sections provide details of the monitoring plan, including constituents, sampling locations, frequency, and sampling team. In a separate document, the QAPP will discuss the details of how the samples are collected to provide data that are representative and scientifically defensible.

Figure 3-1. Stanislaus Multi-Agency SWRP Planning Area Watersheds and Waterbodies



4 Storm Water Quality Monitoring

The purpose of the SWRP Storm Water Quality Monitoring task is to provide water quality data, in combination with existing water quality data from regional, county, and municipal monitoring programs; and to help establish baseline water quality conditions to support watershed characterization and project assessment as part of the development of the SWRP.

Samples will be collected at seven key outfalls over three storm events in the 2017/2018 rainy season. As the project progresses, there may be a need to add or remove sampling sites and to adjust the timing of the sampling events. This monitoring plan will be updated with changes to the locations and schedule as needed.

Storm water monitoring described in this plan must take place early in the rainy season in order for the resulting data to be included in the SWRP watershed analyses and characterization in the beginning of 2018. If the requisite storm events do not occur and sampling cannot take place in this time frame, the Monitoring Plan and QAPP will serve as guidelines to assess and incorporate existing monitoring data into the SWRP watershed analyses and characterization process, as well as offer guidance for future monitoring that may take place during later SWRP implementation.

4.1 Storm Water Monitoring Constituents

Storm water monitoring constituents were selected based on established TMDLs, the most common 303(d) listed water body impairments, as well as the results of storm water sampling and analysis completed by the City of Modesto as required by their MS4 Permit R5-2015-0025 NPDES NO. CAS083526.A range of pollutants will be analyzed, including bacteria, metals, organics, nutrients, pesticides and general water chemistry parameters, with the focus on pollutants that may impact groundwater. Some pollutants were excluded from this sampling effort because the complexity was outside the limited timeline of the monitoring program (toxicity bioassays), or because stormwater runoff is not a primary source in receiving waters (boron). Salinity will be assessed through measurements of specific conductivity. This constituent list may be modified based on initial monitoring results or other relevant sampling data. The monitoring plan and QAPP will be updated as needed.

Table 4-1. Storm Water Monitoring Constituent List

Constituent	Analytical Method[1]	Minimum Level	Units
Bacteriological			
E. coli	SM 9221F	1.1	MPN/100 mL
Fecal coliform	SM 9221E	1.8	MPN/100 mL
Conventional			
Dissolved oxygen	Field	5	mg/L
Oil and grease	EPA 1664	1.4	mg/L
pH	Field	0.1	Std. units
Temperature	Field	None	°C
General			
Biochemical oxygen demand (BOD)	SM5210B	2.0	mg/L
Chemical oxygen demand (COD)	SM5220D	9.0	mg/L
Nitrate-nitrite (as N)	Calculation	0.0086	mg/L
Specific conductivity	Field	1.0	µmhos/cm
Total ammonia (as N)	SM4500NH3C	0.1	mg/L
Total dissolved solids (TDS)	SM2540C	5.0	mg/L
Total organic carbon (TOC)	SM5310C	0.2	mg/L
Total phosphorus	SM4500-PE	0.011	mg/L
Total suspended solids (TSS)	SM2540D	0.3	mg/L
Turbidity	EPA 180.1/Field	0.1	NTU

Constituent	Analytical Method[1]	Minimum Level	Units
Metals			
Aluminum, Total	EPA 200.8	5.0	µg/L
Copper, Total	EPA 200.8	0.4	µg/L
Iron, Total	EPA 200.8	10	µg/L
Lead, Total	EPA 200.8	0.060	µg/L
Mercury, Total	EPA 1631	0.200	ng/L
Zinc, Total	EPA 200.8	2.0	µg/L
Methyl mercury	EPA 1630	0.0200	ng/L
Organophosphate Pesticides			
Chlorpyrifos	EPA 614	0.30	µg/L
Diazinon	EPA 614	0.01	µg/L

[1]Or other approved EPA or Standard Method meeting the required minimum level.

4.2 Storm Water Sampling Methodology

4.2.1 Storm Water Sampling Event

A wet weather sampling event will be defined as an event with 0.2 inches of rainfall. Storm events will be considered viable for mobilization if at least 0.2 inches of rainfall is forecast with at least a 70% probability within 72 hours prior to the event. Three wet weather outfall discharge sampling events will be conducted during the 2017/2018 rainy season. The first qualifying storm event of the year after October 1st will be targeted. Qualifying storm events monitored shall be preceded by at least three days of dry weather. Storm forecasts can be obtained from the National Weather Service website (http://www.wrh.noaa.gov/sgx/) or an equivalent source.

4.2.2 Field Observations

During each wet weather monitoring event, narrative descriptions and field observations shall be recorded at each monitoring location. Narrative descriptions and observations include:

- Sampling location identified by coordinates and street location
- Date, time and duration of the storm event sampled
- Ambient temperature and current weather conditions
- Rainfall estimates of the storm event
- Duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event

Flow estimation or measurement will be performed using data from nearby United States Geological Survey (USGS) gauging stations, or flow rates may be measured or estimated in accordance with the United States Environmental Protection Agency (USEPA) Storm Water Sampling Guidance Document (EPA-833-B-92-001).

4.2.3 Field Monitoring

During each wet weather monitoring event, grab samples will be collected at each location for the analytes tested in the field: pH, temperature, specific conductivity, dissolved oxygen, and turbidity. Samples will be immediately analyzed and the results documented on a field observation form. Sample collection methods

are discussed in Section 4.2.4 below. Field monitoring parameters for each constituent are provided in Table 4-1.

4.2.4 Sample Collection

All samples will be collected, transported, processed and analyzed in accordance with Surface Water Ambient Monitoring Program (SWAMP) protocols. Grab samples will be collected for the analytes tested in the field, as well as for analytes that require separate sampling protocols and containers (oil & grease, methyl mercury, and bacteria). For all other constituents, composite samples will be collected using a minimum of 4 grab samples collected in 20-minute intervals during the first 24 hours of the storm water discharge. After the storm event, the discrete samples will be composited into one time-weighted composite for chemistry analysis. Samples will be kept under chain of custody and delivered to the appropriate laboratory within the required holding time. Bacteria samples will be kept on ice and stored in a cooler until analysis.

4.3 Sampling Locations

Seven sampling sites were selected in an effort to characterize potential storm water pollutant loading to priority receiving waters and groundwater basins. Site selection considerations included land uses, priority drainages, and importance or nearness to listed receiving waters. Sites include identified County priority outfalls, currently sampled for dry weather flows each year, as well as a location near a potential groundwater recharge project with no existing water quality data records. Site identification, location, receiving water, and land use are summarized in Table 4-2. An overview of the monitoring locations and surface waters are shown in Figure 4-1.

Figure 4-2 through Figure 4-4 show the monitoring locations in more detail and the land use is shown in Figure 4-5.

Based on field conditions, the program may be modified by the project team during the sampling event to provide for field safety and make the collection accurate and thorough. Any changes made to the plan will be documented within the field notebooks and added to this Monitoring Plan as Appendices.

Table 4-2. Storm Water Outfall Monitoring Locations

Site ID	Location	Approximate Coordinates		Receiving Water	Land Use
		Latitude	Longitude		
BT-001	Beard Tract - Mariposa at Ag Field	37.62181	-120.934	Tuolumne River	Industrial, Suburban Residential, Commercial
BT-002	Beard Tract - McClure at Gilton Facility	37.62151	-120.93	Tuolumne River	Industrial, Suburban Residential, Commercial
BT-003	Beard Tract - Codoni at Railroad	37.62197	-120.911	Tuolumne River	Industrial, Suburban Residential, Commercial
STR-008	Salida Community	37.73029	-121.109	Stanislaus River	Suburban Residential, Commercial
TUO-001C	Santa Fe Ave. Bridge	37.624007	-120.899678	Tuolumne River	Suburban Residential, Commercial, Open Space
TUO-003	9th Street Bridge Region	37.62707	-120.987	Tuolumne River	Industrial, Urban Residential, Commercial
LSC-001	Little Salado Creek at Crows Landing	37.4112	-121.1143	San Joaquin River	Agricultural, Industrial, Open Space

Figure 4-1. Monitoring Locations Overview

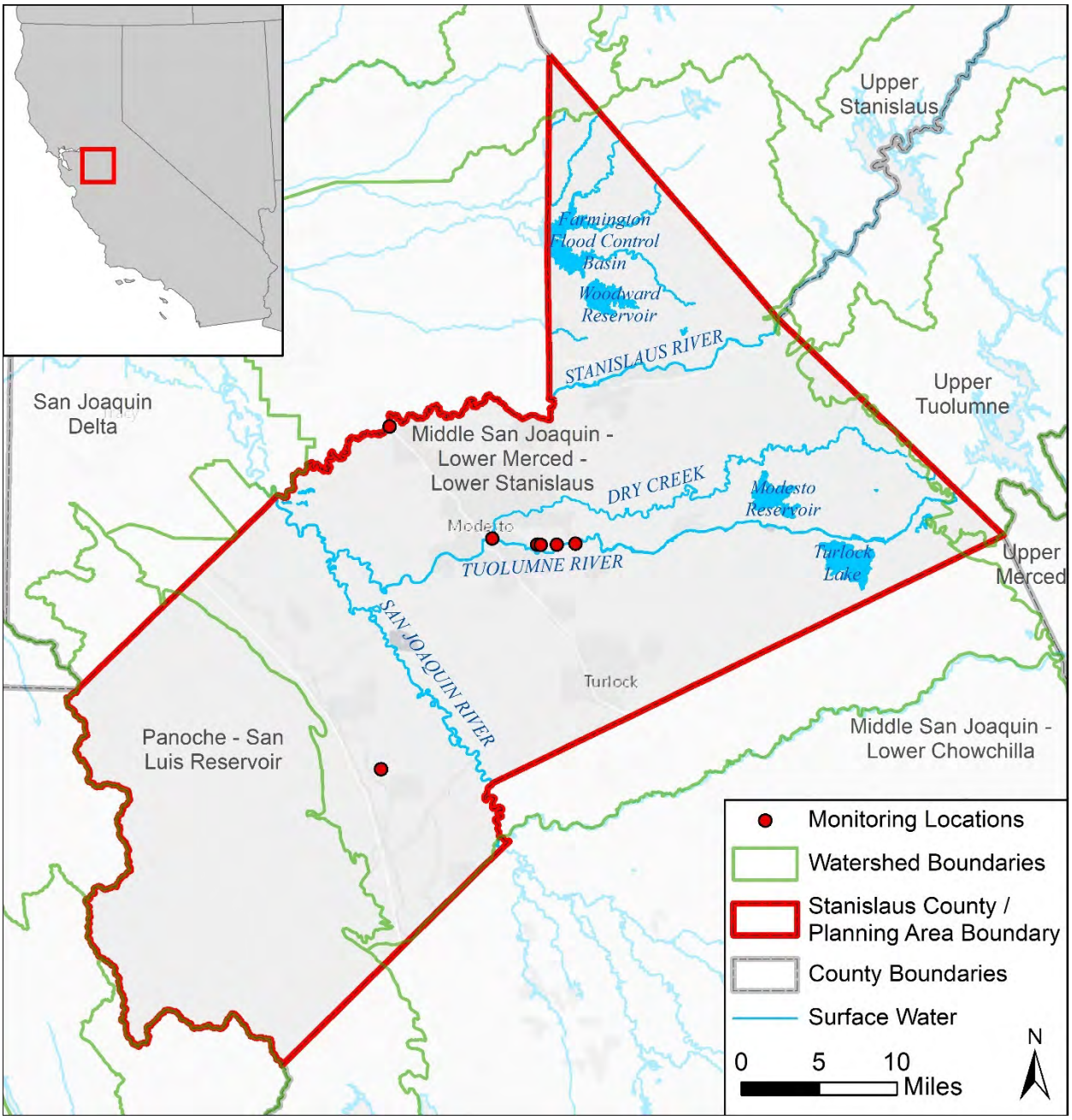


Figure 4-2. Monitoring Locations - North

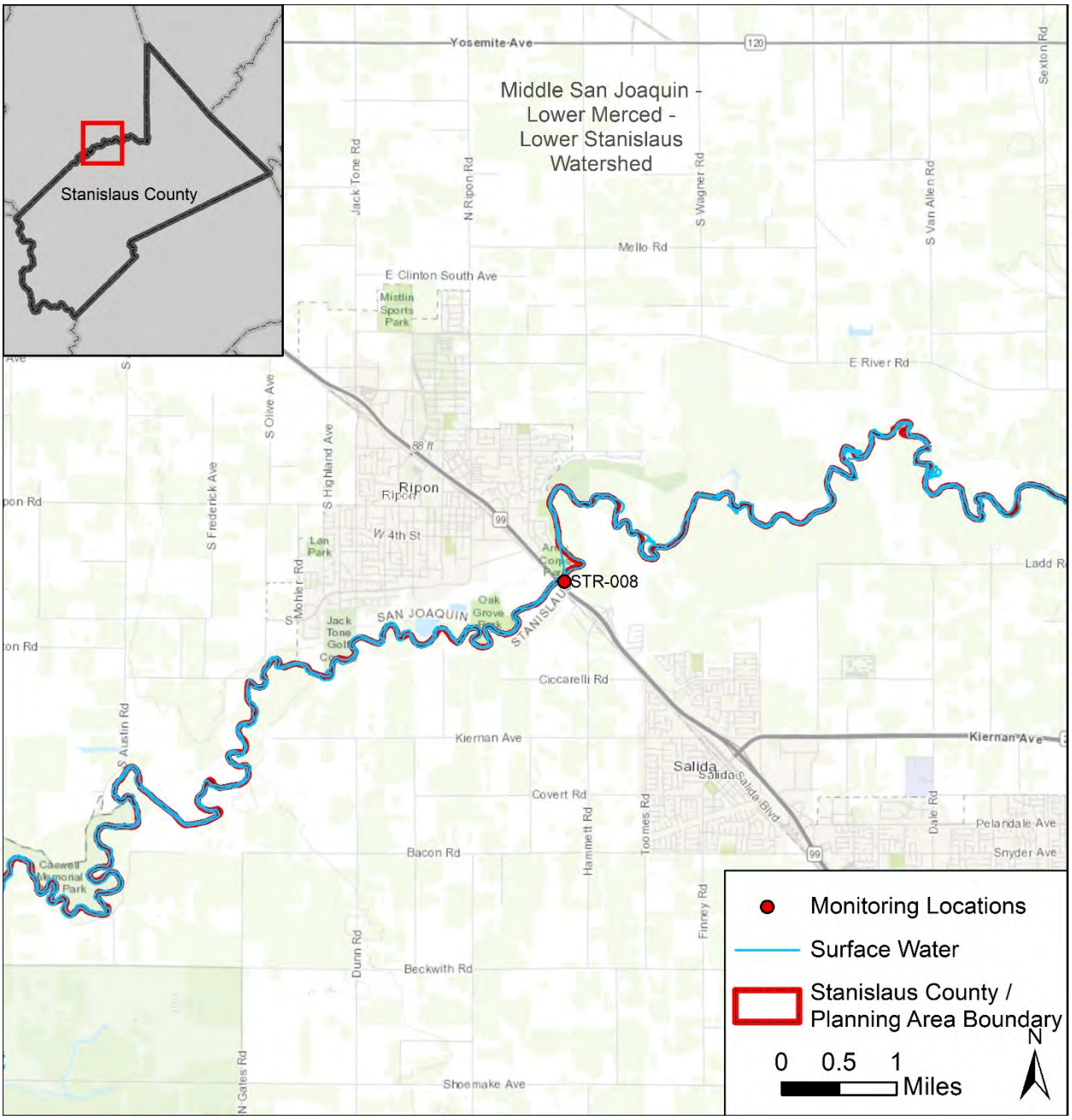


Figure 4-3. Monitoring Locations - Central

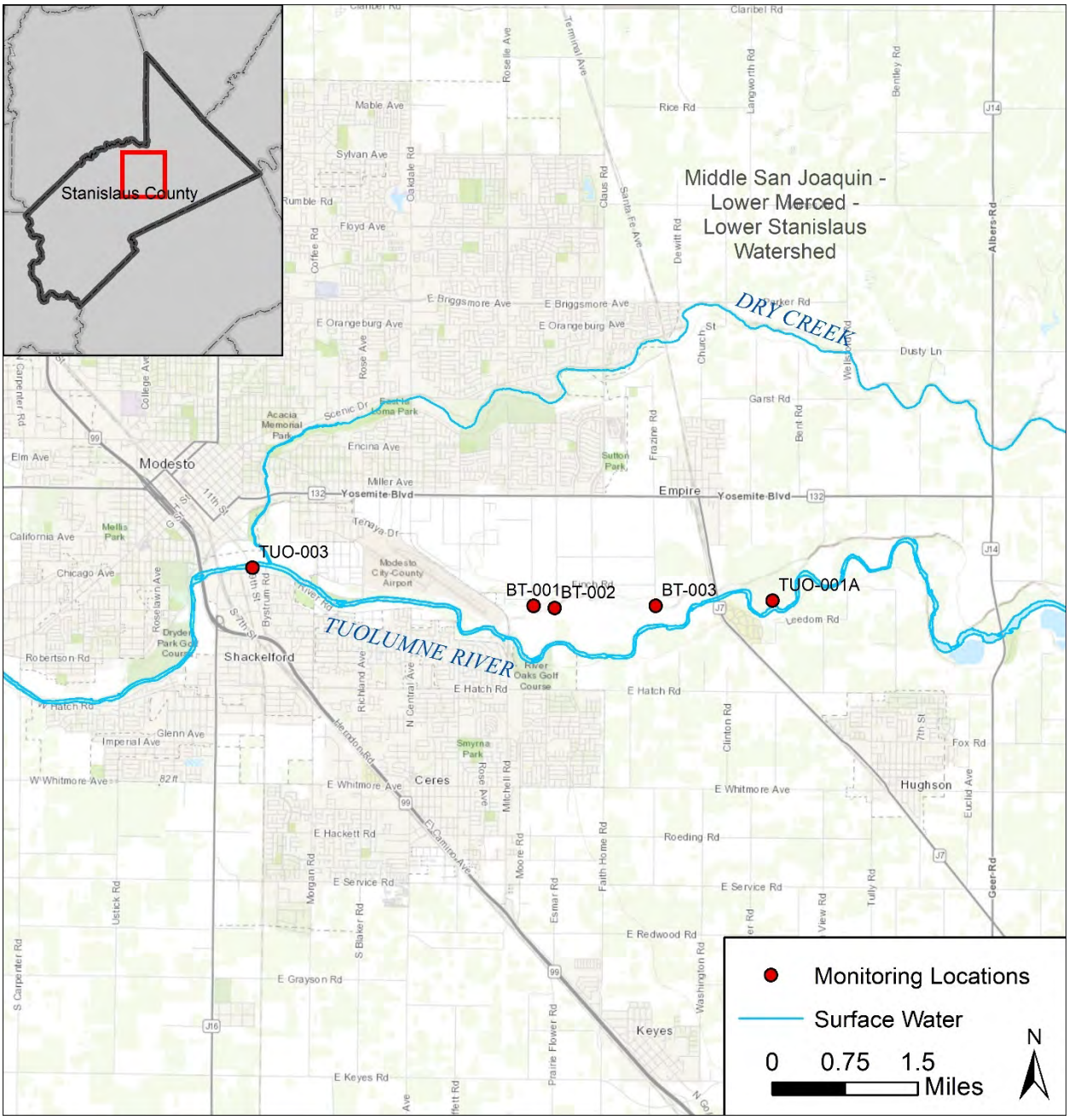


Figure 4-4. Monitoring Locations - South

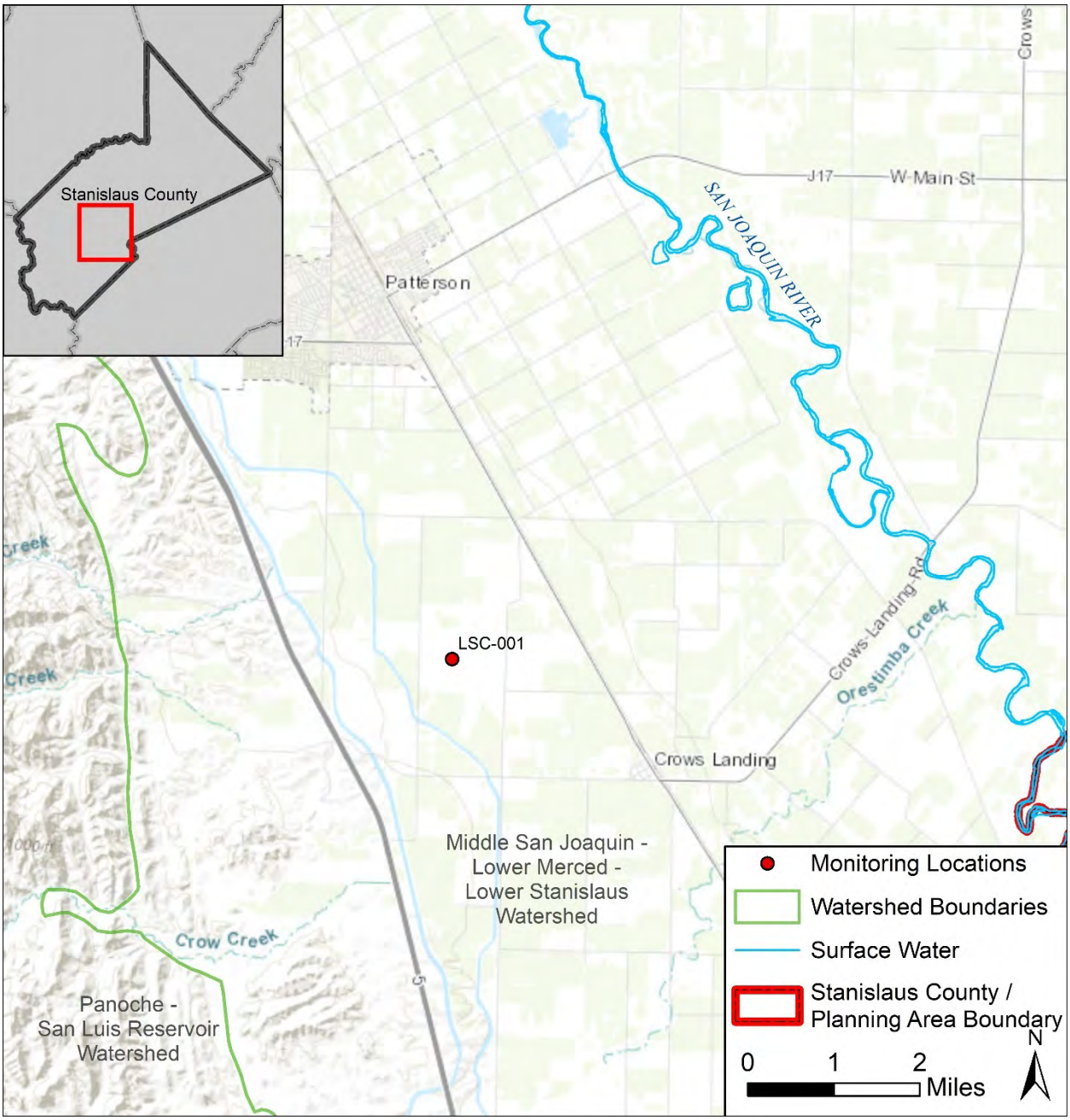
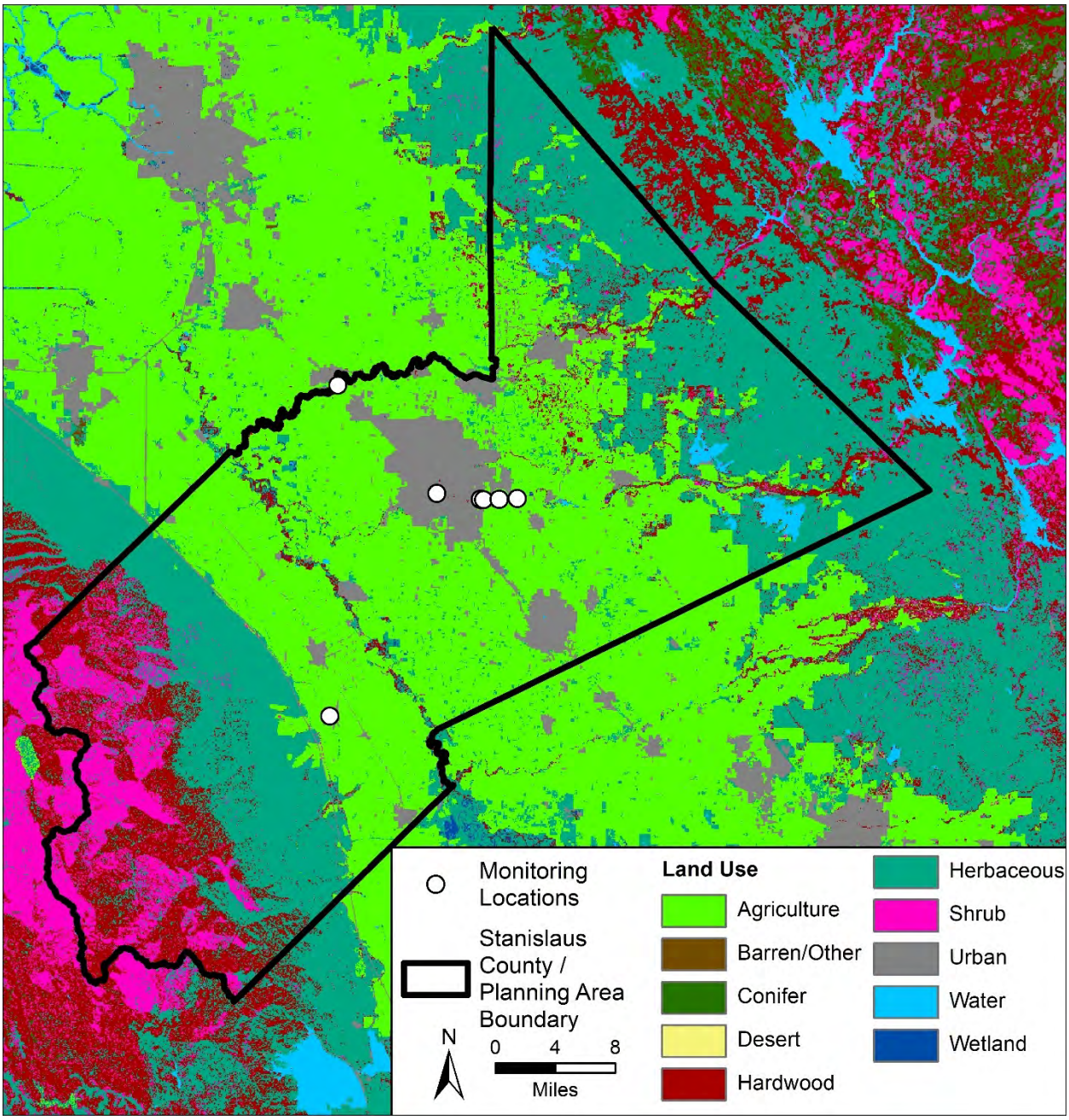


Figure 4-5. Land Use and Monitoring Locations



4.4 Sampling Team

Sampling teams will be composed of two O'Dell Engineering personnel that will collect samples, measure field parameters, and take flow measurements at each site. There may be times when the conditions are safe enough to necessitate only one sampler per site for an event. This decision will be made by O'Dell Engineering personnel based on flows, antecedent precipitation, and sampling site characteristics. The O'Dell Engineering Sampling Team Leader provides project oversight and will also provide technical

assistance as needed. Field safety instructions shall be prepared by O'Dell Engineering and they are responsible for following all safety protocols.

4.5 Data Management and Reporting

Results obtained from both the field investigation parameters and laboratory data are to be validated for quality, accuracy, and completeness according to the guidelines set forth in the QAPP document. The data are then to be tabulated in a database format compliant with the SWAMP program, saved, and maintained by Stanislaus County designated personnel. Results of these reports will be provided as described in the contractual agreement with the State (SWRCB Agreement # D1612618).

5 References

California Regional Water Quality Control Board, Central Valley Region. 2014. Resolution R5-2014-0041. *Amendment to the Water Quality Control Plan or the Sacrament River and San Joaquin River Basins for the Control of Diazinon and Clorpyrifos Discharges.* March, 2014.

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Modesto, City of. 2009. Storm Water Management Plan (SWMP). August 2009

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State Water Resources Control Board, Central Valley Region. RWQCB Order No. R5-2015-0025 NPDES No. CAS083526. Waste Discharge Requirements, City of Modesto Storm Water Discharge Municipal Separate Storm Sewer System.

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APPENDIX B

Alpha Analytical Laboratories

Quality Manual

Alpha Analytical Laboratories Inc.

QUALITY ASSURANCE PLAN
Alpha Analytical Laboratories, Inc.

208 Mason Street, Ukiah, CA 95482
Phone: 707-468-0401
Fax: 707-468-5267
www.alpha-labs.com

ELAP Certificate# 1551

Revised July 2016

Reviewed by:

Title	Name	Signature and Date
Owner, President	Robbie C. Phillips	7-18-16
Inorganics Section Manager	James Shoberg	8/3/16
Organics Section Manager	Laura Williams	9-13-16
~~Director~~, Wet Chemistry, Microbiology, and Toxicity Sections Manager	Zee Hopper	9-2-16
Quality Manager	Cheryl Watson	9.13.16

dw 8.8.16

1. Introduction and Objectives

The purpose of the Alpha Analytical Quality Assurance/Quality Control (QA/QC) Plan is to establish and maintain laboratory practices that insure the scientific reliability and the legal defensibility of our data. This document is revised annually.

1.1 Specific Objectives

1. The primary objective of the QA/QC plan is to set a level of quality for each laboratory section and to insure that each section meets that level.

2. The QA/QC plan is designed to assist in the early recognition of deficiencies that might affect the quality of data submitted to clients.

1.2 QA/QC Components

1. ***Employee Training***
   Alpha Analytical Laboratory personnel are instructed by experienced Alpha employees under the direction of the section manager, or by the section manager directly. They are given copies of relevant methods and standard operating procedures (SOPs) with follow-up discussion of contents. Analysts must demonstrate method proficiency prior to unsupervised analysis of client samples and this proficiency documented.

2. ***Internal Quality Control***
   Quality control is practiced on all aspects of sampling, analytical systems, equipment, and data. In all cases, protocols for corrective action have been set up in case limits are not met. Specific measures are described in this document.

3. ***Performance Audits***
   Alpha Analytical participates in annual proficiency testing for drinking water, wastewater, hazardous waste, and underground storage tank analyses as mandated by the State Water Resources Control Board Environmental Laboratory Accreditation Program.

2. Organization and Responsibilties

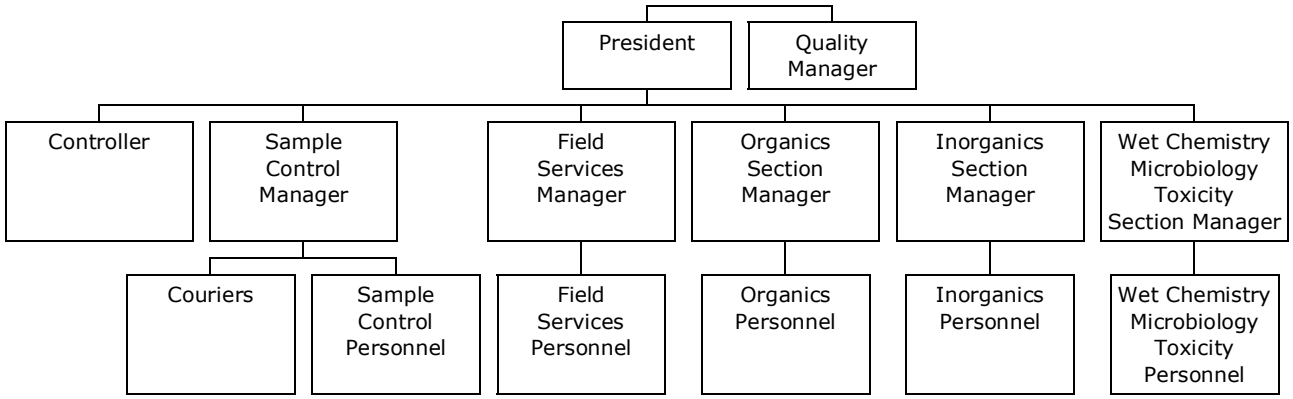


Figure 1
QA/QC Organizational Chart for Alpha Analytical Laboratories

2.1 Organization

Figure 1 represents the QA/QC organizational structure of Alpha. The Sample Control Manager is assisted by seven employees. In addition, the Sample Control Manager schedules a fleet of seven couriers. The field services department provides sampling and sample pick up. The department is staffed by two employees in addition to the manager. Field personnel and couriers maintain responsibility for samples in their custody until they are released to the laboratory. The analytical laboratory is divided into three sections: wet chemistry, inorganics, and organics. Each group has a manager who is responsible for the section's quality control. The organics section employs four analysts in addition to the manager, as well as four technicians. The inorganics manager oversees three analysts and two technicians. The wet chemistry section includes microbiology and toxicity. This section employs two analysts and nine technicians. QA/QC responsibilities of personnel are outlined below. In addition, employees are trained in and expected to perform their duties in accordance with Alpha's ethics and data integrity policy. See Attachment A.

2.2 Responsibilities

A. The President Will:

1. Provide support to Section Managers.

2. Approve resources necessary to do the work.

B. The Quality Manager Will:

1. Have general knowledge of the analytical tests the laboratory performs.

2. Report directly to management and put a hold on any data or analysis for which quality control measures are compromised.

3. Review and revise QA/QC procedures as necessary. This includes review and approval of changes or new procedures, and annual review of the QA plan.

2. Organization and Responsibilties

4. Coordinate participation in annual performance evaluation studies required to maintain certification and review results with Section Managers and the Laboratory Director.

5. Review and approve initial demonstration of proficiency of new analyses and analysts.

6. Act as a liaison for exchange and release of QA/QC information.

7. Periodically review data packages for correctness and completeness of QA/QC.

8. Act as a liaison between client and lab in technical and QC issues.

9. Maintain an awareness of the laboratory and client feedback sufficient to continually improve quality.

C. The Section Managers Will:

1. Advise the QAQC Officer on quality assurance practices.

2. Provide direction to the analysts and technicians in the section.

3. Define experience, skills, and education requirements for positions in their department.

4. Review all data and quality control generated in his or her department.

5. Work with the QA/QC officer to insure the effective implementation of quality control.

6. Be responsible for resolving any out-of-control event in the section and assure that data generated while the system is out-of-control is flagged or reanalyzed.

7. Maintain an awareness of the entire section to detect any situation which could compromise the safety of any employee.

8. Be responsible for keeping instrumentation in working order, and for documenting instrument problems and corrective action taken.

9. Ensure that department personnel have completed demonstrations of capability.

10. Keep personnel training current.

D. Field Sampling Personnel Will:

1. Be trained and certified in proper sampling, testing, and hazardous materials techniques.

2. Maintain, in ink, complete and accurate chain of custody records and field log books.

3. Insure that samples are properly preserved, packaged and transported.

2. Organization and Responsibilties

E. Sample Control Personnel Will:

1. Check sample conditions and notify the client of any problems.
2. Accurately enter chain of custody information into the laboratory information management system (LIMS).
3. Properly label samples with LIMS sample numbers.
4. Be responsible for sending samples to proper subcontractor labs when necessary.
5. Release samples to the appropriate section for analysis.
6. Prepare and review client reports.
7. Upload client data as requested to meet regulatory and database requirements.

F. Technical Personnel will:

1. Be trained for all procedures and analyses they run.
2. Maintain a record of all work, including quality assurance data.
3. Know the criteria for out-of-control events, alert the Section Manager when they occur, and attempt to resolve them.
4. Reanalyze or flag data generated during an out-of control situation.
5. Perform and document routine preventive maintenance on the instruments he or she uses.
6. Inform the section manager of any instrument problem, and document the problem and any corrective action taken.
7. Work safely in accordance with the safety regulations specified in the laboratory Safety Policy.

3. Sampling and Sample Management

Sample management QA/QC addresses sampling techniques, the maintenance of a secure chain of custody, and sample handling from collection to disposal. Alpha's sampling and sample handling protocols are established using the specifications given in the method appropriate to each analysis. References for these methods are in Section 4.1.

3.1 Collection of Samples

1. The sampling objective is to obtain samples which represent the matrix being tested. Trace levels of contaminants from external sources must be eliminated through the use of good sampling techniques and clean sample containers.

2. Field samples are uniquely identified by client, site, date and time sampled, and identifications provided by site maps. Soil samples may be further identified by borehole depth. See Attachment B for sample field sheet.

3. Trip blanks for volatiles analysis sampling are determined to be free of contamination before leaving the lab.

4. The specific sampling procedures required by each method are described in Field Services SOPs. The Field Services Manager instructs samplers in each sampling technique.

5. Samplers maintain a field log, in ink, of sampling date, time, location, sample type, and any unusual details with regard to the job. Sample containers will be marked to indicate sampling date, time, and location. Samplers will also begin a chain of custody record for each sample. See Attachment C for sample chain of custody.

3.2 Handling of Samples

1. Samples received at the counter are checked for:

   A. Temperature ≤6 deg C
   B. Container labels matching chain of custody
   C. Completeness of chain of custody
   D. Proper containers
   E. Proper preservation labels
   F. No headspace in volatiles containers.

2. When samples are picked up by our couriers, the courier will:

   A. Check that samples and chain of custody agree
   B. Sign and date the chain of custody receiving the samples
   C. Check and record cooler temperature upon returning to Alpha
   D. Sign and date the chain of custody relinquishing the samples to Alpha
   E. If samples are received after hours, sign the chain of custody receiving the samples for Alpha

3. When samples are received from delivery services, shipping personnel will:

   A. Check and record cooler temperature
   B. Bring the cooler to the office to complete the chain of custody requirements

3. Sampling and Sample Management

4. The client is notified if samples do not meet acceptance criteria. Abnormalities are documented, as is all correspondence with the client. If the client decides to proceed with analysis, notes are made on the chain of custody which is included with the final report.

5. Samples sent for subcontracting will be:

   A. Accompanied by a signed chain of custody
   B. Carefully packed with adequate ice
   C. Shipped overnight on Monday through Thursdays only

3.3 Sample Containers

1. Sample containers, and the cleaning and preparation of such containers will be in accordance with the specifications given in the appropriate analytical methods. Sample containers, preservation and holding times are listed in Attachment D.

2. VOA vials and coliform bottles are purchased pre-preserved in several case lots. Containers from each lot are analyzed for contamination before being distributed to clients. Records of these analyses are logged into the LIMS.

3. Precleaned containers are certified by the manufacturer to be free of contaminants

3.4 Preservation of Samples

1. To prevent or retard the degradation and modification of analytes in samples during transit and storage, the samples are preserved and stored as outlined in the appropriate analytical method or as promulgated in the Federal Register.

2. Sample preservatives are analyzed and determined to be free of contamination before use in samples.

3. Sample preservation requirements are posted in the LIMS, and in this document.

4. Samples are checked for proper preservation at the prep bench. Results are recorded and the client notified when requirements are not met.

3.5 Sample Management

1. ***Laboratory Numbers*** - Sample Control Personnel will assign LIMS generated internal laboratory identification numbers to all incoming samples. Unique laboratory numbers are assigned to each sample by date, chain of custody batch, and chain of custody order. For example, sample 16A0010-03 refers to the third listed sample on the tenth chain of custody logged in January 2016.

2 ***Sample Retention*** - Samples will be retained for 30 days from receipt unless other arrangements are made.

2. ***Sample Storage*** – Samples are stored in the laboratory walk-in refrigerator until all analyses are complete, with the following exceptions.

   A. Drinking water samples for HPLC, haloacetic acids, and volatiles analyses are stored in designated drinking water refrigerators.

3. Sampling and Sample Management

B. Wastewater samples for volatiles analysis are stored in a designated wastewater refrigerator.

C. Solid samples for volatiles analysis are stored in a designated soils refrigerator.

Samples and extracts are secured under lock and key at the end of each day. Cold storage areas are monitored daily. Acceptable ranges are ≤6°C for refrigerators and ≤0°C for freezers. Once analyses are complete, any remaining sample is removed to ambient storage until disposal.

4. ***Sample Tracking*** - Sample tracking is accomplished through the LIMS. Sample status is checked throughout the day by appropriate personnel to determine hold times, due dates, and reportability of samples.

5. ***Sample and Hazardous Waste Disposal*** - Laboratory waste is collected and held in our hazardous waste storage facility. Hazardous waste is stored in DOT approved containers and commercially disposed of by a California certified waste disposal company as mandated by the California Code of Regulations Title 22.

6. ***Compliance With Local Regulations*** - Local city and county regulations pertaining to waste disposal and environmental pollution are strictly adhered to.

4. Analysis and Calibration

4.1 Analytical Methods

1. An analytical method is a series of procedures or steps that must be performed to estimate the quantity of analyte in a sample

2. Standard and accepted methods are used for each analysis. The methods used are drawn from:

   A. *Federal Register* 40 CFR Parts 136, 260, 423, 430, and 435: Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; Analysis and Sampling Procedures; USEPA May 18, 2012

   B. *California Code of Regulations* Title 22, Division 4.5, Chapter 11

   C. *Analytical Methods Approved for Drinking Water Compliance Monitoring of Organic Contaminants;* USEPA, January 2014

   D. *Analytical Methods Approved for Drinking Water Compliance Monitoring of Inorganic Contaminants and Other Inorganic Constituents;* USEPA, December 2009

   E. *Analytical Methods Approved for Drinking Water Compliance Monitoring of Radionuclides;* USEPA, June 2008

   F. *Analytical Methods Approved for Drinking Water Compliance Monitoring Under the Total Coliform Rule;* USEPA, June 2008

   G. *Analytical Methods Approved for Drinking Water Compliance Monitoring Under the Disinfection Byproducts Rule;* USEPA, January 2014

   H. *Analytical Methods Approved for Drinking Water Compliance Monitoring Under the Enhanced Surface Water Treatment Rule;* USEPA, December 2009

   I. *Leaking Underground Fuel Tank Field Manual: Guidelines for Site Assessment, Cleanup, and Underground Storage Tank Closure;* October 1989.

3. ***Standard Operating Procedures*** - SOPs are a step by step listing of procedures used by Alpha to accomplish an analysis. SOPs contain a summary of the method, interferences, instrument parameters, reagents, standards, preservation and special handling, procedure, quality control, calculations, method performance, general maintenance, safety and references. SOPs are continuously reviewed and modified as necessary. Attachment E is a list of current SOPs.

4.2 Method Detection and Practical Quantitation Limits (MDLs and PQLs)

1. An 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. MDLs are method and matrix specific. MDL studies are performed following the EPA procedure in 40 CFR Appendix B to Part 136 “Definition and Procedure for the Determination of the Method Detection Limit - Revision 1.11". This method consists of processing at least seven replicate method standards, generally spiked at three to five times the expected MDL, through the entire analytical method. The MDL is calculated by multiplying the standard deviation by the applicable t value of

4. Analysis and Calibration

3.143. MDLs must always be less than or equal to the laboratory PQL. MDL studies are on file for accredited analytes and methods.

2. MDLs are verified annually. A known clean matrix is spiked at one to three times the detection limit (four for multi-analyte analyses), then prepared and analyzed as a routine sample. The MDL is verified if the analyte is detected.

3. A PQL is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. For methods employing a calibration curve, the PQL must be at or above the lowest calibration point. Sample PQLs are highly matrix dependent.

4. Nominal PQLs for analytes and methods are listed in Attachment F: Practical Quantitation Limits.

5. PQLs are verified annually. A known clean matrix is spiked at one to two times the PQL, then prepared and analyzed as a routine sample. The PQL is verified if analyte recovery is 50 to 100%.

4.3 Calibration

All calibration standards and second source analytes are mixed from pure standard materials or obtained as certified solutions. Lot numbers, dates, and suppliers of analytical standards are recorded in the LIMS. Calibration procedures for specific instruments are described below. Major analytical instruments are listed in Attachment E.

1. ***Gas Chromatographs (GC) and GC Mass Spectrometers (GCMS)***
GC and GCMS analyses are performed using either internal or external standard calibration. Calibration curves are generated from three to six concentration levels of standards, with the lowest standard at or below the reporting limit. A second source calibration verification is prepared when required by the method. Calibration curves, second source calibration verification checks, daily calibration checks, and continuing calibration checks must be within method defined limits for analysis to proceed. GCs and GCMSs are recalibrated when the daily calibration check fails.

2. **High Performance Liquid Chromatographs (HPLC)**
The HPLC uses external or internal calibration with five standards, with the lowest standard at or below the reporting limit. Daily calibration checks must be within 20% of the expected response. HPLCs are recalibrated when the daily calibration check fails.

3. **Inductively Coupled Plasma (ICP)**
The ICP atomic emission spectrometer is calibrated daily with a blank and high-level standard. The standard and blank are rerun immediately after calibration. The standard must be within 5% of the expected value and the blank below the PQL for analysis to proceed. A mid-range standard prepared from a separate source is analyzed. Response must be within 10% of the expected value for analysis to proceed. The calibration is verified every ten runs and must respond within 10% of the expected value. An ICP Interference Check Standard is run at the beginning and end of each day's batch.

4. **Inductively Coupled Plasma/Mass Spectrometer (ICPMS)**
The ICPMS is calibrated daily. An initial calibration blank and verification (ICB and ICV) are analyzed immediately after calibration. The ICB must be $\leq$2.2 times the method detection limit and the ICV within 10% of the expected value for analysis to proceed. A continuing calibration blank

4. Analysis and Calibration

and verification (CCB and CCV) are analyzed every ten runs and have the same requirements as the ICB and ICV.

5. Spectrophotometers

Spectrophotometers are calibrated daily, using a blank and two to five calibration standards. Correlation coefficient must be 0.995 or higher. The calibration is verified every ten readings and at the end of each run with a blank and mid-level standard. Response must be ±10% of expected. Spectrophotometer wavelengths are verified yearly against traceable standards.

6. pH Meters

pH meters are calibrated daily, using buffer solutions of pH 4, pH 7, and pH 10. A QC check at pH 6.86 is analyzed daily and must be within 0.05 pH units of the expected value.

7 Ion Chromatograph (IC)

A three to five point calibration curve with a correlation coefficient ≥0.995 and a second source calibration verification within 10% of the expected value are needed to begin IC analysis. Analyte response in the initial and final calibration checks must be within method defined limits. Continuing calibration checks and blanks are run every ten samples and at the end of the run. Instrument response must be within method defined limits.

8. Miscellaneous Equipment

The Section Managers ensure the daily monitoring of temperatures of all refrigerators, freezers, incubators, and water baths. Daily calibration checks are performed on analytical balances using S1 weights, with yearly maintenance and calibration by Wine Country Balance. Thermometers are checked yearly against NIST-certified thermometers and correction factors affixed. Balance and temperature logs are maintained daily. Mechanical pipets are checked quarterly.

4.4 Confirmation

All single peak analytes detected by gas chromatography are confirmed on a second column.

4.5 Preventive Maintenance

Preventive maintenance schedules are maintained for all major instrumentation.

5. Internal Quality Control

Internal quality control provides the guidelines to assess and ensure the quality of all data produced. Background, accuracy, and precision limits are established by applying EPA method acceptance criteria and laboratory generated standards of acceptability. Where criteria are not available, EPA suggested control limits may be used until sufficient data is in place. In addition, internal quality control includes a program for corrective action when control limits are exceeded.

5.1 Blanks

1. A method blank is processed through the same preparation and analytical procedures as client samples. Method blanks are matrix specific: separate reagent blanks must be prepared for soil and water samples. Before processing any sample, the analyst will demonstrate through the analysis of a method blank that interferences from the system, glassware and reagents are under control. At least one method blank is analyzed per preparation batch, or as required by the analytical method. Method blanks are not applicable for some methods, such as pH, conductivity, and ignitability.

2. Trip blanks are provided at client request. A trip blank is a VOA sample vial filled in the volatiles laboratory with reagent water. It accompanies sample vials to the sampling site and is subjected to the same ambient conditions as the samples. Trip blanks are prepared only for volatiles analysis and are used to check for possible contamination during sampling, transport, and storage.

3. Field blanks can provide an indication of possible interferences introduced in the field. They are sampled and analyzed at client request.

5.2 Laboratory Control Samples

1. A laboratory control sample (LCS) is a representative, clean matrix spiked with the analytes of interest for the analysis. The LCS is spiked at a concentration within the system's calibration range.

2. An LCS is prepared with each analytical batch of up to twenty samples, or as required by the method. If the LCS result for any analyte is not within established control limits, the system performance is unacceptable for that analyte, with the following exception: if the recovery exceeds the upper acceptance limits of the method, results for samples without detections may be qualified and reported. Otherwise, the source of contamination must be found and corrected and the associated samples reanalyzed or the results reported with a qualifier.

5.3 Matrix Spike/Matrix Spike Duplicates

1. Matrix spike and matrix spike duplicate (MS/MSD) are prepared from client samples representative of the matrix under analysis. The MS/MSD are spiked at a concentration within the system's calibration range. If adequate client sample is unavailable, a duplicate LCS is prepared.

2. An MS/MSD is analyzed each twenty samples, or as required by the method. If the MS/MSD results are out of control, acceptable LCS results assure that the system is in control, and the former results are generally considered to be due to matrix effects and results qualified.

5.3 Sample Duplicates

5. Internal Quality Control

1. Sample duplicate analyses are performed when a method is not amenable to spiking, or when a method specifically requires the analysis of unspiked duplicates. The former includes dissolved oxygen, alkalinity, pH, and turbidity analyses. Sample duplicates provide matrix specific information on sample homogeneity and laboratory precision.

5.4 Surrogates

1. Surrogates are chemicals similar to the compounds of interest in a particular analysis, but not usually found in samples. In methods which require their use, they are added to all blanks, calibration standards, samples, and spikes.

2. If method blank or LCS surrogate recovery is out of control, samples generally may not be analyzed until the source of the problem is determined and corrected. If sample surrogate recovery is out of control, the sample is re-prepared and reanalyzed if more is available. If the second analysis is also out of control, or if no more sample is available, the appropriate out-of-control surrogate recovery flag is added to the data.

5.5 Control Limits

1. Accuracy is defined as the degree to which the analytical measurement reflects the true concentration of the analyte present in the sample. Unless accuracy requirements are provided by the method, control limits are established using the results from at least 20 spike recoveries. The mean and standard deviation (s) of the recoveries are calculated and control limits are given by the mean $\pm$ 3s. The same procedure is used to set control limits for surrogates.

2. Precision is defined as the degree of agreement between separate measurements of the same analyte in the same sample. Precision control limits are established using the results from at least 15 pairs of MS/MSD, sample duplicates, or duplicate LCSs. The average relative percent difference (RPD) and standard deviation (s) of the duplicates are calculated and a control limit given by the RPD $\pm$ 3s.

3. Until the analyst has run enough analyses to generate control limits based on spike recoveries and RPD, the limits used to determine whether or not an analytical system is in control are those given by the method. If no such limits are recommended, spike recovery of 70-130% and RPD between duplicate samples or spikes of 20% or less is generally expected.

4. When a control limit is exceeded, the LIMS red-flags the failed analyte. The problem must be addressed before data can be reviewed. See 5.7 Corrective Action Procedures below.

5.6 Control Charts

Control charts are created by the LIMS and used to monitor the variations in accuracy or precision of routine analyses and can detect trends in these variations. Accuracy control charts are constructed from spike recovery concentrations expressed as a percent of the spiked values. Precision control charts are constructed from the RPD between recovery values for duplicate samples or duplicate spiked samples.

5.7 Corrective Action Procedures

5. Internal Quality Control

1. Whenever a system is determined to be out of control, corrective steps are taken to bring the system back under control. Corrective actions may involve preparation of fresh standards or reagents, instrument repair, re-analysis, re-extraction, matrix modifications, and dilutions.

2. Analyses will not continue until the system is determined to be under control.

3. Corrective actions can be initiated at several operational levels. First the situation is assessed and appropriate action is taken to correct the situation. The seriousness of the problem will dictate whether corrective actions will be taken at the laboratory personnel level, the department level, or involve the entire laboratory.

6. Data Reduction, Validation, and Reporting

6.1 Laboratory Notebooks

When an instrument generated record is not created, data will be entered directly, in ink, into a permanently bound notebook or pre-printed worksheet. The date, method, QC, and sample results will be noted with each analysis, along with any calculations. Errors will be crossed out with a single line, initialed and dated.

6.2 Validation and Reporting of Data

1. The analyst will enter results into the LIMS in the appropriate units, either manually or directly from the analytical instrument, along with initials, instrument, and preparation and analysis dates. Preparation data and, in some cases, analytical data is entered into the appropriate laboratory notebook.

2. The Section or Quality Managers will review all QC results and corrective action procedures prior to sending data to Sample Control for reporting. Such approval will be indicated by setting analytical results to "Reviewed" in the LIMS.

3. Sample Control Personnel will generate final written reports.

4. Validation of the final report by approved Laboratory Control Personnel will consist of seeing that the following requirements are met:

    a) Sample receiving, extraction and holding times, and batch QA/QC requirements must be met or flagged.

    b) Printed analytical results will contain samples associated with a unique lab number, analytical results, concentration units, methods used, and PQLs.

    c) Final, validated analytical results shall be accompanied by the appropriate Chain-Of-Custody documents, and a batch specific QA/QC report if requested.

6.3 Backing Up and Archiving LIMS Data

The file server containing all LIMS data is backed up at the end of every business day to a dedicated in-house and an offsite hard drive. All written reports, lab sheets and other related paper are stored for at least five years.

6.4 Quality Control Reports

Quality control reports will be issued upon client request and will consist of a separate batch specific report with method blank, duplicate, laboratory control samples (blank spikes), and/or matrix spike results. The method blank is reported in the same units of concentration as the matrix or "ND". Spike results are reported in the same units of concentration as the matrix and as percent recoveries of the analytes. The relative percent difference (RPD) is reported to indicate precision in terms of the difference between percent recoveries of duplicates and duplicate spikes.

7. Safety

Our company will, at all times and at every level of management and supervision, attempt to provide and maintain a safe working environment for all of our employees. In addition, all safety policies will be prevention oriented in the hope that all preventable accidents can and will be avoided. The company will also make every effort to stimulate employee participation in the program so that safety maintenance methods may be used most effectively. This should help eliminate any possible repetition of accidents.

7.1 Policy Goals

1. To provide and maintain an injury free working environment.

2. To solve safety problems through prevention and investigation.

3. To promote safety consciousness of both management and employees through education and mutual participation.

4. To reduce injury related absenteeism when the problem exists.

5. To establish the best line of communication between management and employees in all safety areas.

6. To use authority to decrease safety violations.

7.2 Organization

The Safety Committee meets quarterly to discuss safety concerns and policy and to make recommendations to management. The committee is comprised of non-supervisorial employees from each laboratory section. The committee will be co-chaired by the Chemical Hygiene Officer and one of the company owners.

7.3 Chemical Hygiene Plan

The complete Safety Policy and Chemical Hygiene Plan is on file with the Chemical Hygiene Officer.

7.4 Emergency Action Plan

The Emergency Action Plan - for an explosion, fire, or other emergency requiring immediate evacuation is on file with the Chemical Hygiene Officer.

7.5 Material Safety Data Sheets (MSDSs)

MSDSs for all chemicals used in the organics section are located in the GC room. Additional MSDSs are located in the Conference Room.

7.6 Safety Training

Safety training is provided to employees when hired and in yearly refresher courses.

8. Attachments

Attachment A
Ethics and Integrity Policy and Data Integrity Agreement

1.1 Alpha Analytical Laboratories Ethics and Data Integrity Agreement

Introduction and Policy

This information is in support of our policy of data integrity and business ethics at Alpha Analytical Laboratories. This accompanies our Ethics and Integrity Agreement which all lab employees must understand and agree to as part of working at Alpha Analytical Laboratories.

Alpha Analytical Laboratories' clients use our analyses for numerous purposes. Most of those purposes include some type of regulatory compliance. Some results are used to determine cleanup of various waste sites. It is therefore of utmost importance that we are ethical in all of our dealings with our clients and in carrying out and reporting the results of the analysis we perform. Unethical behavior includes falsifying records, reporting data values that are not the actual values obtained, reporting dates and times of analysis that are not correct, and any intentional misrepresentation of the data or reporting of the data. Lab fraud involves any of the above unethical behaviors, and is characterized by intent to deceive. We want to never authorize, approve, accept, or imply an acceptance of any behavior or practice that includes intent to deceive.

If a hold time is missed, record that accurately. If a laboratory control sample fails, record that accurately. Etc.

Violations of this standard are subject to corrective action up to and including termination from the company. If an act or series of actions are believed to be errors, or misunderstandings, further training and clarification will be provided, and communicated among the employees of the area. Employees convicted of laboratory fraud may be individually subject to criminal and civil penalties.

8. Attachments

Attachment A
Ethics and Integrity Policy and Data Integrity Agreement

1.1 Alpha Analytical Laboratories Ethics and Data Integrity Agreement (cont)

1.1.1 I understand the high standards of integrity required of me with regard to the duties I perform and the data I report in connection with my employment at Alpha Analytical Laboratories.

1.1.2 I agree that in the performance of my duties at Alpha Analytical Laboratories, I shall not intentionally report data values that are not the actual values obtained;

a. I shall not intentionally report dates and times of data analyses that are not actual dates and times of analyses, and

b. I shall not intentionally represent another individual's work as my own.

1.1.3 I agree to inform Alpha Analytical Laboratories of any accidental reporting of non-authentic data by myself in a timely manner.

1.1.4 I agree to inform Alpha Analytical Laboratories of any accidental or intentional reporting of non-authentic reporting by other employees.

1.1.5 I agree to not promote, engage in, or condone any practice that is intended to deceive my co-workers or Alpha Analytical Laboratories' clients with regard to the quality of data produced or reported.

_____
(Printed Name)

_____
(Signature)

_____
(Date)

8. Attachments

Attachment B
Field Sheet

Alpha Analytical Laboratories, Inc.

208 Mason Street, Ukiah, CA 95482
707-468-0401

MONITORING WELL AND STREAM FIELD SHEET

Date: _____
Client: _____
Site: _____

Well # & inside diameter: _____
Depth of Well: _____
Depth to Water: _____
Water Column Height: _____
One Well Vol: _____
Product Depth: _____

DETERMINING VOLUME OF WELL:
V = H X D(Squared) X 0.041

V = one well volume (gallons)
H = height of water column (feet)
D = inside diameter of well (inches)

Stream Comments
(Running condition, Turbid, Foam, Etc.)

_____
_____
_____

NOTE: Collect Turbidity, EC, Temp, and pH initially and after every well volume.

TIME	Temp	pH	EC	Turb.	D.O.	O.R.P	Comments* (Color, Odor, Exceptions)

Sample time: _____

* Sample when EC and T have stabilized, and at least 3-5 well volumes have been purged. If well is purged to dryness before 3-5 volumes are purged and well is very slow to recover, sample will be drawn as soon as well has recovered sufficiently.

Name: _____
Signature

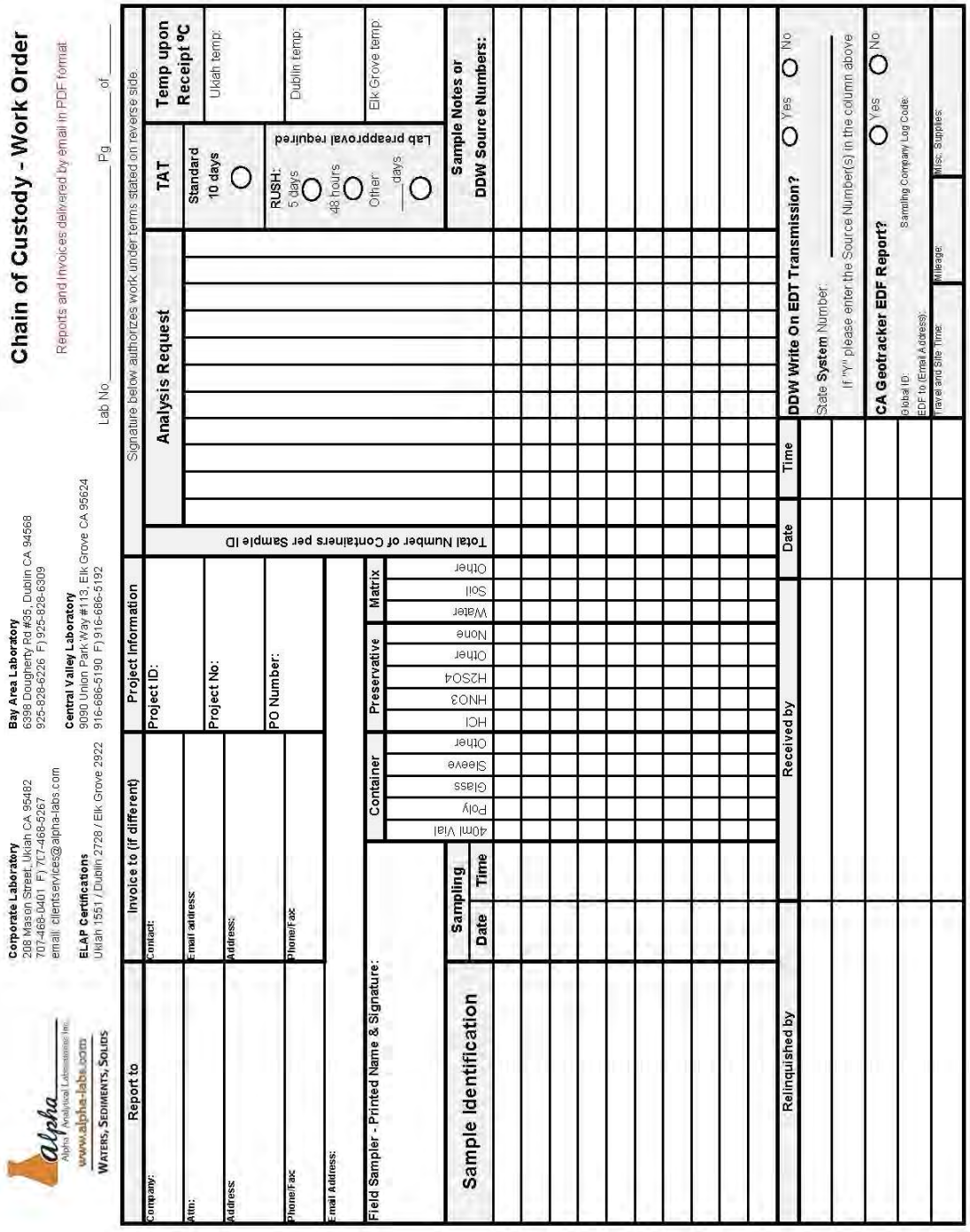
Printed: _____
First Last

Reviewed/Approved: _____
Rob Phillips

w:\Everyone\AA Office forms\Monitoring Well Field Sheets

8. Attachments

Attachment C
Chain of Custody



8. Attachments

Attachment D
Sample Containers, Preservation, and Holding Times

Microbiological Analyses

Sample containers contain 15-30mg sodium thiosulfate ($Na_2S_2O_3$), which is sufficient to neutralize 10-90mg/L residual chlorine. TCFC = total coliform/fecal coliform.

Analysis	Method	Container[1]	Holding Time
Coliform: Presence/absence in finished drinking water	SM9223	100ml sterile P	30 hours
Coliform: Total and fecal coliform in source, recreational, and waste water.	SM9221	100ml sterile P	8 hours
Coliform: Total coliform and e. coli in source, recreational, and waste water	SM9223	100ml sterile P	8 hours
Enterococci	SM9230B Enterolert	100ml sterile P	8 hours
Fecal Streptococci	SM9230B	100ml sterile P	8 hours
Heterotrophic Plate Count	SM9215B Simplate	100ml sterile P	8 hours

Whole Effluent Toxicity of Wastewater

Analysis	Method	Container[1]	Preservation	Holding Time
Freshwater Static Acute: Rainbow Trout	FISH	2 x 2.5gal Cubitainer	≤6°C	36 hours

Toxicity Bioassay of Hazardous Waste

Analysis	Method	Container[1]	Preservation	Holding Time
LC-50 Aqueous: Fathead Minnow	CDFG	Pint P, G	≤6°C	Not specified
LC-50 Solid Waste: Fathead Minnow	CDFG	8 oz. jar	≤6°C	Not specified

Inorganic and Wet Chemistry: Aqueous Analyses

Analysis	Method	Container[1]	Preservation	Holding Time
Acidity	SM2310B	Pint P,G	≤6°C	14 days
Alkalinity	SM2320B	Pint P,G	≤6°C	14 days
Ammonia	SM4500-NH_3 B,C	Quart P,G	Dechlorinate with 80mg/L $Na_2S_2O_3$ if needed. ≤6°C, H_2SO_4 to pH <2	28 days
Bicarbonate	SM2320B	Pint P,G	≤6°C	14 days
BOD and CBOD	SM5210B	Quart P,G	≤6°C	48 hours
Bromate	EPA300.1	Pint P,G	50mg/L EDA	28 days
Bromide	EPA300.1	Pint P,G	None	28 days
Carbonate	SM2320B	Pint P,G	≤6°C	14 days
Carbon Dioxide, Free	SM4500-CO_2 B	See total dissolved solids; pH; and alkalinity		
Chloramines	SM4500-Cl F	Quart brown P,G	None	15 minutes
Chlorate	EPA300.1	Pint P,G	50mg/L EDA	28 days
Chloride	EPA300.0	Pint P,G	≤6°C	28 days
Chlorine, residual	SM4500-Cl F	Quart brown P,G	None	15 minutes
Chlorite	EPA300.1	1L brown poly	≤6°C, 50mg/L EDA	14 days

8. Attachments

Attachment D
Sample Containers, Preservation, and Holding Times

Inorganic and Wet Chemistry: Aqueous Analyses (cont.)				
Analysis	Method	Container[1]	Preservation	Holding Time
Chlorophyll	SM10200H	1L brown poly	≤6 °C	48 hours
COD	SM5220D	Pint P,G	≤6 °C, H2SO4 to pH <2	28 days
Color	SM2120B	Pint P,G	≤6 °C	48 hours
Conductivity	SM2510B	Pint P,G	≤6 °C	28 days
Corrosivity: Langelier Index	SM2330B	See alkalinity, hardness, pH, and total dissolved solids.		
Corrosivity: Aggressive Index	AWWA	See calcium, alkalinity, and pH.		
Cyanide, amenable	SM4500-CN G	Quart brown P,G	≤6°C, NaOH to pH >10	14 days
Cyanide, reactive	SW846 Ch.7, SW9014	Pint brown P,G	Cool and dark	Not specified
Cyanide, total	SM4500-CN E Lachat QuikChem	Quart brown P,G	≤6°C, NaOH to pH >10, reducing agent if oxidizer is present	14 days
Fluoride	EPA300.0	Pint P,G	None	28 days
Hardness	SM2340B EPA200.7	Pint P,G	HNO_3 to pH <2	6 months
Ignitability	SW1010	8oz amber glass	Unpreserved	Not specified
MBAS (surfactants)	SM5540C	Quart. P,G	≤6°C	48 hours
Nitrate (NO_3^-)	EPA300.0 SM4500-NO3 E	Pint P,G	≤6°C	48 hours
Nitrate + nitrite	SM4500-NO3 E	Pint. P,G	≤6°C, H_2SO_4 to pH <2	28 days
Nitrite (NO_2^-)	EPA300.0 SM4500-NO2 B	Pint P,G	≤6°C	48 hours
Nitrogen, inorganic	See ammonia, nitrate, and nitrite nitrogen.			
Nitrogen, Kjeldahl	SM4500-NH_{org} B	Quart P,G	≤6°C, H_2SO_4 to pH <2	28 days
Nitrogen, organic	See ammonia and Kjeldahl nitrogen.			
Nitrogen, total	See nitrate, nitrite, and Kjeldahl nitrogen.			
Odor	EPA140.1	8oz, glass only	≤6°C	24 hours
Oil and Grease	EPA1664A	2 x 1L amber glass w/ Teflon cap	≤6°C, HCl or H_2SO_4 to pH <2	28 days
Orthophosphate	EPA300.0 SM4500-P E	Pint P,G	≤6°C, filter within 15 min	48 hours
Oxygen, dissolved	SM4500-O G	BOD bottle, no headspace	None	15 minutes
Perchlorate	EPA314.0	Pint P,G	None	28 days
pH	SM4500-H+ B SW9040	Pint P,G	None	15 minutes
Phenolics	EPA420.1	1L glass only	≤6°C, H_2SO_4 to pH <2	28 days
Phosphorus, total	SM4500-P E	Pint P,G	≤6°C, H_2SO_4 to pH <2	28 days
Salinity	SM2510B	Pint P,G	≤6°C	28 days
Silica	SM4500-SiO_2 C	Pint, P only	≤6°C	28 days

8. Attachments

Attachment D
Sample Containers, Preservation, and Holding Times

Inorganic and Wet Chemistry: Aqueous Analyses (cont.)				
Analysis	Method	Container[1]	Preservation	Holding Time
Sodium adsorption ratio (SAR)	See metals.			
SAR, adjusted	See metals, bicarbonate, and conductivity.			
Solids, total dissolved (TDS)	SM2540C	1L P,G	≤6 C	7 days
Solids, total suspended (TSS)	SM2540D	1L P,G	≤6 C	7 days
Solids, settleable	SM2540F	1L P,G	≤6 C	48 hours
Solids, total	SM2540B	1L P,G	≤6 C	7 days
Solids, fixed and volatile	SM2540E	Pint P,G	≤6°C	7 days
Sulfate	EPA300.0	Pint P,G	≤6°C	28 days
Sulfide	SM4500-S F	Pint P,G	≤6°C, Zn acetate/NaOH to pH >9	7 days
Sulfide, reactive	SW846 Ch.7, SW9034	1L poly	Cool and dark	Not specified
Tannin and lignin	SM5550B	Pint P,G	Not specified	Not specified
Total or dissolved organic carbon (TOC/DOC)	SM5310C	2 x 40ml amber VOA vial, no headspace	≤6°C, H_3PO_4 to pH <2	28 days
Turbidity	SM2130B	Pint P,G	≤6°C	48 hours

Inorganic and Wet Chemistry: Soil and Solid Waste Analysis Samples are collected in 8oz jars and kept at ≤6 deg C. Samples for reactive cyanide or sulfide must be stored with no headspace and protected from light.		
Analysis	Method	Holding Time
Ammonia	SM4500-NH_3 C	Not specified
Chloride	EPA300.0	Not specified
Cyanide, total	SW9010B SW9014	14 days
Cyanide, reactive	SW846 Sect. 7.3	ASAP
Nitrate (NO_3)	EPA300.0	Not specified
Nitrite (NO_2)	EPA300.0	Not specified
Nitrogen, Kjeldahl	SM4500-NH_{org} B	Not specified
Oil & grease	SW9071A	Not specified
pH	SW9045C	ASAP
Solids, total, fixed and volatile	SM2540G	7 days
Sulfate	EPA300.0	Not specified
Sulfide, reactive	SW846 Ch.7, SW9034	ASAP

8. Attachments

Attachment D
Sample Containers, Preservation, and Holding Times

Metals: Aqueous Analysis				
Analysis	Method	Container[1]	Preservation	Holding Time
Metals, total except Cr(VI) and Hg	EPA200 Series EPA6010B	Quart P	HNO_3 to pH <2[2]	6 months
Metals, dissolved except Cr(VI) and Hg	EPA200 Series EPA6010B	Quart P	HNO_3 to pH <2, after filtering[2]	6 months
Hexavalent chromium (Cr(VI))	SW7196A	Pint P,G	≤6° C	24 hours
Hexavalent chromium (Cr(VI)) Drinking Water	EPA 218.6	Pint P,G	≤6° C , ammonium sulfate buffer	14 days
Hexavalent chromium (Cr(VI)) Waste Water	SM3500-Cr B EPA 218.6	Pint P,G	≤6° C , ammonium sulfate buffer, adjust pH to 9.5 -9.7 within 24 hrs	28 days
Mercury, total	EPA245.1 EPA 7470A	Pint P,G	HNO_3 to pH <2	28 days
Mercury, low level	EPA 1631E	Pint G	≤6° C	28 days[3]
Mercury, dissolved	EPA245.1 EPA 7470A	Pint P,G	HNO_3 to pH <2, after filtering	28 days
Mercury, methyl	EPA 1630	1L amber glass	≤6°C, HCl to pH<2 within 48 hr	180 days

Metals: Soil and Solid Waste Analysis				
Analysis	Method	Container	Preservation	Holding Time
Metals, except Cr(VI) and Hg	SW6010B	8oz. jar	None	6 months
Mercury, total	SW7471A	8oz. jar	≤6° C	28 days

TCLP Extractions SW1311 Analyses require an 8oz Teflon-capped jar, or a foil-capped brass or stainless steel cylinder of sample.		
Analysis	Holding time before leaching	Holding time after leaching
Metals, except Hg	180 days	180 days
Mercury	28 days	28 days
Volatile organics	14 days	14 days
Semi-volatile organics	14 days	7 days

Extraction Tests for Hazardous Waste Analyses require an 8oz Teflon-capped jar, or a foil-capped brass or stainless steel cylinder of sample.		
Extraction	Holding time before extraction	Holding time after extraction
WET Extraction (Title 22)	Not specified	See appropriate aqueous analysis

8. Attachments

Attachment D
Sample Containers, Preservation, and Holding Times

Organic Chemistry: Drinking Water Analyses

Samples with residual chlorine must be dechlorinated before preservation: 2 drops of 10% sodium thiosulfate solution (3mg sodium thiosulfate) per 40mL VOA vial for volatiles, 1mL (80mg)per liter for semivolatiles. All containers require Telfon lined caps or septa. Volatiles (VOA) vials must contain no headspace.

Analysis	Method	Container	Preservation	Holding Time
EDB/DBCP	EPA504.1	3 x 40ml VOA vials	≤6°C	14 days
N-, P - pesticides	EPA507	2 x 1L amber glass	≤6°C	14 days
Chlorinated pesticides/PCBs	EPA508	2 x 1L amber glass	≤6°C	7 days
Chlorinated acids	EPA515.1	2 x 1L amber glass	≤6°C. May be dechlorinated with 50mg/L sodium sulfite.	14 days
Trihalomethanes	EPA524.2	4 x 40ml VOA vials	≤6°C	14 days
Purgeable organic compounds	EPA524.2	4 x 40ml VOA vials	≤6°C, HCl to pH <2 after dechlorination[4]	14 days
Benzo(a)pyrene, DEHA, DEHP	EPA 525.2	2 x 1L amber glass	Dechlorinate with 50mg/L sodium sulfite, HCl to pH<2. ≤6°C	14 days
Carbamates	EPA531.1	125ml amber glass	≤6°C, 3.6ml MCAA[5] buffer	28 days
Glyphosate	EPA547	125ml amber glass	≤6°C	14 days
Endothall	EPA548.1	250ml amber glass	≤6°C	7 days
Diquat	EPA549.2	1L brown poly	≤6°C	7 days
Haloacetic acids	EPA552.2	250ml amber glass	≤6°C, 100mg/L ammonium chloride, no sodium thiosulfate	14 days

Organic Chemistry: Waste Water Analyses

Samples with residual chlorine must be dechlorinated before preservation: 2 drops of 10% sodium thiosulfate solution (10mg sodium thiosulfate)/ 40mL vial for volatiles, 1mL(80mg)/L for semivolatiles. Samples to be analyzed for purgeable non-aromatic organic compounds do not require acidification. All containers require Teflon lined caps or septa. Volatiles vials must contain no headspace.

Analysis	Method	Container	Preservation	Holding Time
Organochlorine pesticides	EPA608	2 x 1L amber glass	≤6°C, pH to 5-9 if not extracted within 72 hours	7 days
PCBs	EPA608	2 x 1L amber glass	≤6°C	1 year
Propiconazole	EPA608	2 x 1L amber glass	≤6°C	7 days
Organophosphorus pesticides	EPA614	2 x 1L amber glass	≤6°C	7 days
Purgeable aromatic compounds	EPA624	4 x 40ml VOA vials	≤6°C, HCl to pH <2 after dechlorination	14 days preserved, 7 days unpreserved
Purgeable halocarbons	EPA624	4 x 40ml VOA vials	≤6°C[6]	14 days
Acrolein, acrylonitrile	EPA624	4 x 40ml VOA vials	≤6°C	3 days[7]
2-Chloroethylvinyl ether	EPA624	4 x 40ml VOA vials	≤6°C	14 days[8]
Phenols	EPA625	2 x 1L amber glass	≤6°C	7 days
Semi-volatile organics	EPA625	2 x 1L amber glass	≤6°C	7 days
Pharmaceutical Pollutants	EPA 524.2 EPA1666	4 x 40ml VOA vials	≤6°C, HCl to pH <2 after dechlorination	14 days

8. Attachments

Attachment D
Sample Containers, Preservation, and Holding Times

Organic Chemistry: Aqueous Waste Analyses

Samples with residual chlorine must be dechlorinated before preservation: 2 drops of 10% sodium thiosulfate (10mg sodium thiosulfate)/ 40mL vial for volatiles, 1mL(80mg)/L for semivolatiles. Samples to be analyzed for purgeable non-aromatics do not require acidification. All containers require Teflon lined caps or septa. Volatiles vials must contain no headspace.

Analysis	Method	Container	Preservation	Holding Time
TPH: diesel/motor oil range organics	SW8015B	2 x 1L amber glass	≤6°C	7 days
TPH: diesel/motor oil range organics	LUFT	2 x 1L amber glass	≤6°C	14 days
Organochlorine pesticides and PCBs	SW8081A SW8082	2 x 1L amber glass	≤6°C	7 days
Organophosphorus pesticides	SW8141A	2 x 1L amber glass	≤6°C	7 days
Phenoxy herbicides	SW8151A	2 x 1L amber glass	≤6°C	7 days
Trichlopyr (Garlon)	SW8151A	2 x 1L amber glass	≤6°C	7 days
TPH: gasoline range organics	SW8260B	4 x 40ml VOA vials	≤6°C, HCl to pH <2 after dechlorination	14 days
Volatile organic compounds	SW8260B	4 x 40ml VOA vials	≤6°C, HCl to pH <2 after dechlorination	14 days
Semivolatile organics	SW8270C	2 x 1L amber glass	≤6°C	7 days
Phenols	SW8270C	2 x 1L amber glass	≤6°C	7 days
PNAs (PAHs)	SW8270C	2 x 1L amber glass	≤6°C	7 days

Organic Chemistry: Soil and Waste Analyses

Analysis	Method	Container	Preservation	Holding Time
Volatile organics SW5030B	SW8260B	Foil capped brass or stainless steel cylinder or 4 oz. Teflon capped jar. No headspace.	≤6°C	14 days
TPH: diesel range and semivolatile organics by GC or GCMS	SW8015M SW8081A SW8082 SW8270C	Foil capped brass or stainless steel cylinder or 4 oz. Teflon capped jar	≤6° C	14 days
PCBs in oil	SW8082	20ml glass vial w/ Teflon cap	Unpreserved	14 days

8. Attachments

Attachment D
Sample Containers, Preservation, and Holding Times

Subcontracted Organic Drinking Water Analyses

Aqueous samples with residual chlorine must be dechlorinated before preservation: 2 drops of 10% sodium thiosulfate solution (3mg sodium thiosulfate) per 40mL VOA vial for volatiles, 1mL (80mg) per liter for semivolatiles. All containers (except PVC) require Telfon lined caps or septa. Volatiles (VOA) vials must contain no headspace.

Analysis	Method	Container	Preservation	Holding Time
1,2,3-Trichloropropane	EPA524.2M	2 x 40ml VOA vials	≤6°C	14 days
Nitrosamines	EPA521	1L amber glass	≤6°C	14 days
Paraquat	EPA549.2	1L brown poly	≤6°C	7 days

Subcontracted Organic Wastewater and Aqueous Hazardous Waste Analyses

Aqueous samples with residual chlorine must be dechlorinated before preservation: 2 drops 10% sodium thiosulfate solution (3mg sodium thiosulfate)/40mL vial for volatiles, 1mL (80mg)/Lfor semivolatiles. All containers require Telfon lined caps or septa. Volatiles vials must contain no headspace.

Analysis	Method	Container	Preservation	Holding Time
Penta-, tri-, and tetrachlorophenols	CPAR	125ml amber glass	≤6°C	7 days
Triazine pesticides	EPA619	1L amber glass	≤6°C	7 days
Carbamate and urea pesticides	EPA632	1L amber glass	≤6°C	7 days
Dioxins	EPA1613	2 x 1L amber glass	≤6°C	1 year
Dioxins	SW8290	2 x 1L amber glass	≤6°C	30 days
Dissolved gases	RSK-175	3 x 40ml VOA vials	≤6°C	14 days
Formaldehyde	SW8315A	1L amber glass	≤6°C	3 days
7 Oxygenates	SW8260B	2 x 40ml VOA vials	≤6°C, 2 drops 1:1 HCl after dechlorination[2]	14 days
Pharmaceutical pollutants: Amines, methyl cellosolve	EPA1666	2 x 40ml VOA vials	≤6°C	7 days
Polynuclear aromatics	EPA610 SW8310	1L amber glass	≤6°C	7 days

8. Attachments

Attachment D
Sample Containers, Preservation, and Holding Times

Subcontracted Organic Soil Analyses				
Analysis	Method	Container	Preservation	Holding Time
Dioxins	SW8290	Foil capped brass or stainless steel cylinder or 4 oz. Teflon capped jar. No headspace.	≤6°C	30 days
Formaldehyde	SW8315A	Foil capped brass or stainless steel cylinder or 4 oz. Teflon capped jar. No headspace.	≤6°C	14 days
TPH gasoline range organics	SW5030B SW8015B	Foil capped brass or stainless steel cylinder or 4 oz. Teflon capped jar. No headspace.	≤6°C	14 days
TPH gasoline range organics	SW5035 SW8015B	3 x Encore samplers	≤6°C	48hr to preserve, 14 days to analyze
7 Oxygenates	SW5030B SW8260B	Foil capped brass or stainless steel cylinder or 4 oz. Teflon capped jar. No headspace.	≤6°C	14 days
7 Oxygenates	SW5035 SW8260B	3 x Encore samplers	≤6°C	48hr to preserve, 14 days to analyze
Organophosphorus pesticides	SW8141A	Foil capped brass or stainless steel cylinder or 4 oz. Teflon capped jar. No headspace.	≤6°C	14 days
Phenoxy herbicides	SW8151A	Foil capped brass or stainless steel cylinder or 4 oz. Teflon capped jar. No headspace.	≤6°C	14 days
Polynuclear aromatics	SW8310	Foil capped brass or stainless steel cylinder or 4 oz. Teflon capped jar. No headspace.	≤6°C	14 days

8. Attachments

Attachment D
Sample Containers, Preservation, and Holding Times

Subcontracted Miscellaneous Analyses				
Analysis	Method	Container	Preservation	Holding Time
Agricultural suitability	Several	8 oz. jar	≤6°C	Not specified
Asbestos, aqueous	EPA100.2	2 x 1L amber glass	≤6°C	48 hours[9]
Asbestos, bulk	PLM	15g, double plastic bag	Unpreserved	Not specified
Asbestos, soil	CARB435	8 oz. jar	Unpreserved	180 days
Gross Alpha Gross Beta	EPA900.0	Quart P	HNO_3 to pH <2 within 5 days of collection, then hold 16 hours	180 days preserved
Hexavalent chromium (Cr(VI))	SW7196A SW7199	8oz. jar	≤6° C	30 days
Iron bacteria	SM9240B	Pint P,G	Not specified	Not specified
Organic lead, aqueous	DHS LUFT	3 x 40ml VOA vials, no headspace	≤6°C	14 days
Organic lead, soil	DHS LUFT	Foil capped brass or stainless steel cylinder or 4 oz. Teflon capped jar. No headspace.	≤6°C	14 days
Radium 226	EPA903	Quart P	≤6°C, HNO_3 to pH <2	180 days
Radium 228	EPA904 EPA Ra-05	Quart P	≤6°C, HNO_3 to pH <2	180 days
Radon	SM7500Rn	40ml VOA	Unpreserved	4 days
Strontium 90	EPA905	Quart P	≤6°C, HNO_3 to pH <2	180 days
Sulfite	EPA 300.1	Pint P	None	15 minutes
Tributyltin	Battelle	1L glass amber	≤6°C	7 days
Tritium	EPA 906	1L glass amber	≤6°C	180 days
Uranium	EPA 908 EPA 908.1	Quart P	Unpreserved	180 days
UV254	SM5910	250ml amber glass	≤6°C	48 hours

[1]Plastic (P) or glass (G)
[2]Samples not preserved in the field must be acidified at least 24 hours prior to analysis.
[3]Sample digested in container with bromine monochloride.
[4]EPA recommends dechlorinating with 25mg ascorbic acid per 40ml VOA vial for the full 524.2 list.
[5]Monochloroacetic acid.
[6]May be analyzed from acidified vial.
[7]Holding time is 14 days if pH adjusted to 4-5 at collection.
[8]May not be analyzed from acidified vial.
[9]Asbestos TEM Laboratory can treat asbestos samples with UV as described in Section 8.2 of EPA 100.2 to extend the hold time.

Method Sources and Abbreviations

Hold times specified in the Method Update Rule (Federal Register, 40 CFR Part 136, May 18, 2012) supercede times given in other sources where applicable.

AWWA "American Waterworks Association Standard for Asbestos-Cement Pipe, 4 inch through 16 inch (100mm through 400mm) NPS, for Water and Other Liquids." AWWA C400-80, Revision of C400-77, AWWA, Denver Colorado; June 1980

CDFG Static Acute Bioassay Procedures for Hazardous Waste Samples, Polsini and Miller, California Department of Fish and Game; November 1988.

8. Attachments

Attachment D
Sample Containers, Preservation, and Holding Times

CPAR Effect of Pulp Chlorination Conditions on the Formation of Toxic Chlorinated Compounds, Pulp and Paper Research Institute of Canada, Final Report to March 31, 1979

Method Sources and Abbreviations (continued)

FISH Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms; Fifth Edition; EPA-821-R-02-012; Washington, DC, October 2002

DHS LUFT Leaking Underground Fuel Tank Field Manual: Guidelines for Site Assessment, Cleanup, and Underground Storage Tank Closure; October 1989

RSK-175 Technical Guidance for the Natural Attenuation Indicators: Methane, Ethane, and Ethene, USEPA Region 1, February 21, 2002

8. Attachments

Attachment E
Standard Operating Procedures (SOPs)

Number	Code	Revision Number	Date	Title
Field Services SOPs (FSOP)				
FSOP2.00	Groundwater	1.04	2013 May	Field Guide and SOP for Ground Water Monitoring
FSOP2.01	CreekSampling	1.01	2016 Jul	Field Guide and SOP for Spring or Creek Sampling
FSOP2.02	PotBactiSamp	1.01	2016 Jul	Potable Water Bacteriological Field Sampling
FSOP4.00	TCpH	2.00	2013 Feb	Calibration of Field Temperature/Conductivity/pH Meter
FSOP4.01	DO	2.00	2013 Feb	Field Measurement of Dissolved Oxygen
FSOP4.02	FieldpH	1.01	2106 Jul	Field pH instrument Calibration, Sample Collection, and Analysis
FSOP4.04	FieldTurbidity	1.00	2013 Mar	Measurement of Turbidity in the Field
FSOP4.05	FieldTestCoC	1.00	2014 Aug	Field Testing Chain of Custody
FSOP5.00	VOADechlor	2.02	2016 Jun	Dechlorinating and Preserving Samples for Volatiles Analysis
FSOP5.02	AscorbicAcid	1.02	2016 Jun	Collecting Chlorinated Samples for EPA 524.2 Analysis
FSOP7.00	NonPotable	1.00	2012 Mar	Non-Potable Field Sampling and Collection Guidelines

8. Attachments

Attachment E
Standard Operating Procedures (SOPs)

Number	Code	Revision Number	Date	Title
Inorganics SOPs (ISOP)				
ISOP1.02.01	01 Hg-Aq	3.00	2015 Feb	Digestion and Analysis of Mercury in Water by EPA Method 245.1/7470
ISOP1.02.02	02 Hg-So	2.00	2016 Jun	Digestion and Analysis of Mercury in Soils and Sludges by EPA Method 7471
ISOP1.02.03	03 Hg-S	2.00	2013 Feb	Digestion and Analysis of Mercury in Sulfur Cakes by EPA Method 7471M
ISOP1.03	ICP	2.01	2016 July	Trace Metal Analysis by Inductively Coupled Plasma (ICP)
ISOP1.04	TOC	3.01	2015 Oct	Analysis of Total Organic Carbon (TOC) and Dissolved Organic Carbon (DOC)
ISOP1.06	Cr6	2.00	2016 Jun	Analysis of Hexavalent Chromium by EPA Method 7196A
ISOP1.07	TKN	2.00	2014 Jan	Analysis of Total Kjeldahl Nitrogen
ISOP1.08	P&PO4	3.00	2015 Feb	Analysis of Total Phosphorus, Total Phosphate, and Orthophosphate in Water
ISOP1.09	Ign	2.00	2016 Jun	Ignitability
ISOP1.10	Color	1.04	2016 Jul	Determination of Color
ISOP1.11	AgIDX	2.00	2016 Jun	Aggressive Index Calculation
ISOP1.12	Lang	2.00	2013 Apr	Langelier Index Calculation
ISOP1.13	Salinity	3.00	2016 Apr	Salinity in Water Calculation
ISOP1.14	SAR	2.00	2012 Nov	SAR and Adjusted SAR Calculation
ISOP1.15	Hardness	1.01	2013 May	Hardness: Total, Calcium, and Magnesium
ISOP1.16	Cr3	2.00	2016 Jun	Chromium (III) Calculation
ISOP1.17	Odor	2.03	2016 Feb	Determination of Odor
ISOP1.18	HvyMtlCalc	2.00	2016 Jun	Heavy Metals Calculation
ISOP1.19	Cations	1.02	2013 May	Total Cations
ISOP1.20	ACBalance	1.01	2013 May	Anion/Cation Balance
ISOP1.21	ICPMS	3.00	2016 Jun	Trace Metal Analysis by ICPMS
ISOP2.01	AcidDigest	2.00	2016 May	Acid Digestion for Metals
ISOP2.03	3015	2.03	2016 May	Microwave Digestion of Aqueous Samples by EPA Method 3015
ISOP2.04	3051	3.00	2016 May	Microwave Digestion of Soil, Oil, and Solid Waste by EPA Method 3051
ISOP2.06	Diss	1.02	2016 Junj	Dissolved Metals Prep
ISOP2.08	STLC	2.01	2016 May	STLC WET Extraction
ISOP2.09	200.8 Prep	1.02	2016 Apr	EPA Method 200.8 Sample Preparation
ISOP2.10	Batching	1.00	2013 May	Batching Samples for ICP, ICPMS, and GFAA
ISOP2.11	Larson-Skold	1.00	2013 May	Larson-Skold Index
ISOP2.12	Labware	1.00	2013 Jun	Metals Glassware
ISOP2.13	7471M Digest	2.00	2016DRAFT	Digestion and Analysis of Mercury in Sulfur Cakes by EPA 7471M
ISOP2.14	TCLP	1.00	2016DRAFT	TCLP Extraction for Inorganic Analytes
Laboratory SOPs (LABSOP)				
LABSOP1.01	Thermo	2.04	2015 Sep	Thermometer Calibration
LABSOP1.02	Pipet	3.00	2014 Jan	Pipetter Calibration and Maintenance
LABSOP1.03	Spectronic	2.00	2016 Jun	Spectrophotometer Wavelength Verification
LABSOP1.04	Doc Control	1.00	2013 Jan	Document Control SOP
LABSOP1.05	Balance	1.01	2016 Jun	Balance Calibration
LABSOP1.06	LODLOQ	1.00	2014 Nov	LOD and LOQ Verification
LABSOP1.07	PTs	1.00	2015 Dec	Analysis and Reporting of PT Samples

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Attachment E
Standard Operating Procedures (SOPs)

Number	Code	Revision Number	Date	Title
Microbiology SOPs (MSOP)				
MSOP1.00	Autoclave	1.02	2016 Jun	Autoclave Sterility Test
MSOP1.01	Coli Bottle	1.05	2015 Sep	Coli Bottle Check
MSOP1.02	ColiWater	2.03	2014 Aug	Coli Wash (Dilution Water) Preparation
MSOP1.03	Controls	1.03	2014 Jun	Preparation of Positive and Negative Coliform Controls
MSOP1.04	TSB	1.01	2013 May	Tryptic Soy Broth
MSOP1.05	MicroPrep	1.02	2013 Nov	Preparing Aqueous Microbiological Samples
MSOP1.06	MicroDisp	1.00	2013 Jun	Disposal of Microbiological Samples
MSOP1.07	Pipets	2.00	2014 Jan	Micropipet and Dispenser Verification
MSOP2.00	PA	1.05	2013 Jun	Presence/Absence of Total and E. coli in Drinking Water by SM9223
MSOP2.01	TCFC15	2.05	2014 Oct	Total and Fecal Coliforms: Most Probable Number (MPN) 15 Tube by SM9221
MSOP2.02	TCFC10	1.05	2016 June	Total and Fecal Coliforms: Most Probable Number (MPN) 10 Tube by SM9221
MSOP2.03	Media	1.04	2014 May	Media Preparation for Microbiology
MSOP2.04	QuantiTray	2.00	2013 Nov	Total and Fecal Coliforms in Drinking Water by SM9223 QuantiTray
MSOP2.05	Coli HiDil	2.01	2014 Oct	High-Dilution Total and Fecal Coliforms by SM9221
MSOP2.06	FecalStrep	1.06	2014 Nov	Fecal Streptococcus: Most Probable (MPN) 15 Tube by SM9230B
MSOP2.07	Enterococci	1.07	2014 May	Enterococci: Most Probable Number (MPN) 15 Tube by SM9230B
MSOP2.08	FStrepHiDil	2.00	2014 Nov	High-Dilution Fecal Streptococcus: Most Probable Number (MPN) by SM9230B
MSOP2.10	HPC	2.00	2016 Jun	Heterotrophic Plate Count by SM9215B
MSOP2.12	TCR	3.00	2016 Jun	Total Coliform Rule: Invalidation of Total Coliform Samples
MSOP2.13	SimPlate	1.05	2014 Jun	Heterotrophic Plate Count by SimPlate
MSOP2.14	Colisure	1.01	2011 Apr	Presence/Absence of Total Coliforms and E. coli in Drinking Water by Colisure
MSOP2.15	Enterolert	1.04	2016 Jun	Enterococci: Most Probable Number (MPN) by IDEXX Enterolert
MSOP2.16	PA18	1.02	2016 May	Presence/Absence of Total Coliforms and E. coli by IDEXX Colilert-18
MSOP2.17	TCFC30	2.00	2014 Oct	Total and Fecal Coliforms: Most Probable Number (MPN) 30 tube by SM9221
MSOP2.19	PA Notification	1.00	2014 Sep	PA Coliform Notification
MSOP2.20	Pseudalert	1.00	2016 Feb	Pseudomonas: MPN in Water by IDEXX Pseudalert
MSOP2.21	QuantiTray18	1.00	2016 May	TCEC by SM9223 Quantitray with IDEXX Colilert 18
MSOP3.00	BQLW	1.01	2013 May	Bacteriological Quality of Laboratory Water (BQLW)
MSOP3.01	Inhibitory Res	1.01	2009 May	Inhibitory Residues on Glassware or Plasticware

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Attachment E
Standard Operating Procedures (SOPs)

Number	Code	Revision Number	Date	Title
Organics SOPs (OSOP)				
OSOP1.03	ManInt	1.02	2016 Jul	Manual Integration Policy
OSOP1.04	TIC	1.00	2016 Feb	Tentatively Identified Compounds (TICs)
OSOP2.01	Glass	2.01	2016 Jul	Glassware Cleaning Procedure
OSOP2.02	HazMat	3.00	2013 July	Disposition of Hazardous Materials
OSOP2.08	AcidVials	1.01	2016 Jul	Acid Rinsing Vials
OSOP2.09	AcetoneVials	1.01	2016 Jul	Acetone Rinsing Vials
OSOP3.01	TPHD	5.00	2013 Dec	Analysis of Diesel and Motor Oil in Soil and Water by LUFT/EPA Method 8015
OSOP4.01	PCB	4.01	2014 Apr	HP6890 Analysis of Polychlorinated Biphenyls (PCBs) by EPA Method 8082
OSOP4.02	Pests	7.01	2014 Apr	Analysis of Chlorinated Pesticides and PCBs: EPA 608, 8080 and 8081
OSOP4.03	Herbs	6.00	2013 Nov	Analysis of Chlorinated Acids in Water: EPA Methods 8151 and 515.1
OSOP4.04	HAA5	2.02	2014 Jun	Analysis of Haloacetic Acids and Dalapon in Drinking Water by EPA 552.2
OSOP4.06	OPP	2.01	2014 Apr	Analysis of Organophosphorus Compounds: EPA Method 8141A
OSOP4.07	507	2.00	2013 Nov	Analysis of Nitrogen and Phosphorus Pesticides: EPA Method 507
OSOP4.08	508	3.00	2013 Nov	Analysis of Chlorinated Pesticides and PCBs: EPA Method 508
OSOP5.02	CPAR	3.00	2014 Jan	Analysis of Polychlorinated Phenols by the Canadian Pulp (CPAR) Method
OSOP6.01	TCLP	2.06	2016 Jul	TCLP for Volatiles (by ZHE) and Semi-volatiles by EPA Method 1311
OSOP6.02	DIWET	2.06	2013 Oct	DIWET for Volatiles (by Zero Headspace Extractor (ZHE)) and Semi-volatiles
OSOP6.03	STLC	2.05	2013 Oct	STLC for Volatiles (by Zero Headspace Extractor (ZHE)) and Semi Volatiles
OSOP9.02	624&8260	5.00	2015 Jul	Analysis of Volatile Organic Compounds by GCMS
OSOP9.03	TPHG8260	3.00	2016DRAFT	Analysis of Gasoline Range Organics by EPA Method 8260
OSOP9.05	524.2	2.00	2016 Jun	Analysis of Volatiles in Drinking Water by GCMS Using EPA 524.2 and 1666
OSOP9.06	1666	1.00	2014 May	VOCs Specific to the Pharmaceutical Industry by Isotope Dilution GCMS
OSOP10.01	8270/625	4.00	2013 Nov	Analysis of Semi Volatile Organic Compounds in Water by GC/MS: EPA 8270C
OSOP10.03	548.1	1.00	2013 Sep	Determination of Endothall in Drinking Water by EPA Method 548.1
OSOP11.01	531.1	2.00	2015 Jan	Carbamates in Water by EPA Method 531.1
OSOP11.02	547	2.01	2015 Oct	Glyphosate in Drinking Water by HPLC with Fluorescence Detection: EPA 547
OSOP11.03	549	2.00	2015 Aug	Diquat and Paraquat in Drinking Water by EPA Method 549
OSOP11.04	504	1.01	2013 Jan	Analysis of EDB and DBCP in DW by Microextraction and GC by EPA 525.2
OSOP11.05	525.2	1.01	2015 Jan	Determination of Organic Compounds in DW by LSE/GCMS by EPA 525.2
OSOP APP1	N2 Blowdown	1.00	2013 Oct	Extraction, Concentration, and Solvent Transfer with Nitrogen Concentrator

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Attachment E
Standard Operating Procedures (SOPs)

Number	Code	Revision Number	Date	Title
Sample Control SOPs (SCSOP)				
SCSOP1.00	Samp Rec	4.00	2013 Jun	Sample Receiving Log-in
SCSOP1.02	Temp	1.03	2016 Jul	Monitoring Refrigerator Temperature in the Office
SCSOP1.03	Sample Pres	2.00	2016 Jul	Bottle and Sample Preserving Procedures
SCSOP1.04	Sample Flow	3.01	2016 Jul	Sample Flow in the Walk-in Refrigerator
SCSOP1.06	DechlorReq	1.01	2012 May	Dechlorination Requirements
SCSOP1.07	AfterHoursCOC	1.02	2016 Jul	After Hours Chains of Custody
SCSOP1.08	PresChart	1.06	2015 Nov	Preserving Bottles
SCSOP1.09	SampRecDublin	1.03	2013 Aug	Sample Receiving Dublin
SCSOP1.11	Notification	1.05	2016 Jul	Client Notification of Perchlorate and NItrate/Nitrite in Drinking Water
SCSOP1.12	Alum	1.01	2016 Jun	Alum Calculation
SCSOP1.13	Cl2	2.00	2013 Jan	Dechlorination Requirements
SCSOP1.14	EQuiS	1.00	2013 Mar	EQuiS EDD
SCSOP1.15	EDF Upload	1.00	2013 Mar	EDF (Geotracker) Upload
SCSOP1.16	EPA Dechlor	1.00	2013 Jun	Dechlorinated Bottles
SCSOP1.17	Shipping	1.00	2013 Jun	Sample Shipping
SCSOP1.18	Disposal	1.00	2013 Jun	Sample Disposal
SCSOP1.19	Couriers	1.00	2013 Jun	Courier Responsibilities
SCSOP1.20	Report Review	1.00	2013 Jun	Report Review
Toxicity SOPs (TSOP)				
TSOP1.00	QA	2.03	2016 Jun	Fish Bioassay Quality Assurance
TSOP1.02	Hardness	1.03	2016 Jun	Total Hardness Using the Hach Total Hardness Test Kit
TSOP2.00	Arrival	2.00	2016 Jun	Standard Operating Procedure for Fish Arrival
TSOP3.00	Holding	2.03	2016 Jun	Standard Operating Procedure for Holding Tank Log
TSOP4.00	FishRoom	2.03	2016 Jun	Standard Operating Procedure for Fish Room Readiness
TSOP4.01	ControlWater	1.03	2016 Jun	Standard Operating Procedure for Preparing Dilution or Control Water
TSOP5.00	HWScreen	2.09	2016 Jun	Standard Operating Procedure for Hazardous Waste Screen Bioassay
TSOP5.01	HWDef	2.02	2016 Jun	Standard Operating Procedure for Hazardous Waste Definitive Bioassay
TSOP5.03	HWDisposal	2.01	2016 Jun	Standard Operating Procedure for Hazardous Waste Bioassay Disposal
TSOP6.00	%Survival	3.02	2016 Jun	SOP for Effluents: Percent Survival of Rainbow Trout (Fourth Edition)
TSOP7.00	KCl	4.01	2016 Jun	Standard Operating Procedure for Reference Toxicant KCl
TSOP7.01	SDS	1.02	2016 Jul	Standard Operating Procedure for Reference Toxicant SDS

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Attachment E
Standard Operating Procedures (SOPs)

Number	Code	Revision Number	Date	Title
Wet Chemistry SOPs (WCSOP)				
WCSOP1.00	Labware	1.01	2016 Jan	Labware Cleaning Procedures
WCSOP2.01	Alkalinity	3.01	2015 Feb	Analysis of Alkalinity, Bicarbonate, Carbonate, and Hydroxide by SM2320B
WCSOP2.02	NH3	3.02	2016 Jan	Analysis of Ammonia and Ammonia-N by Standard Method 4500-NH3 B and C
WCSOP2.03	COD	3.02	2016 Jul	Chemical Oxygen Demand (COD) by Standard Method 5220D
WCSOP2.05	Cond	5.00	2016 Mar	Conductivity Analysis by SM2510B
WCSOP2.06	CN	4.00	2014 Nov	Analysis of Total and Amenable Cyanide
WCSOP2.06A	WADCN	2.00	2014 Nov	Distillation of Weak-acid Dissociable (WAD) Cyanide
WCSOP2.06B	CN EPASM	3.00	2014 Sep	Analysis of Total Cyanide by EPA 9014 or SM4500-CN E
WCSOP2.07	CNReactive	2.00	2014 May	Analysis for Reactive Cyanide
WCSOP2.08	O&G Water	5.00	2016 Jul	Grease and Oil: Hexane Extractable Material (HEM) in Water
WCSOP2.10	O&G Soil	3.00	2016 Jul	Grease and Oil: Hexane Extractable Material (HEM) in Soil or Sludge
WCSOP2.16	MBAS	2.01	2016 Jul	Analysis for Methylene Blue Active Substances (MBAS) by SM5540C
WCSOP2.17	NO3NO2	3.00	2014 Mar	Analysis of NO3+NO2-N in Water by SM4500-NO3 B and NO3 by Calculation
WCSOP2.18	NO2	3.01	2014 Nov	Spectrophotometric Analysis of Nitrite and Nitrite-N in Water by SM4500-NO2 B
WCSOP2.20	pH	6.00	2016 Apr	Electrometric pH Measurement of Water and Wastes
WCSOP2.22	Phenolics	3.01	2016 Apr	Analysis of Total Recoverable Phenolics in Water by EPA Method 420.1
WCSOP2.23	PhenolicsLow	2.00	2014 Oct	Analysis of Low-level Phenolics in Water by EPA Method 420.1
WCSOP2.24	Settleable	3.00	2014 May	Settleable Matter in Water by SM2540F
WCSOP2.25	Silica	3.01	2014 May	Analysis of Silica in Water by Standard Method 4500-SiO_2 D
WCSOP2.28	S2 Reactive	2.00	2016DRAFT	Analysis for Reactive Sulfide in Water and Soils
WCSOP2.30	T&L	2.00	2016 Jun	Colorimetric Analysis of Tannin and Lignin by Standard Method 5550B
WCSOP2.31	TSS	3.00	2014 Jun	Total Suspended (TSS) AKA NFR (Non-filterable Residue) by SM2540D
WCSOP2.32	Solids	2.00	2014 Jun	Analysis of Total Solids in Water by SM2540B
WCSOP2.33	FSSVSS	2.00	2016 Jun	Analysis of Fixed Suspended and Volatile Solids (FSS and VSS) by
WCSOP2.34	TDS	3.01	2016 May	Analysis of Total Dissolved Solids (TDS) AKA Filterable Residue by SM2540C
WCSOP2.35	%Solids	2.00	2016 Jun	Determining Percent Moisture by EPA Method 160.3
WCSOP2.36	TFSTVS	3.00	2015 Feb	Determination of Total Fixed, and Volatile Solids in Sludges and Solids
WCSOP2.39	Turbidity	5.02	2016 Apr	Determination of Turbidity by SM2130B
WCSOP2.40	BOD	4.03	2016 Jun	5 Day Biochemical Oxygen Demand (BOD) by SM5210B
WCSOP2.41	IC	3.01	2015 Dec	Analysis of Anions in Water by Ion Chromatography
WCSOP2.43	Acidity	1.01	2011 Apr	Determination of Acidity by Standard Method 2310B
WCSOP2.44	Unionized NH3N	2.00	2014 Aug	Unionized Ammonia as Nitrogen
WCSOP2.45	Anions	2.00	2016 Jun	Total Anions
WCSOP2.46	Chlorine	3.01	2016 Apr	Analysis of Residual Chlorine and Chloramine by Standard Method 4500-Cl F
WCSOP2.47	FreeCO2	2.00	2016 Jun	Free Carbon Dioxide (CO_2) Calculation by by SM4500-CO2 B
WCSOP2.48	DO	2.00	2015 Mar	Dissolved Oxygen by SM4500-O G
WCSOP2.49	Nitrogen	2.00	2016 Jun	Nitrogen: Inorganic, Organic, and Total by SM4500-N

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Attachment E
Standard Operating Procedures (SOPs)

Number	Code	Revision Number	Date	Title
Wet Chemistry SOPs (WCSOP)				
WCSOP2.50	TDS Calc	2.00	2016 Jun	Total Dissolved Solids (TDS) Estimation
WCSOP2.51	FDSVDS	2.00	2016 May	Determination of Fixed and Total Volatile Solids
WCSOP2.52	SpecificGrav	1.01	2016 Jun	Specific Gravity
WCSOP2.53	NH4	2.00	2016 Jun	Ammonium Calculation
WCSOP2.54	Chlorophyll	1.03	2016 Jul	Standard Operating Procedure for Chlorophyll by SM10200H
WCSOP2.55	Sulfide	3.01	2016 Apr	Analysis of Sulfide in Water by Hach Method 8131 Methylene Blue
WCSOP2.56	H2S	2.00	2016 Jun	Calculation of Hydrogen Sulfide in Water
WCSOP2.57	Perchlorate	2.02	2015 Nov	Determination of Perchlorate by EPA Method 314.0
WCSOP2.58	Prep	1.05	2016 Jun	Prep Bench Procedure
WCSOP2.59	218.6	1.02	2014 Nov	Analysis of Hexavalent Chromium in Drinking Water by EPA 218.6
WCSOP2.60	300.1	1.01	2016 Feb	Analysis of Anions by EPA 300.1
WCSOP2.61	COD FF	1.00	2015 Jun	Flocculation and Filtration for COD Analysis

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Attachment F
Practical Quantitation Limits

Wet Chemistry Analyses

Aqueous		Soil and Solid Waste	
Analyte	**mg/L**	**Analyte**	**mg/kg**
Alkalinity	5.0	Cyanide	2.0
BOD	5.0	Cyanide, reactive	250
Chloride	0.50	Ignitability (flash point)	40°F
Chlorine, residual	0.10	Nitrogen, ammonia	2.0
COD	50	Nitrogen, Kjeldahl	10
Color	5 CU	Oil and grease	250
Conductivity	20μmhos/cm	Solids, volatile	1.0
Cyanide	0.0030		
Cyanide, reactive	250		
Fluoride	0.10		
Hardness	5.0		
Ignitability (flash point)	40°F		
Nitrogen, ammonia	0.20		
Nitrogen, Kjeldahl	1.0		
Nitrogen, nitrate	0.20		
Nitrogen, nitrite	0.20		
Odor	1 TON		
Oil and grease	5.0		
Orthophosphate-P	0.30		
Perchlorate	0.0040		
Phenolics	0.50		
Phosphorus	0.10		
Silica	1.0		
Solids, settleable	0.10ml/L		
Solids, total	10		
Solids, dissolved	10		
Solids, suspended	1.0		
Solids, volatile	1.0		
Sulfate	0.50		
Sulfide	0.10		
Surfactants (MBAS)	0.050		
Total organic carbon	0.30		
Turbidity	0.10		

CU = color units
TON = threshold odor number

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Attachment F
Practical Quantitation Limits

Metals: ICP and ICPMS

	Aqueous (ug/L)		Soil (mg/kg)
Analyte	**ICP**	**ICPMS**	**ICP**
Aluminum	50	10	20
Antimony	20	0.50	15
Arsenic	10	0.50	2.0
Barium	10	0.50	10
Beryllium	1.0	0.10	0.75
Boron	50	50	50
Cadmium	1.0	0.10	1.0
Calcium	1000	500	50
Chromium	10	0.50	5.0
Cobalt	10	0.10	10
Copper	20	0.50	10
Iron	100	50	50
Lead	50	0.25	5.0
Magnesium	1000	500	50
Manganese	20	5.0	5.0
Molybdenum	50	0.25	10
Nickel	10	0.50	10
Potassium	1000	100	50
Selenium	20	1.0	2.0
Silver	10	0.10	5.0
Sodium	1000	500	50
Thallium	200	0.10	7.0
Vanadium	20	1.0	5.0
Zinc	20	5.0	10

ICP = Inductively coupled plasma
ICPMS = Inductively coupled plasma mass spectrometry

Metals: Hexavalent Chromium and Mercury

Analyte	Method	Aqueous (ug/L)	Soil (mg/kg)
Hexavalent Chromium	EPA 218.6	0.50	-
Hexavalent Chromium	SM3500Cr-B	10	-
Mercury	EPA 7470A	-	0.20
Mercury	EPA 245.1	0.20	-

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Attachment F
Practical Quantitation Limits

Organic Drinking Water Analyses

Analyte	Method	ug/L
1,2-Dibromoethane (EDB)	EPA 504.1	0.020
1,2-Dibromo-3-chloropropane (DBCP)	EPA 504.1	0.010
Alachlor	EPA 507	1.0
Atrazine	EPA 507	0.50
Molinate	EPA 507	2.0
Simazine	EPA 507	1.0
Thiobencarb	EPA 507	1.0
Endrin	EPA 508	0.10
γ BHC(Lindane)	EPA 508	0.20
Heptachlor	EPA 508	0.010
Heptachlor epoxide	EPA 508	0.010
Hexachlorobenzene	EPA 508	0.50
Hexachlorocyclopentadiene	EPA 508	1.0
Methoxychlor	EPA 508	10
PCB 1016	EPA 508	0.50
PCB 1221	EPA 508	0.50
PCB 1232	EPA 508	0.50
PCB 1242	EPA 508	0.50
PCB 1248	EPA 508	0.50
PCB 1254	EPA 508	0.50
PCB 1260	EPA 508	0.50
Toxaphene	EPA 508	1.0
Chlordane	EPA 508	0.10
Bentazon	EPA 515.1	2.0
2,4-D	EPA 515.1	10
Dalapon	EPA 515.1	10
Dinoseb	EPA 515.1	2.0
Pentachlorophenol	EPA 515.1	0.20
Picloram	EPA 515.1	1.0
2,4,5-TP (Silvex)	EPA 515.1	1.0
Benzo(a)pyrene	EPA 525.2	0.10
Diethylhexyl adipate	EPA 525.2	5.0
Diethylhexyl phthalate	EPA 525.2	3.0
Carbofuran	EPA 531.1	5.0
Oxamyl	EPA 531.1	20
Glyphosate	EPA 547	25
Endothall	EPA 548.1	45
Diquat	EPA 549.2	4.0

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Attachment F
Practical Quantitation Limits

Organic Drinking Water Analysis (cont.)

Analyte	Method	ug/L
Benzene	EPA 524.2	0.50
Bromodichloromethane	EPA 524.2	1.0
Bromoform	EPA 524.2	1.0
Carbon tetrachloride	EPA 524.2	0.50
Chlorobenzene	EPA 524.2	1.0
Chloroform	EPA 524.2	1.0
Dibromochloromethane	EPA 524.2	0.50
1,2-Dichlorobenzene	EPA 524.2	0.50
1,4-Dichlorobenzene	EPA 524.2	0.50
1,1-Dichloroethane	EPA 524.2	0.50
1,2-Dichloroethane	EPA 524.2	0.50
1,1-Dichloroethene	EPA 524.2	0.30
cis-1,2-Dichloroethene	EPA 524.2	0.50
trans-1,2-Dichloroethene	EPA 524.2	0.50
1,2-Dichloropropane	EPA 524.2	0.50
1,3-Dichloropropane	EPA 524.2	0.50
Ethylbenzene	EPA 524.2	0.50
Methyl-*tert*-butyl ether	EPA 524.2	3.0
Styrene	EPA 524.2	0.50
1,1,2,2-Tetrachloroethane	EPA 524.2	0.50
Tetrachloroethene	EPA 524.2	0.50
Toluene	EPA 524.2	0.50
1,2,4-Trichlorobenzene	EPA 524.2	0.50
1,1,1-Trichloroethane	EPA 524.2	0.50
1,1,2-Trichloroethane	EPA 524.2	0.50
Trichloroethene	EPA 524.2	0.50
Trichlorofluoromethane	EPA 524.2	5.0
Trichlorotrifluoroethane	EPA 524.2	10
Trihalomethanes (total)	EPA 524.2	1.0
Vinyl chloride	EPA 524.2	0.50
Xylenes (total)	EPA 524.2	0.50
Monochlorobromoacetic Acid	EPA 552.2	1.0
Monochloroacetic Acid	EPA 552.2	2.0
Dibromoacetic Acid	EPA 552.2	1.0
Dichloracetic Acid	EPA 552.2	1.0
Trichloroacetic Acid	EPA 552.2	1.0

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Attachment F
Practical Quantitation Limits

Organic Wastewater Analyses

Analyte	Method	ug/L
Aldrin	EPA 608	0.010
α-BHC	EPA 608	0.010
β-BHC	EPA 608	0.050
γ BHC(Lindane)	EPA 608	0.010
δ-BHC	EPA 608	0.050
Chlordane	EPA 608	0.050
4,4'-DDD	EPA 608	0.020
4,4'-DDE	EPA 608	0.020
4,4'-DDT	EPA 608	0.020
Dieldrin	EPA 608	0.010
Endosulfan I	EPA 608	0.010
Endosulfan II	EPA 608	0.010
Endosulfan sulfate	EPA 608	0.050
Endrin	EPA 608	0.010
Endrin aldehyde	EPA 608	0.050
Heptachlor	EPA 608	0.020
Heptachlor epoxide	EPA 608	0.020
Methoxychlor	EPA 608	0.020
PCB 1016	EPA 608	0.50
PCB 1221	EPA 608	0.50
PCB 1232	EPA 608	0.50
PCB 1242	EPA 608	0.50
PCB 1248	EPA 608	0.50
PCB 1254	EPA 608	0.50
PCB 1260	EPA 608	0.50
Toxaphene	EPA 608	0.50
Azinphos methyl	EPA 614	2.0
Chlorpyrifos	EPA 614	0.5
Demeton-o	EPA 614	1.0
Demeton-s	EPA 614	1.0
Diazinon	EPA 614	0.50
Disulfoton	EPA 614	0.50
Ethion	EPA 614	0.50
Malathion	EPA 614	0.50
Parathion	EPA 614	0.50
Parathion-methyl	EPA 614	0.50

8. Attachments

Attachment F
Practical Quantitation Limits

Organic Wastewater Analyses (cont.)

Analyte	Method	ug/L
Acenaphthene	EPA 625	1.0
Acenaphthylene	EPA 625	10
Anthracene	EPA 625	10
Benzidine	EPA 625	5.0
Benzo(a)anthracene	EPA 625	5.0
Benzo(a)pyrene	EPA 625	10
Benzo(b)fluoranthene	EPA 625	10
Benzo(g,h,i)perylene	EPA 625	5.0
Benzo(k)fluoranthene	EPA 625	10
Bis(2-chloroethoxy) Methane	EPA 625	5.0
Bis(2-chloroethyl) Ether	EPA 625	1.0
Bis(2-chloroisopropyl) Ether	EPA 625	2.0
Bis(2-ethylhexyl) Adipate	EPA 625	5.0
Bis(2-ethylhexyl) Phthalate	EPA 625	5.0
4-Bromophenyl Phenyl Ether	EPA 625	5.0
Butylbenzyl Phthalate	EPA 625	10
4-Chloro-3-methylphenol	EPA 625	1.0
2-Chloronaphthalene	EPA 625	10
2-Chlorophenol	EPA 625	5.0
2-Chlorophenyl Phenyl Ether	EPA 625	5.0
Chrysene	EPA 625	10
Dibenz(a,h)anthracene	EPA 625	10
3,3'-Dichlorobenzidine	EPA 625	5.0
2,4-Dichlorophenol	EPA 625	5.0
Diethyl Phthalate	EPA 625	2.0
2,4-Dimethylphenol	EPA 625	2.0
Dimethyl Phthalate	EPA 625	2.0
Di-n-butyl Phthalate	EPA 625	10
4,6-Dinitro-2-methylphenol	EPA 625	5.0
2,4-Dinitrophenol	EPA 625	5.0
2,4-Dinitrotoluene	EPA 625	5.0
2,6-Dinitrotoluene	EPA 625	5.0
Di-n-octyl Phthalate	EPA 625	10
1,2-Diphenylhydrazine	EPA 625	1.0
Fluoranthene	EPA 625	1.0
Fluorene	EPA 625	10
Hexachlorobenzene	EPA 625	1.0
Hexachlorobutadiene	EPA 625	1.0
Hexachlorocyclopentadiene	EPA 625	5.0
Hexachloroethane	EPA 625	1.0

8. Attachments

Attachment F
Practical Quantitation Limits

Organic Wastewater Analyses (cont.)

Analyte	Method	ug/L
Indeno(1,2,3-cd) pyrene	EPA 625	10
Isophorone	EPA 625	1.0
Naphthalene	EPA 625	1.0
Nitrobenzene	EPA 625	1.0
2-Nitrophenol	EPA 625	10
4-Nitrophenol	EPA 625	10
N-Nitrosodimethylamine	EPA 625	5.0
N-Nitrosodi-n-propylamine	EPA 625	5.0
N-Nitrosodiphenylamine	EPA 625	1.0
Pentachlorophenol	EPA 625	5.0
Phenanthrene	EPA 625	5.0
Phenol	EPA 625	1.0
Pyrene	EPA 625	10
1,2,4-Trichlorobenzene	EPA 625	5.0
2,4,6-Trichlorophenol	EPA 625	10

Pharmaceutical Pollutants in Wastewater

Analyte	Method	ug/L
Ethyl acetate	EPA 1666	100
Isobutylaldehyde	EPA 1666	100
Isopropyl acetate	EPA 1666	100
Methyl formate	EPA 1666	500
n-Amyl acetate	EPA 1666	100
n-Butyl acetate	EPA 1666	100
n-Heptane	EPA 1666	100
n-Hexane	EPA 1666	500
Acetone	EPA 524.2	5.0
Benzene	EPA 524.2	0.50
Chlorobenzene	EPA 524.2	0.50
Chloroform	EPA 524.2	0.50
1,2-Dichlorobenzene	EPA 524.2	0.50
1,2-Dichloroethane	EPA 524.2	0.50
Isopropyl ether	EPA 524.2	1.0
Methylene chloride	EPA 524.2	0.50
Methyl isobutyl ketone	EPA 524.2	1.0
Tetrahydrofuran	EPA 524.2	5.0
Toluene	EPA 524.2	0.50
m.p-Xylene	EPA 524.2	0.50
o-Xylene	EPA 524.2	0.50

8. Attachments

Attachment F
Practical Quantitation Limits

Organic Hazardous Waste Analyses

EPA 8081A	Aqueous	Solid Waste
Analyte	**ug/L**	**mg/kg**
Aldrin	0.010	0.0050
α-BHC	0.010	0.0050
β-BHC	0.050	0.0050
γ BHC(Lindane)	0.010	0.0050
δ-BHC	0.050	0.0050
Chlordane	0.050	0.20
4,4'-DDD	0.020	0.0050
4,4'-DDE	0.020	0.0050
4,4'-DDT	0.020	0.0050
Dieldrin	0.010	0.0050
Endosulfan I	0.010	0.0050
Endosulfan II	0.020	0.0050
Endosulfan sulfate	0.050	0.0050
Endrin	0.010	0.0050
Endrin aldehyde	0.050	0.0050
Heptachlor	0.020	0.0050
Heptachlor epoxide	0.020	0.0050
Kepone	1.0	1.0
Mirex	0.10	0.10
Methoxychlor	0.020	0.0050
Toxaphene	0.50	0.20

EPA 8082	Aqueous	Solid Waste	Oil
Analyte	**ug/L**	**mg/kg**	**mg/kg**
PCB 1016	0.20	0.20	1.0
PCB 1221	0.20	0.20	1.0
PCB 1232	0.20	0.20	1.0
PCB 1242	0.20	0.20	1.0
PCB 1248	0.20	0.20	1.0
PCB 1254	0.20	0.20	1.0
PCB 1260	0.20	0.20	1.0

8. Attachments

Attachment F
Practical Quantitation Limits

Organic Hazardous Waste Analyses (cont.)

EPA 8141A Aqueous		EPA 8151A Aqueous	
Analyte	**ug/L**	**Analyte**	**ug/L**
Azinphos ethyl	2.0	2,4-D	1.0
Azinphos methyl	2.0	Dalapon	6.0
Bolstar	1.0	2,4-DB	5.0
Chlorpyrifos	0.50	Dicamba	0.40
Coumaphos	2.0	Dichlorprop	1.0
Demeton-o	1.0	Dinoseb	1.0
Demeton-s	1.0	MCPA	300
Diazinon	0.50	MCPP	300
Dichlorvos	1.0	Pentachlorophenol	0.20
Dimethoate	2.0	Picloram	1.0
Disulfoton	0.50	2,4,5-T	0.50
EPN	1.0	2,4,5-TP (Silvex)	0.50
Ethion	0.50		
Ethoprop (Ethoprophos)	1.0		
Fensulfothion	2.0		
Fenthion	0.50		
Malathion	0.50		
Mevinphos	1.0		
Parathion	0.50		
Parathion-methyl	0.50		
Phorate	0.50		
Ronnel	0.50		
Simazine	0.50		
Stirofos	0.50		
Thionazin	1.0		
Tokuthion (Prothiofos)	1.0		
Trichloronate	1.0		

8. Attachments

Attachment F
Practical Quantitation Limits

Organic Hazardous Waste Analyses (cont.)

EPA 8260B Aqueous	Aqueous	Solid Waste
Analyte	**ug/L**	**mg/kg**
Acetone	5.0	0.70
Benzene	0.30	0.17
Bromobenzene	0.50	0.17
Bromochloromethane	0.50	0.17
Bromodichloromethane	0.50	0.17
Bromoform	0.50	0.17
Bromomethane	0.50	0.17
n-Butylbenzene	0.50	0.17
sec-Butylbenzene	0.50	0.17
tert-Butylbenzene	0.50	0.17
Carbon disulfide	0.50	NA
Carbon tetrachloride	0.50	0.17
Chlorobenzene	0.50	0.17
Chloroethane	0.50	0.17
Chloroform	0.50	0.17
Chloromethane	0.50	0.17
2-Chlorotoluene	0.50	0.17
4-Chlorotoluene	0.50	0.17
Dibromochloromethane	0.50	0.17
1,2-Dibromo-3-chloropropane	2.0	0.17
1,2-Dibromoethane (EDB)	0.50	0.17
Dibromomethane	0.50	0.17
1,2-Dichlorobenzene	0.50	0.17
1,3-Dichlorobenzene	0.50	0.17
1,4-Dichlorobenzene	0.50	0.17
Dichlorodifluoromethane	0.50	0.17
1,1-Dichloroethane	0.50	0.17
1,2-Dichloroethane	0.50	0.17
1,1-Dichloroethene	0.50	0.17
cis-1,2-Dichloroethene	0.50	0.17
trans-1,2-Dichloroethene	0.50	0.17
1,2-Dichloropropane	0.50	0.17
1,3-Dichloropropane	0.50	0.17
2,2-Dichloropropane	0.50	0.17
1,1-Dichloropropene	0.50	0.17
cis-1,3-Dichloropropene	0.50	0.17
trans-1,3-Dichloropropene	0.50	0.17
Ethylbenzene	0.50	0.17
Hexachlorobutadiene	0.50	0.17
2-Hexanone	5.0	NA
Isopropylbenzene	0.50	0.17
p-Isopropyltoluene	0.50	0.17

8. Attachments

Attachment F
Practical Quantitation Limits

Organic Hazardous Waste Analyses (cont.)

EPA 8260B Aqueous	Aqueous	Solid Waste
Analyte	**ug/L**	**mg/kg**
Methyl *tert* butyl ether	0.50	0.17
Methyl ethyl ketone	1.0	0.35
Methyl isobutyl ketone	1.0	0.35
Methylene chloride	0.50	0.17
Naphthalene	0.50	0.17
n-Propylbenzene	0.50	0.17
Styrene	0.50	0.17
1,1,1,2-Tetrachloroethane	0.50	0.17
1,1,2,2-Tetrachloroethane	0.50	0.17
Tetrachloroethene	0.50	0.17
Toluene	0.30	0.17
1,2,3-Trichlorobenzene	0.50	0.17
1,2,4-Trichlorobenzene	0.50	0.17
1,1,1-Trichloroethane	0.50	0.17
1,1,2-Trichloroethane	0.50	0.17
Trichloroethene	0.50	0.17
Trichlorofluoromethane	0.50	0.17
Trichlorotrifluoroethane	0.50	0.17
1,2,3-Trichloropropane	0.50	0.17
1,2,4-Trimethylbenzene	0.50	0.17
1,3,5-Trimethylbenzene	0.50	0.17
Vinyl acetate	1.0	NA
Vinyl chloride	0.50	0.17
m,p-Xylene	0.50	0.35
o-Xylene	0.50	0.17
Xylenes (total)	0.50	0.35

EPA 8260B Appendix II Aqueous Additional Analytes			
Analyte	**ug/L**	**Analyte**	**ug/L**
Acetonitrile	100	Ethyl tert butyl ether	1.0
Acrolein	5.0	Hexachloroethane	1.0
Acrylonitrile	5.0	2-Hexanone	5.0
Allyl chloride	10	Isobutanol	100
Carbon disulfide	5.0	Methacrylonitrile	1.0
Chloroprene	1.0	Methyl iodide	2.0
trans-1,4-Dichloro-2-butene	5.0	Methyl methacrylate	1.0
Di-isopropyl ether	0.50	Proprionitrile	50
Ethanol	50	Tert amyl methyl ether	0.50
Ethyl methacrylate	10		

8. Attachments

Attachment F
Practical Quantitation Limits

Organic Hazardous Waste Analyses (cont.)

EPA 8270C Aqueous	Aqueous	Solid Waste
Analyte	**ug/L**	**mg/kg**
Acenaphthene	10	0.062
Acenaphthylene	10	0.062
Anthracene	10	0.062
Benzidine	50	1.6
Benzo(a)anthracene	10	0.33
Benzo(a)pyrene	10	0.062
Benzo(b)fluoranthene	10	0.062
Benzo(g,h,i)perylene	10	0.062
Benzo(k)fluoranthene	10	0.062
Benzoic acid	50	1.6
Benzyl alcohol	20	0.66
Bis(2-chloroethoxy) methane	10	0.33
Bis(2-chloroethyl) ether	10	0.33
Bis(2-chloroisopropyl) ether	10	0.33
Bis(2-ethylhexyl) phthalate	10	0.33
4-Bromophenyl phenyl ether	10	0.33
Butylbenzyl phthalate	10	0.33
4-Chloro-3-methylphenol	10	0.33
4-Chloroaniline	20	0.66
2-Chloronaphthalene	10	0.33
2-Chlorophenol	10	0.33
4-Chlorophenyl phenyl ether	10	0.33
Chrysene	10	0.062
Di-n-butyl phthalate	10	0.33
Di-n-octyl phthalate	10	0.33
Dibenz(a,h)anthracene	10	0.062
Dibenzofuran	10	0.33
1,2-Dichlorobenzene	10	0.33
1,3-Dichlorobenzene	10	0.33
1,4-Dichlorobenzene	10	0.33
3,3'-Dichlorobenzidine	20	0.66
2,4-Dichlorophenol	10	0.33
Diethyl phthalate	10	0.33
Dimethyl phthalate	10	0.33
2,4-Dimethylphenol	10	0.33
4,6-Dinitro-2-methylphenol	50	1.6
2,4-Dinitrophenol	50	1.6
2,4-Dinitrotoluene	10	0.33
2,6-Dinitrotoluene	10	0.33

8. Attachments

Attachment F
Practical Quantitation Limits

Organic Hazardous Waste Analyses (cont.)

EPA 8270C Aqueous	Aqueous	Solid Waste
Analyte	**ug/L**	**mg/kg**
1,2-Diphenylhydrazine	10	
Fluoranthene	10	0.062
Fluorene	10	0.062
Hexachlorobenzene	10	0.33
Hexachlorobutadiene	10	0.33
Hexachlorocyclopentadiene	15	1.6
Hexachloroethane	10	0.33
Indeno(1,2,3-cd) pyrene	10	0.062
Isophorone	10	0.33
2-Methylnaphthalene	10	0.062
2-Methylphenol	10	0.33
3/4-Methylphenol	10	0.33
N-Nitrosodi-n-propylamine	10	0.33
N-Nitrosodimethylamine	5	0.66
N-Nitrosodiphenylamine	10	0.33
Naphthalene	10	0.062
2-Nitroaniline	50	1.6
3-Nitroaniline	50	1.6
4-Nitroaniline	50	1.6
Nitrobenzene	10	0.33
2-Nitrophenol	10	1.6
4-Nitrophenol	50	1.6
Pentachlorophenol	50	1.6
Phenanthrene	10	0.062
Phenol	10	0.33
Pyrene	10	0.062
1,2,4-Trichlorobenzene	10	0.33
2,4,5-Trichlorophenol	10	0.33
2,4,6-Trichlorophenol	10	0.33

Fuels

Analyte	Method	Aqueous (ug/L)	Soil (mg/kg)
Diesel	EPA 8015B	250	1.0
Motor Oil	EPA 8015B	250	2.0
Gasoline	EPA 8260B	50	-

8. Attachments

Attachment G
Major Instrumentation

Organics

Instrument	Description	LIMS Code
GCMS-VOA	Agilent 6890N gas chromatograph with 5973 mass spectrometer and volatiles interface, Tekmar LSC3000 purge and trap, Archon autosampler, and HP Chemstation chromatography data system.	GCMS1
GCMS-SVOA	Agilent 6890N gas chromatograph with 5973 mass spectrometer, Agilent 7683 autosampler, and HP Chemstation chromatography data system.	GCMS3
GCMS-VOA	Agilent 7890A gas chromatograph with 5975 mass spectrometer and volatiles interface, OI Eclipse 4660 purge and trap, Archon autosampler, and HP Chemstation chromatography data system.	GCMS4
GCMS-SVOA	Agilent 7890A gas chromatograph with 5975 mass spectrometer, Agilent 7693 autosampler, and HP Chemstation chromatography data system.	GCMS5
GCMS-VOA	Agilent 7890A gas chromatograph with 5977A mass spectrometer, OI Eclipse 4660 purge and trap, Archon autosampler, and HP Chemstation chromatography data system.	GCMS6
GC-FID	Agilent 7890A gas chromatograph with FID and cool-on-column injector, Agilent 7693 autosampler, and HP Chemstation chromatography data system.	HPdiesel2
GC-ECD	Agilent 6890N gas chromatograph with dual ECDs, Leap CombiPAL autosampler, and HP Chemstation chromatography data system.	HPdECD2
GC-ECD	Agilent 7890A gas chromatograph with dual ECDs and inlets, Agilent 7693 autosampler, and HP Chemstation chromatography data system.	HPdECD3
GC-ECD	Agilent 7890A gas chromatograph with dual ECDs, Agilent 7693 autosampler, and HP Chemstation chromatography data system.	HPdECD4
GC-NP	Agilent 6890N gas chromatograph with dual nitrogen-phosphorus detectors, Agilent 7683 autosampler and HP Chemstation chromatography data system.	HPdNPD1
HPLC	Agilent 1100 high performance liquid chromatograph with fluorescence and diode array detectors, Pickering Pinnacle post-column derivatization system, and HP Chemstation chromatography data system.	HPLC1

GC-ECD: Gas chromatograph with electron capture detector
GC-FID: Gas chromatograph with flame ionization detector
GC-NP: Gas chromatograph with nitrogen-phosphorus detector
GCMS-SVOA: Gas chromatograph with mass spectrometer for semi-volatile organics analysis
GCMS-VOA: Gas chromatograph with mass spectrometer for volatile organics analysis
HPLC: High-performance liquid chromatograph

8. Attachments

Attachment G
Major Instrumentation

Inorganics

Instrument	Description	LIMS Code
Balance	Precisa XT220A analytical balance.	XT220A
CVAAS	Cetac mercury analyzer, model M7500 with ASX-520 autosampler and QuickTrace data acquisition system.	M7500
DO Meter	YSI oxygen meter, model 58.	DOYSI
DO Meter	YSI oxygen meter, model 57.	NONE
EC Meter	YSI conductance meter, model 3200.	ECYSI
Flash tester	Pensky Martens closed-cup flash tester	Pensky
Fluorometer	Sequoia-Turner model 450 fluorometer.	ST450
IC	Metrohm 761 Compact ion chromatograph with autosampler and data system.	IC761
IC	Metrohm 821 ion chromatograph with autosampler and data system.	IC820
IC	Metrohm 881 ion chromatograph with UV/VIS detector, autosampler, and MagicNet data system.	IC881
IC	Metrohm 930 ion chromatograph with autosampler and MagicNet data system	IC930
ICPAES	Perkin Elmer Optima 7300DV simultaneous ICP with Perkin-Elmer S10 autosampler, and WinLab32 data acquisition system.	PE7300
ICPMS	Perkin Elmer Sciex ELAN6100 ICPMS with AS93Plus autosampler and ELAN 3.3 data acquisition software	ELAN
ICPMS	Perkin Elmer Sciex ELAN DRCII ICPMS with S10 autosampler and ELAN 3.4 data acquisition software	ELANDRC
pH Meter	ThermoScientific Orion Star LogR pH meter (Serial# L00628)	pHSTAR2
pH Meter	ThermoScientific Orion Star LogR pH meter (Serial# L00777)	pHSTAR3
pH Meter	Thermo Orion pH/ISE 710A meter.	pH710
SPEC	Lachat QuikChem 8500 Series 2 autoanalyzer with ASX 520 Series autosampler, Lachat micro-distillation system, and Omnion3.0 data acquisition software.	Lachat
SPEC	Genesys Spectronic 20 spectrophotometer.	SPEC20
SPEC	Hach DR2800 spectrophotometer.	DR2800
SPEC	Milton Roy Spectronic 20 spectrophotometer.	MRSPEC
Turbidimeter	HF Scientific Micro 100 turbidity meter.	HF100
UVIR	Teledyne Tekmar Phoenix 8000 UV-persulfate total organic carbon (TOC) analyzer	P8000

CVAAS: Cold-vapor atomic absorption spectrometer
EC Meter: Electric conductivity meter
DO Meter: Dissolved oxygen meter
GFAAS: Graphite-furnace atomic absorption spectrometer
IC: Ion chromatograph
ICPAES: Inductively-coupled plasma atomic emission spectrometer
ICPMS: Inductively-coupled plasma mass spectrometer
SPEC: Spectrophotometer
UVIR: Ultra-violet infra-red TOC analyzer

9. Revisions

Revisions from 16.01 to 17.00: Effective Date March 13, 2015

General:	Add signatures to title page.
	Change <6 deg C to ≤6 deg C throughout document.
Section 1:	Change ELAP reference from CDPH to SWRCB
Section 2:	Update number of employees
	Update Lab Director reference in 2.2.A to President.
Section 4:	Change method references from methods to regulatory sources.
Attachment C:	Include new laboratory addresses on chain of custody.
Attachment D:	Change references from volumes of preservatives to pH required.
	Update preservation, filtration, and/or hold time requirements on fluoride, orthophosphate, dissolved oxygent, pH, PCBs by EPA 6098, PCBs in oil by EPA 8082, bromate, bromide, chlorate, chlorite, radon, sulfite, and subcontracted Pharmaceutical Pollutants.
	Update hold time for tributyltin (7 days per Enviromatrix, unspecified per McCampbell Analytical).
	Correct SW846 method versions.
Attachment E:	Add, update, and remove SOPs as needed.
Attachment F:	Update phenolics reporting limit.
	Remove graphite furnace references.
	Add arsenic and selenium by ICP, hexavalent chromium by EPA 218.6, mirex and kepone by EPA 8081A, and picloram by EPA 8151A.

Revisions from 17.00 to 18.00: Effective Date July 15, 2016

Section 1.2.1:	Remove reference to MSDSs.
Section 2.1:	Update organizational chart and numbers of employees.
	Replace references to “Laboratory Directors” with “Section Managers”
Section 2.2.C:	Replace “Laboratory Directors” with “Section Managers”
	Add “technicians” (2.2.C.2)
Section 3.5.1:	Update work order number and year.
Section 4.2.1:	Update description of MDL spike levels.
Section 4.3.8:	Replace “Laboratory Directors and Sample Control” with “Section”
Section 5.4.2:	Change “re-extracted” to “re-prepared and reanalyzed”.
Section 6.1:	Add “or pre-printed worksheet”.
Section 6.2.2:	Change “Laboratory Directors” to “Section Managers” and “QAQC Officer” to “Quality Manager”.
Section 7.5:	Add location of organics MSDSs.
Attachment D:	Update descriptions, preservation, container, or method requirements on coliform, chloramines, chlorine (residual), cyanide (total), oil and grease, perchlorate, silica, solids (fixed and volatile), sulfide, turbidity, aqueous metals (total and dissolved), 1,2,3-trichloropropane, dioxins, 7 oxygenates, asbestos (soil), and sulfite.
	Move bromate, bromide, chlorate, and chlorite from subcontracted to wet chemistry.\
	Move Cr(VI) in soil from metals to subcontracted.
	Add formaldehyde to subcontracted.
	Replace “extraction” with “leaching” in TCLP table.
	Remove UCMR3 table.
Attachment E:	Add, update, and remove SOPs as needed.

APPENDIX C

Chain of Custody Form

Alpha Analytical Laboratories Inc.
www.alpha-labs.com
WATERS, SEDIMENTS, SOLIDS

Corporate Laboratory
208 Mason Street, Ukiah CA 95482
707-468-0401 F) 707-468-5267
email: clientservices@alpha-labs.com

ELAP Certifications
Ukiah 1551 / Dublin 2728 / Elk Grove 2922

Bay Area Laboratory
6398 Dougherty Rd #35, Dublin CA 94568
925-828-6226 F) 925-828-6309

Central Valley Laboratory
9090 Union Park Way #113, Elk Grove CA 95624
916-686-5190 F) 916-686-5192

Chain of Custody - Work Order

Reports and Invoices delivered by email in PDF format

Lab No _____ Pg _____ of _____

Report to	Invoice to (if different)	Project Information
Company:	Contact:	Project ID:
Attn:	Email address:	Project No:
Address:	Address:	PO Number:
Phone/Fax:	Phone/Fax:	
Email Address:		

Signature below authorizes work under terms stated on reverse side.

TAT
Standard 10 days ●
RUSH:
5 days ○
48 hours ○
Other: ____days ○
Lab preapproval required

Temp upon Receipt ºC
Ukiah temp:
Dublin temp:
Elk Grove temp:

Field Sampler - Printed Name & Signature:

Sample Identification	Sampling Date	Sampling Time	Container: 40ml Vial	Container: Poly	Container: Glass	Container: Sleeve	Container: Other	Preservative: HCl	Preservative: HNO3	Preservative: H2SO4	Preservative: Other	Preservative: None	Matrix: DW	Matrix: Soil	Matrix: Other	Total Number of Containers per Sample ID	Analysis Request	Sample Notes or CDPH Source Numbers:

Relinquished by	Received by	Date	Time

CDPH Write On EDT Transmission? ○ Yes ○ No

State **System** Number: _____

If "Y" please enter the Source Number(s) in the column above

CA Geotracker EDF Report? ○ Yes ○ No

Global ID: Sampling Company Log Code:

EDF to (Email Address):

Travel and Site Time:	Mileage:	Misc. Supplies:

APPENDIX D

References

California Regional Water Quality Control Board, Central Valley Region. 2014. Resolution R5-2014-0041. *Amendment to the Water Quality Control Plan or the Sacrament River and San Joaquin River Basins for the Control of Diazinon and Clorpyrifos Discharges.* March, 2014.

California Water Code 13267 Order from the Central Valley Regional Water Quality Control Board on March 27, 2017 to participate in Delta Water Quality Monitoring by joining the Delta Regional Monitoring Program (Delta RMP).

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