QUALITY ASSURANCE PROJECT PLAN

REC-1 Beneficial Use in Agua Hedionda Lagoon

Prepared for the Agua Hedionda Lagoon Responsible Agencies:

City of Carlsbad
City of Vista
County of San Diego

Prepared by:

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Contract Number: PSA21-1527ENV

August 2021

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GROUP A ELEMENTS: PROJECT MANAGEMENT

1. TITLE AND APPROVAL SHEET

Quality Assurance Project Plan

REC-1 Beneficial Use in Agua Hedionda Lagoon

August 2021

Approval Sheet

Title	Name	Signature	Date
City of Carlsbad			
Senior Program Manager	Tim Murphy	Tim Murphy	09/30/2021
City of Vista			
Environmental Specialist II	Jillian Amaya	Jillian Amaya	10/4/2021
County of San Diego			
Water Resources Manager	Jo Ann Weber	Jo Ann Weber Digitally signed by Jo Ann Weber Date: 2021.10.04 08:47:38 -07'00'	
Weston Solutions			
Project Manager	Alexander Schriewer, PhD	Alexander Schriewer	09/29/2021
QA Officer	Satomi Yonemasu	Satomi Yonemasu	09/30/2021

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List of Acronyms and Abbreviations

Basin Plan	Water Quality Control Plan for the San Diego Basin
CEDEN	California Environmental Data Exchange Network
COC	chain-of-custody
DQO	data quality objective
EDD	electronic data deliverable
ELAP	Environmental Laboratory Accreditation Program
EWA	Encina Wastewater Authority
GPS	global positioning system
HA	hydrologic area
ID	identification
Lagoon	Agua Hedionda Lagoon
Lagoon IO	Investigative Order No. 2006-076
MDL	method detection limit
MQO	measurement quality objective
NA	not applicable
PWQC	priority water quality condition
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RA	Responsible Agency
Regional Water Board	San Diego Regional Water Quality Control Board
REC-1	contact water recreation
RL	reporting limit
RPD	relative percent difference
SM	Standard Methods
SOP	standard operating procedure
Study	Agua Hedionda Lagoon Bacteria Special Study
SWAMP	Surface Water Ambient Monitoring Program
USEPA	United States Environmental Protection Agency
WMA	Watershed Management Area
WQIP	Water Quality Improvement Plan
WQO	water quality objective

Units of Measure

°C	degrees Celsius
CFU	colony forming units per 100 milliliters
µS/cm	micro Siemens per centimeter
mL	milliliters
NTU	nephelometric turbidity unit
%	percent

3. DISTRIBUTION LIST

Table 3-1 identifies those individuals who will oversee the implementation of the approved Quality Assurance Project Plan (QAPP). Copies of the QAPP will be submitted via electronic format to the key personnel listed in Table 3-1. These individuals will then be responsible for distributing this QAPP to their respective staff.

Table 3-1. Quality Assurance Project Plan Distribution List

Title	Name (Affiliation)	Telephone No.	QAPP Version No.
Senior Program Manager	Tim Murphy (City of Carlsbad)	(760) 594-4077	1.0
Environmental Specialist II	Jillian Amaya (City of Vista)	(760) 643-5412	1.0
Water Resources Manager	Jo Ann Weber (County of San Diego)	(858) 495-5317	1.0
Project Manager	Alexander Schriewer, PhD (WESTON)	(760) 795-6957	1.0
QA Officer	Satomi Yonemasu (WESTON)	(760) 795-6907	1.0
Field Sampling Lead	Kyle Clouthier (WESTON)	(760) 795-6903	1.0
Laboratory Manager/ QA Officer	Jeff Parks (Encina Wastewater Authority)	(760) 268-8801	1.0

4. PROJECT/TASK ORGANIZATION

4.1 Involved Parties and Roles

This section of the QAPP describes individuals and their respective roles for this project. Table 4-1 provides a summary of individuals, their key roles, and contact information. Figure 4-1 is an organizational chart showing the roles and lines of communication between key individuals.

City of Carlsbad Senior Program Manager: Tim Murphy will serve as the City of Carlsbad's Senior Program Manager. He will be responsible for oversight of the monitoring program, coordination with WESTON on field activities and schedules, technical review of plans and reports, and approving invoices for payment.

WESTON Project Manager: Alexander Schriewer, PhD, will serve as WESTON's Project Manager. He will be responsible for all aspects of project implementation, including scheduling and implementation of field monitoring activities, coordination with the laboratory, overseeing budgetary expenses, and technical review of plans and reports.

WESTON Assistant Project Manager: Amy Margolis will serve as WESTON's Assistant Project Manager. She will assist Mr. Schriewer with scheduling and implementation of field monitoring activities, coordination with the laboratory, oversight of budgetary expenses, and technical review of plans and reports.

WESTON Field Sampling Lead: Kyle Clouthier will serve as the WESTON Field Sampling Lead. He will be responsible for field team efforts and provide oversight for all field activities including developing field schedules, coordinating field staff, maintaining equipment utilized for sampling, conducting the sampling, ensuring samples are delivered to the laboratory with proper documentation and sample preservation, and maintaining field records associated with each monitoring task.

WESTON Quality Assurance (QA) Officer: Satomi Yonemasu will serve as the WESTON QA Officer. She will be responsible for guaranteeing the overall QA and quality control (QC) procedures and will ensure that data reported by WESTON have been generated in compliance with the appropriate protocols. Ms. Yonemasu will report all findings to the WESTON Project Manager, including all requests for corrective actions. If there is evidence of significant deviations from protocols stated in this QAPP or if there is evidence of systematic failure, Ms. Yonemasu has the authority to stop all activities until corrective actions can be documented and performed.

Encina Wastewater Authority (EWA) Laboratory Manager/QA Officer: Jeff Parks will serve as the EWA Laboratory Manager and QA Officer. Mr. Parks will be responsible for coordination of laboratory staff to conduct *Enterococcus* analysis and coordination with the WESTON Project Manager for scheduling, and invoicing of laboratory charges. He will also be responsible for all analyses conducted by the laboratory and will ensure that the QAPP guidelines are being met.

Table 4-1. Personnel Responsibilities and Contact Information

Name	Organizational Affiliation	Title	Contact Information (telephone number and email address)
Tim Murphy	City of Carlsbad	Senior Program Manager	(760) 594-4077 Tim.Murphy@carlsbadca.gov
Alexander Schriewer, PhD	Weston Solutions, Inc.	Project Manager	(760) 795-6957 Alexander.Schriewer@westonsolutions.com
Kyle Clouthier	Weston Solutions, Inc.	Field Sampling Lead	(760) 795-6903 Kyle.Clouthier@westonsolutions.com
Satomi Yonemasu	Weston Solutions, Inc.	Laboratory QA Officer	(760) 795-6907 Satomi.Yonemasu@westonsolutions.com
Jeff Parks	Encina Wastewater Authority	Laboratory Manager/ QA Officer	(760) 268-8801 jparks@encinajpa.com

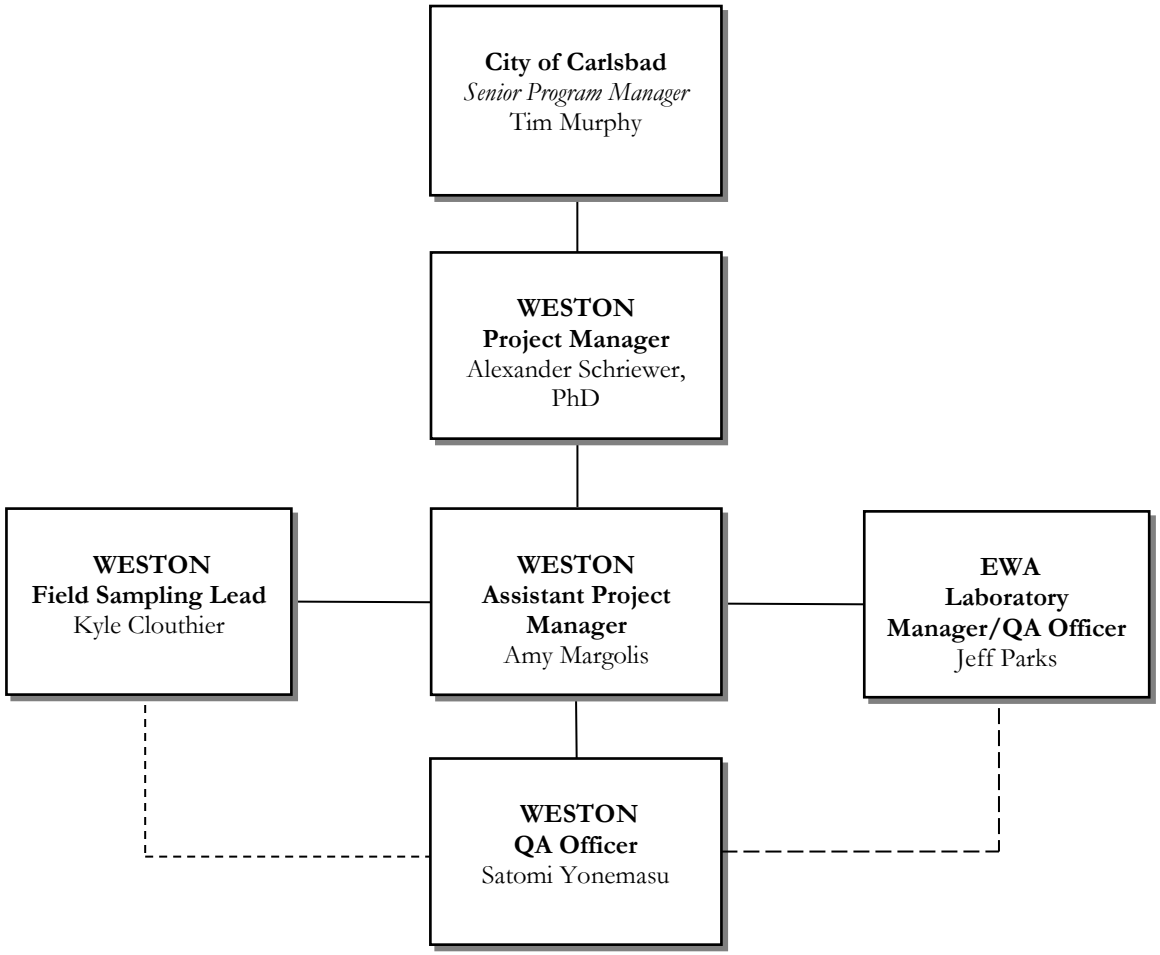

Figure 4-1. Organizational Chart

4.2 Quality Assurance Officer Role

The WESTON QA Officer will be responsible for maintaining the QAPP and ensuring that personnel listed in Element 3 have the most recent version of the QAPP. The QA Officer will ensure that project staff understand and perform all QA/QC procedures related to field sample collection, laboratory analysis, and data analysis according to QAPP requirements throughout the duration of this project.

4.3 Persons Responsible for QAPP Update and Maintenance

Changes and updates to this QAPP may be made after a review of the evidence for change by WESTON's Project Manager and QA Officer with the concurrence of the City of Carlsbad Senior Program Manager. WESTON's Project Manager, with input from the QA Officer, will be responsible for making the changes, submitting drafts for review, preparing a final amended copy, and submitting the final version for signature.

5. PROBLEM DEFINITION/BACKGROUND

5.1 Problem Statement

Agua Hedionda Lagoon (Lagoon) is located within the Agua Hedionda hydrologic area (HA) of the Carlsbad Watershed Management Area (WMA) and consists of three basins (i.e., Inner, Middle, and Outer) separated by Interstate 5, the railroad, and Highway 101. On its west side, the Lagoon maintains a permanent opening with the Pacific Ocean through which it receives tidally influenced saltwater flows. Agua Hedionda Creek enters the Lagoon on its east side and is the Lagoon's primary freshwater input. The Contact Water Recreation (REC-1) beneficial use is applicable in all three basins of the Lagoon, but recreational activities typically occur in the Inner Basin. Swimming and wading are expressly prohibited, as stated in signage posted around the Lagoon. However, other recreational activities are popular including boating, kayaking, and stand up paddle boarding.

Bacteria concentrations in the Lagoon have historically met water quality objectives (WQOs) established to protect the REC-1 beneficial use. In 2010, the Lagoon was removed from the Clean Water Act Section 303(d) List of impaired water bodies based on data collected in response to Investigative Order No. 2006-076 (the Lagoon IO; MACTEC, 2009). However, in response to concerns expressed by the California Regional Water Quality Control Board, San Diego Region (Regional Water Board), the Agua Hedionda Agencies (RAs)[1] re-evaluated the REC-1 beneficial use in the Lagoon in 2020, resulting in the elevation of bacteria and the associated REC-1 beneficial use to a priority water quality condition (PWQC).

The Agua Hedionda Lagoon Bacteria Special Study (Study) described in this QAPP and the associated monitoring plan (Larry Walker Associates, 2021) was designed to meet the requirements of *WQIP Appendix I: Agua Hedionda Phased Approach Information and Draft Monitoring Framework: REC-1 Beneficial Use in Agua Hedionda Lagoon – Phase I.* The Study will guide the monitoring and assessment to support implementation of Phase 1 of the RAs' strategy for addressing the REC-1 bacteria PWQC.

5.2 Decisions or Outcomes

The outcome for this monitoring program will be an assessment of whether water quality conditions in the Inner Basin of the Lagoon support REC-1 beneficial uses. To make this determination, the Study will answer the assessment question "Are exceedances of the geometric mean standard for *Enterococcus* in the Inner Basin below the 303(d) listing threshold?".

5.3 Water Quality or Regulatory Criteria

Table 5-1 lists the constituents that will be monitored as part of the Study, their associated water quality criteria, and the applicable analytical quantitation limits. These include in-situ measurements of water temperature, specific conductivity/salinity, turbidity, and pH). Water samples will be collected and analyzed for *Enterococcus*.

[1] The Agua Hedionda RAs include the City of Carlsbad, City of Vista, and the County of San Diego.

Table 5-1. Field and Analytical Parameters

Parameter	Water Quality Criteria	Source	Target Reporting Limit
Field Parameters			
pH	6.5 - 8.5 pH units	Basin Plan	0.5 units
Temperature	NA	NA	0.1 °Celsius
Conductivity	NA	NA	0.5 µS/cm
Turbidity	20 NTU	Basin Plan	5 NTU
Analytical Parameters			
Enterococcus	Six-week geometric mean of 30 CFU/100 mL	Basin Plan[1]	1 CFU/100 mL[1]

µS/cm – micro Siemens per centimeter; NTU – nephelometric turbidity unit; CFU/100 mL – colony forming units per 100 milliliters; NA- not applicable

1 - Established by the Statewide Bacteria Provisions (Bacteria Provisions) (State Water Resources Control Board and California EPA, 2018) and adopted into the Basin Plan (Regional Water Board, 2016) as Resolution R9-2020-0254.

2 – Reporting limit may change depending on dilution required to generate valid results. Typical reporting limit for the Lagoon is 4-10 CFU/100 mL.

6. PROJECT/TASK DESCRIPTION

6.1 Work Statement and Produced Products

Water quality monitoring at receiving water locations in the Inner Basin of the Lagoon will occur on a weekly basis at approximately the same time on the same day of the week for each event. A grab sample will be analyzed for *Enterococcus* and field parameters (water temperature, specific conductivity/salinity, turbidity, and pH) will be measured in situ following the collection of the grab sample.

Monthly summaries of monitoring activities and results data deliverables will be provided to the City of Carlsbad Project Manager and the RAs. A report presenting the findings of the Study will be presented to the RAs for review. Upon review by the RAs, comments will be incorporated and the report will be finalized for inclusion in the 2021-2022 Water Quality Improvement Plan (WQIP) Annual Report.

6.2 Constituents to be Monitored and Measurement Techniques

Monitoring locations will be photographed to provide additional information and documentation of site conditions. In-situ physical measurements of water temperature, specific conductivity/salinity, turbidity, and pH will be collected at each site using a YSI 6920 multi-parameter sonde (or similar). Visual observation and field measurement data will be entered onto a field log or into an electronic database. These observations are intended to provide a general assessment of the site and include variables such as odor, water clarity, presence or absence of floatable matter, visible deposits/ stains, vegetative density, and biological status.

EWA, an Environmental Laboratory Accreditation Program (ELAP)-certified laboratory (Certification No. 1441), will analyze samples for *Enterococcus*. Table 6-1 lists the monitored constituents and methods. The laboratory will conduct the appropriate dilutions to generate results, avoid data qualifiers, and achieve the desired reporting limits (RLs). To ensure that a countable plate is obtained, four dilutions will be analyzed for each sample. If initial results indicate that fewer dilutions are sufficient to provide consistent enumeration of *Enterococcus*, a reduction in the number of dilutions required during dry weather events will be considered. In determining appropriate dilution volumes, the laboratory will consider the factors influencing the sample (e.g., turbidity, wet vs. dry weather, potential marine vs. freshwater influence). Element 13 provides additional discussion of the analytical methods. EWA's procedures for analysis of *Enterococcus* are included in their QA/QC Methods Manual (Appendix 4).

Table 6-1. Monitored Constituents

Laboratory	Parameter	Method
In situ	pH	YSI 6920, or similar
	Temperature	
	Conductivity/Salinity	
	Turbidity	
Encina Wastewater Authority	*Enterococcus*	EPA 1600/SM 9230 C

6.3 Project Schedule

Table 6-2 details the monitoring and reporting schedule for the Study, including initiation and completion dates for major tasks, required deliverables, and each deliverable's due date. Monitoring will be conducted weekly from October 2021 through September 2022 (potential constraints discussed in Section 6.5).

Monthly data deliverables will be provided to the City of Carlsbad and the RAs in electronic format and will include a summary of monitoring activities and results. A Draft Report will be submitted to the RAs in November of 2022. Assuming one round of comments from the RAs, a Final Report will be submitted with the 2021-2022 WQIP Annual Report due on January 31, 2023. Data included in the report will be submitted to the California Environmental Data Exchange Network (CEDEN) prior to January 31, 2023.

Table 6-2. Agua Hedionda Lagoon Bacteria Special Study Monitoring and Reporting Schedule

Task	Anticipated Start Date	Anticipated End Date
Monitoring Activities		
Sample Collection	October 2021	September 2022
Data Deliverables & Reporting Activities		
Monthly Summary	Monthly – varies	Monthly – varies
Draft Project Report	October 2022	November 2022
Final Project Report	December 2022	January 2023
Data Submittal to CEDEN	TBD	January 2023

CEDEN – California Environmental Data Exchange Network; TBD – to be determined

6.4 Geographical Setting

The Carlsbad WMA (hydrologic unit 904) comprises approximately 211 square miles. The WMA is bordered by the San Luis Rey River Watershed to the north and by the San Dieguito River Watershed to the south. It reaches inland nearly 24 miles to just northeast of Lake Wohlford. The Agua Hedionda HA is the third largest of the six HAs within the Carlsbad WMA. The HA extends approximately 10.6 miles inland from the coast and comprises about 18,800 acres in area (14 percent [%] of the WMA). Most of the HA is located within the City of Carlsbad (41%); the remainder is in Vista (24%), San Diego County (24%), and small portions in Oceanside and San Marcos. Over seventy percent (70%) of the Agua Hedionda HA is developed, with residential land uses comprising 33%. Twenty-nine % is open space or undeveloped).

6.5 Constraints

Weekly monitoring will occur year round, including during the wet weather season. Samples will generally be collected from shore (e.g., ankle or knee deep water) or from a kayak, depending on that week's sampling location. Storm events are likely to occur in the wet weather season (October through April) and may require the use of a larger vessel if operation of a kayak would be difficult or unsafe.

In the case that a sampling event cannot be conducted safely (e.g., access, severe weather), sampling will be conducted as soon as possible within the same week.

If field staff deem a site inaccessible (e.g., as a result of insufficient/absent water due to tidal fluctuations, lack of access to private property), the sampling team will move to the nearest location where sample collection is feasible, collect the sample, and document the coordinates of the modified location and reason for new sample location. The new location should be within 100 feet of the original sample location coordinates. If a new location within 100 feet cannot be sampled, the WESTON Project Manager will be notified, who will then notify the City of Carlsbad Senior Program Manager to determine the appropriate course of action.

The laboratory will employ multiple dilutions, if necessary, to increase the maximum quantification limit. However, method detection limits (MDLs) and RLs may increase as a result of those dilutions.

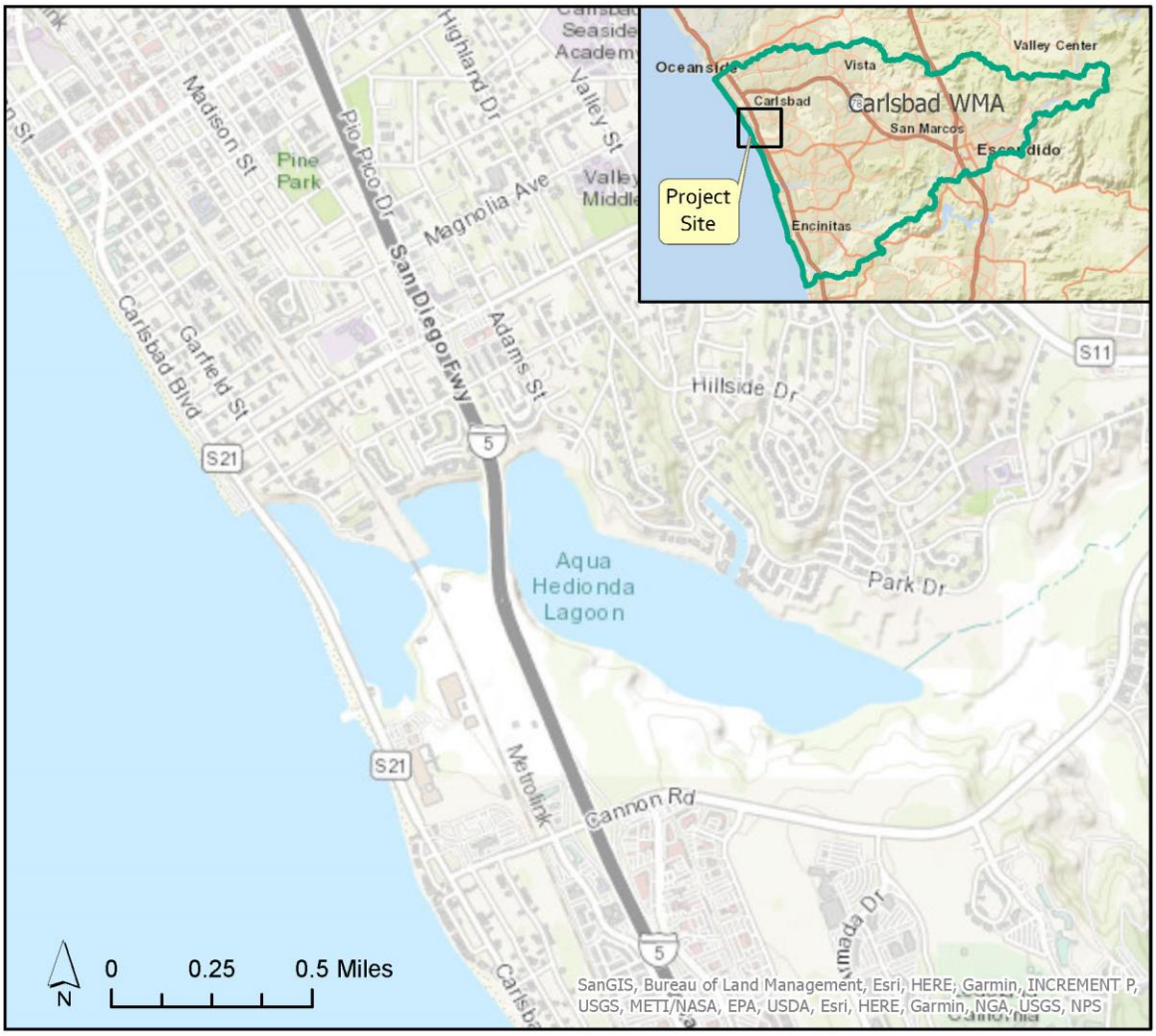

Figure 6-1. Location of Agua Hedionda Lagoon within the Carlsbad WMA

7. QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

7.1 Data Quality Indicators

Data quality indicators for field measurements and laboratory analyses, including accuracy, precision, and completeness, will be used to assess data quality for this monitoring program. These indicators and measurement quality objectives (MQOs) are used to determine the acceptable level of error in the data produced by the sampling program. Acceptance criteria will be based on the implementation of acceptable and recognized QA/QC procedures. Acceptable data must have been collected and analyzed using proper sample collection and handling methods, sample preparation and analytical procedures, holding times, stability issues, and QA protocols. The data quality indicators for the field measurements are summarized in Table 7-1, followed by a brief discussion of the objectives of each indicator.

Table 7-1. Applicable Measurement Quality Indicators

Measurement or Analysis Type	Applicable Measurement Quality Objective
Field measurements	Accuracy, Precision, Completeness

Accuracy
Accuracy (bias) is a measure of how closely the result or measurement represents the true quantity found in the sample. To achieve accuracy in field measurements, the YSI sonde will be calibrated before each sampling event and the sonde response will be verified to be within appropriate precision as shown in Table 7-2. Bias of field measurements will be controlled using best professional judgment to obtain representative samples that reflect field conditions.

Precision
Precision is the measure of agreement among repeated measurements of the same property under identical or substantially similar conditions calculated as either the range or as the standard deviation. Precision is determined by measuring replicate samples. 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 in duplicate. Duplicate samples are collected at a rate of at least 5% of the overall samples per study.

Completeness
Completeness is a measure of the percentage of sample results that are collected and analyzed and determined to be valid. Field personnel and the analytical laboratory will strive for 90% data completeness, which accounts for unexpected field conditions, equipment problems, and laboratory error.

The data quality objectives (DQOs) for field measurements are provided in Table 7-2. Field duplicate samples and field blank samples will be collected at a rate of at least 5% for field duplicates and field blanks, meeting or exceeding the Surface Water Ambient Monitoring Program (SWAMP) requirements of 5% frequency for field duplicates and once per method for field blanks.

Table 7-2. Measurement Quality Objectives for Field Data

Parameter	Accuracy (Unit)	Precision (Unit or RPD)	Completeness	Target Reporting Limit
pH	± 0.2 units	± 0.2 units	90%	0.5 units
Specific Conductivity	± 2 µS/cm	± 2 µS/cm or ± 10%	90%	0.5 µS/cm
Temperature	± 0.2 °C	± 1 °C or ± 10%	90%	0.1 °Celsius
Turbidity	± 1 NTU	± 1 NTU or ± 10%	90%	5 NTU

Source – State Water Resources Control Board, 2020; does not include a MQO for salinity measurements.
µS/cm – micro Siemens per centimeter; NTU – nephelometric turbidity unit; RPD – relative percent difference

SWAMP MQOs do not apply to marine indicator bacteria samples. EWA will follow their standard operating procedures (SOPs) and all QA requirements per the methodology used (see EWA QA/QC Methods Manual provided as Appendix 4). Any deviations will be documented in the analytical reports. Accuracy is evaluated through sterility checks, positive and negative controls using certified reference cultures for each lot of media received, and method blanks. Precision is evaluated through analysis of laboratory duplicates. Duplicate analyses are performed at least monthly.

7.2 Project Action Limits for Parameters of Interest

The 47 geometric means derived from the 52 weekly samples will be compared to the geometric mean standards for *Enterococcus* established by the Bacteria Provisions[2] and adopted into the Basin Plan as Resolution R9-2020-0254 (Regional Water Board, 2016). The number of geometric mean exceedances for *Enterococcus* in the Inner Basin of the Lagoon will be compared to the thresholds for impairment outlined in the *Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List* (Listing Policy) (State Water Resources Control Board, 2015). For a sample size of 47, less than 8 geometric mean exceedances would indicate that REC-1 beneficial uses are supported.

[2] *Part 3 of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California – Bacteria Provisions and a Water Quality Standards Variance Policy* (State Water Resources Control Board and California EPA, 2019).

8. SPECIAL TRAINING NEEDS/CERTIFICATION

8.1 Specialized Training or Certifications

Field personnel will have current and relevant experience in the aspects of standard field monitoring, including use of relevant field monitoring equipment, experience in the collection and handling/storage of samples, and chain-of-custody (COC) procedures. Prior to project initiation, techniques for proper field sampling and sample-handling will be reviewed, and only those staff with proficiency will be permitted to conduct field work.

EWA is certified by ELAP for the analyses of microbiology in recreational water (Certificate 1441). Laboratory analysts will be proficient in the use of analytical equipment, conducting analytical protocols, and other general laboratory processes. The QA Officer is responsible for distributing the most up-to-date QAPP for this monitoring project to the respective laboratory staff and ensuring that the staff understand and follow all SOPs and the QAPP for the duration of this study.

8.2 Training and Certification Documentation

Personnel are responsible for complying with QA/QC requirements that pertain to their organizational/technical function. Technical staff members must have a combination of experience and education to adequately demonstrate a specific knowledge of their particular function and a general knowledge of laboratory operations, test methods, QA/QC procedures, and records management. The EWA QA Officer will ensure that all laboratory staff is proficient at analyses applicable to this project. Training and certification documents for laboratory staff will be maintained by the Laboratory QA Officer, or their designee.

8.3 Training Personnel

The WESTON Project Manager and/or Field Sampling Lead will provide training for field personnel in proper field sampling techniques prior to work initiation to ensure consistent and appropriate sampling, sample handling/storage, and COC procedures. EWA's QA Officer will ensure that training is provided to the laboratory personnel for implementing standard laboratory procedures and maintaining proper documentation.

9. DOCUMENTS AND RECORDS

WESTON will document and track the aspects of the sample collection process, including COC forms for the samples collected. COC forms will accompany samples to the laboratory. The laboratory will document and track the aspects of receipt and storage, analyses, and reporting related to the samples.

WESTON will maintain a database of information collected during this project. The database will include field observations, data sheets, COC records, and analytical results. The original data sheets and reports produced will be housed in project-specific files maintained in file cabinets at the WESTON office after the report has been submitted. Electronic data will be stored in WESTON's internal electronic file system. Data from outside contractors are kept exactly as received. Records will be maintained for at least five years or transferred according to agreement between the company and the client.

WESTON's Project Manager (Mr. Schriewer) will be responsible for maintaining records for this project and will oversee the operations of the project, maintain the sample collection, sample transport, COC forms, and laboratory data. Mr. Schriewer will also arbitrate any issues relative to records retention and any decisions to discard records.

Copies of all records held by EWA will be provided to WESTON both electronically, in specified format, and by hard copy and stored in the project file.

Copies of this QAPP will be distributed to the parties identified previously in Element 3. Updates to this QAPP will be distributed in like manner, and previous versions will be discarded from the project file. WESTON's Project Manager (Mr. Schriewer) under the direction, supervision, and review of WESTON's QA Officer (Ms. Yonemasu), will be responsible for distributing an updated version of the QAPP.

Copies of the final deliverables, including laboratory results and field records, will be maintained for a minimum of five years after project completion.

GROUP B: DATA GENERATION AND ACQUISITION

10. SAMPLE PROCESS DESIGN

10.1 Sample Locations

To ensure that Study data collected are representative of the spatial variability of the Inner Basin of the Lagoon, a randomized approach was utilized to select monitoring locations. A rectangular grid was laid over the Inner Basin and potential monitoring locations were identified at the center of each grid cell. If a grid center point fell just outside of the Lagoon, the center point was moved to be within the Lagoon to avoid biasing sampling away from shoreline areas. Each grid center point was assigned an identification (ID) number between 1 and 60 (the total number of grid center points). Fifty-two numbers were then selected from within the range of the 60 grid center point ID numbers using a random number generator without replacement (i.e., sites could not be selected more than once). The 52 sites and coordinates are provided in Table 10-1, and sample locations are shown in Figure 10-1.

If collection of a sample is not possible at a selected location (e.g., as a result of insufficient/absent water due to tidal fluctuations, lack of access to private property), the sampling team should move to the nearest location where sample collection is feasible, collect the sample, and document the coordinates of the modified location and the reason for the new location. The new location should be within 100 feet of the original sample location coordinates.

Table 10-1. Monitoring Locations

Event (Week)	Latitude	Longitude
1	33.14142125	-117.3220245
2	33.13885883	-117.3208465
3	33.14456365	-117.3304726
4	33.14362564	-117.3274030
5	33.14329413	-117.3285457
6	33.14332070	-117.3254880
7	33.14392722	-117.3297003
8	33.13977710	-117.3262090
9	33.14135822	-117.3292864
10	33.14360568	-117.3296963
11	33.14009865	-117.3262130
12	33.14520340	-117.3308628
13	33.14048304	-117.3189551
14	33.14112942	-117.3185807
15	33.14360235	-117.3300785
16	33.14295927	-117.3300706
17	33.14421875	-117.3331442
18	33.14361567	-117.3285497
19	33.14299916	-117.3254841
20	33.14423877	-117.3308509

Table 10-1. Monitoring Locations

Event (Week)	Latitude	Longitude
21	33.14454029	-117.3331481
22	33.14048633	-117.3185729
23	33.14013839	-117.3216266
24	33.14012847	-117.3227732
25	33.14326414	-117.3319856
26	33.14393388	-117.3289358
27	33.13949861	-117.3212365
28	33.13886873	-117.3196999
29	33.14267430	-117.3258623
30	33.14134490	-117.3308152
31	33.14200130	-117.3292943
32	33.13948539	-117.3227653
33	33.14104001	-117.3289002
34	33.14301904	-117.3231908
35	33.14297591	-117.3281595
36	33.14425542	-117.3289398
37	33.14168642	-117.3285259
38	33.14776238	-117.3324234
39	33.14776906	-117.3316589
40	33.14044008	-117.3239237
41	33.14168309	-117.3289081
42	33.14489518	-117.3293299
43	33.13947545	-117.3239119
44	33.14648956	-117.3308786
45	33.14142786	-117.3212601
46	33.14233947	-117.3273872
47	33.14268425	-117.3247157
48	33.14327748	-117.3304568
49	33.14558806	-117.3236045
50	33.13914397	-117.3250546
51	33.14015490	-117.3197156
52	33.14326748	-117.3316034

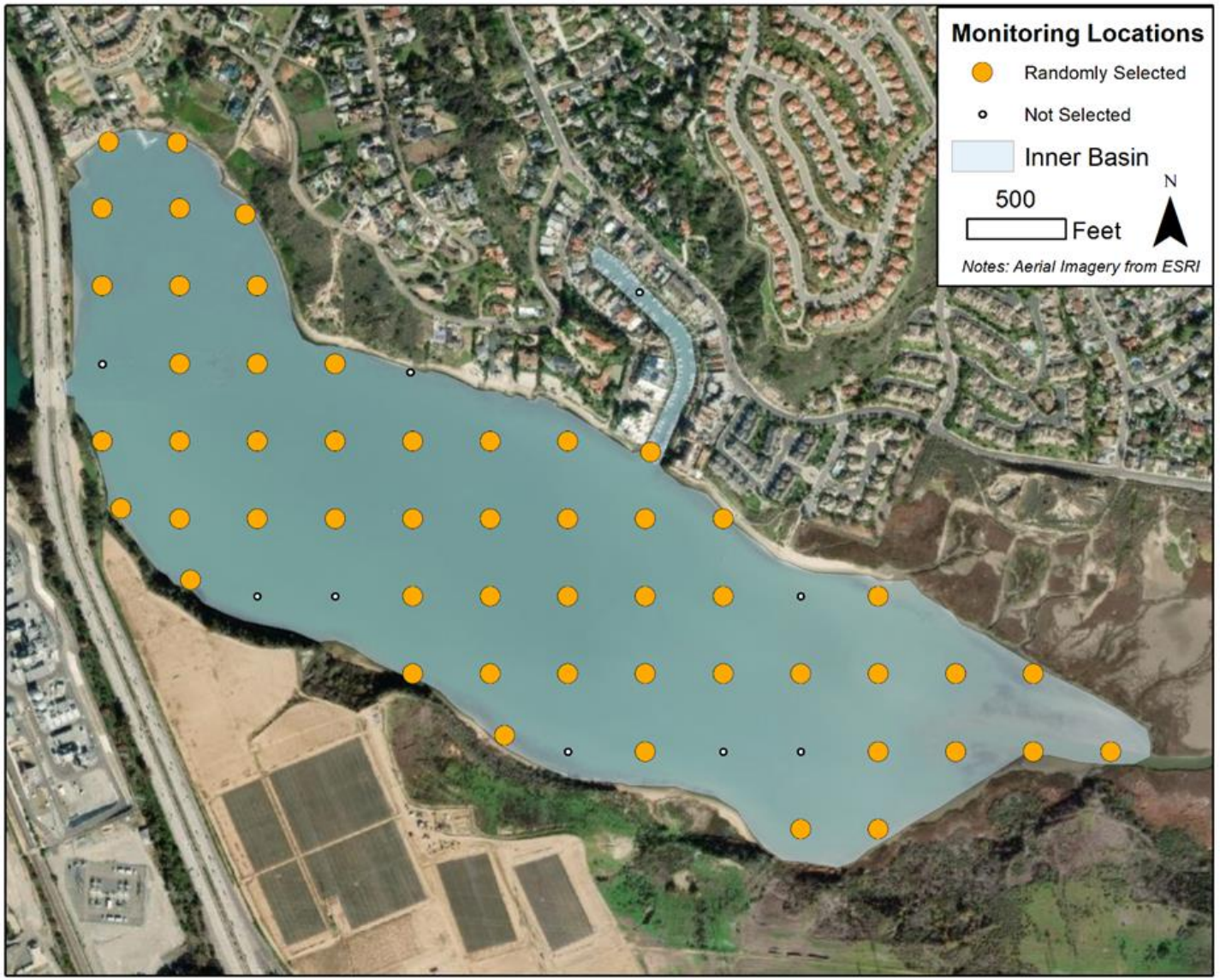

Figure 10-1. Agua Hedionda Lagoon Bacteria Special Study Sampling Locations

10.2 Variability and Bias

Natural variability may occur within a given sampling location. Proper sampling procedures will help minimize variability. Field personnel will follow United States Environmental Protection Agency (USEPA) guidance for collecting grab samples. Bottom sediments will be avoided, and care will be taken to avoid collection of uncharacteristic floating debris. Field duplicates will also be collected to assess variability.

Bias is defined as the systematic or persistent distortion of a measurement process that causes errors in one direction. Bias, with regard to sample collection, will be controlled using best professional judgment to obtain representative samples that reflect field conditions. Field blanks will also be used to measure potential contamination introduced during sample collection and handling.

11. SAMPLING METHODS

11.1 Sample Collection Schedule

Sampling will be conducted on a weekly basis for a period of one year. Sampling is expected to begin during the week of October 4, 2021, contingent upon Regional Water Board approval of the Study monitoring plan. Sampling will occur on the same day of the week and at approximately the same time every week, if feasible. In doing so, a random sampling of weather, tidal, and other conditions will be captured without giving undue weight to any one set of conditions. Samples will be collected in the morning (i.e., before noon) on Tuesdays. The precise time of sampling will be determined by the sampling team before monitoring begins based on logistical considerations but will generally be between 8 am and 11 am.

11.2 Sample Collection Techniques

On the pre-selected day of the week and time, the sampling team will mobilize to collect a sample at the pre-selected location for the week. Using a global positioning system (GPS) device, the sampling team will navigate to the coordinates noted in Table 10-1. Depending on the location, the sample may be collected from shore (e.g., ankle to knee deep water) or may require use of a kayak or a boat if conditions (e.g., storm) make use of a kayak difficult or unsafe. All vessels will display a valid lagoon use permit issued by the City of Carlsbad.

Once the sampling team has located the pre-determined sampling location, the team will take special care to ensure that clean samples will be collected in a manner appropriate for the specified analytical methods. Proper techniques for the collection of *Enterococcus* samples, outlined in this section, will ensure that the collected samples are representative of the sites being sampled. Samples will be collected 6-12 inches below the water's surface.[3] If waves are present when collecting shoreline samples, samples should be collected on an incoming wave.

Methods used to collect water samples will depend on the location of the site (i.e., shoreline vs. open water), but in all cases, the following procedures will be followed:

1. The sampler should use new, clean, powder-free, nitrile gloves to prevent contamination.
2. Gloves should be changed if they are soiled, or if the potential for cross-contamination exists from handling sampling materials or samples.
3. The sampler should take care not to disturb the sediment around the point of sample collection and will avoid collecting floating debris.
4. The sampler should exercise aseptic techniques to avoid any contamination (i.e., do not touch the inner surfaces or lip edges of the sample bottle or cap).
5. When collecting the sample, the sampler should not breathe, sneeze, or cough in the direction of the container.
6. While the sample is collected, the bottle lid shall not be placed on the ground.
7. The sampler should not eat or drink during sample collection.
8. The sampler should not smoke during sample collection.
9. Each person on the sampling team should wear clean clothing that is free of dirt, grease, or other substances that could contaminate the sample bottles.

[3] Surface samples will be more representative of most recreator's point of exposure. Results collected by Lagoon IO monitoring in the Inner Basin during both wet and dry weather suggest that depth of sample collection does not have a strong influence on *Enterococcus* counts. Sample collection depth is consistent with recommendations in EPA Method 1600.

10. When the sample is collected, ample air space should be left in the bottle to facilitate mixing by shaking for lab analysis, unless otherwise required by the method.
11. After the sample is collected and the cap is tightly screwed back on the bottle, the time of sampling should be recorded on the field log sheet.
12. Samples should be stored on ice.

Where practical, all grab samples will be collected by direct submersion 6-12 inches below the water's surface using the following procedures:

1. Remove the lid (keeping lid face down) and submerge the container 6-12 inches below the water's surface with the mouth of the bottle pointing away from the sampler.
2. Decant collected sample water to the bottle's fill line in order to preserve head space needed for proper mixing, and secure the lid.
3. Place the sample on ice.
4. Collect any field duplicate samples using the same protocols described above.
5. Collect any field blanks by filling a sample bottle to the fill line with sterile blank water.

If a grab pole is necessary for collection of the sample, the sample bottle will be affixed directly to the pole and collected using the same instructions as above.

11.3 Analytical Methods

Grab samples will be collected in clean sample bottles provided by the laboratory and analyzed for *Enterococcus*, consistent with the applicable REC-1 bacteria WQO for brackish waters from the Basin Plan.

To ensure that a countable plate is obtained, four dilutions will be analyzed for each sample. If initial results indicate that fewer dilutions are sufficient to provide consistent enumeration of Enterococcus, a reduction in the number of dilutions required during dry weather events will be considered. In determining appropriate dilution volumes, the laboratory will consider the factors influencing the sample (e.g., turbidity, wet vs. dry weather, potential marine vs. freshwater influence).

EWA follows standard procedures for cleaning and decontamination of analytical equipment as described in their QA/QC Methods Manual (Appendix 4).

11.4 Field Measurements and Observations

Field measurements of conductivity/salinity, temperature, pH, and turbidity will be recorded after each sample is collected. Temperature and conductivity/salinity measurements will provide information regarding the extent of marine and freshwater influences at the point of sampling. Turbidity measurements will also provide a greater understanding of conditions in the Lagoon that may influence sample results. In addition, turbidity measurements will be useful in determining the appropriate dilution volume for enumeration of *Enterococcus*. Turbidity should be recorded on the COC and communicated to the analytical laboratory to assist in determination of appropriate dilution volumes.

The maintenance procedures of the YSI 6-Series multi-parameter sonde are described in the SOP provided in Appendix 3. The sonde probes will be cleaned with tap water followed by a deionized water rinse. No special decontamination procedures are needed for the YSI 6-Series multi-parameter

sonde or the flow meter. The rinsate will be disposed of in the sanitary sewer. Field measurements will be recorded on a field log or in an electronic database.

If monitoring 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.

In addition to field measurements, the sampling team will take photographs of the monitoring location and record field observations on the field log or electronic database that will provide context for the bacteriological results. A digital recording device may be used in lieu of a paper field log. Relevant field observations will include:

- Site Characteristics (e.g., water color, odor, turbidity, algae)
- Weather (e.g., precipitation, sun/cloud cover, wind)
- Tidal Stage
- Nearby Activity (e.g., recreators, boats, wildlife, homeless encampments)

12. SAMPLE HANDLING CUSTODY

12.1 Sample Collection

Each field sample will be labeled in indelible ink and identified with the project title, sample ID number, date and time of sample collection, and preservation method. Upon collection, samples will be stored on ice until delivery to the laboratory for analysis within the required holding time (Table 12-1).

Table 12-1 lists the analytes, sample volumes, container types, sample preservation, and holding times.

Table 12-1. List of Analytes with Sample Volume, Container Type, Holding Time, and Preservation Method

Analyte	Volume/Container	Preservation	Holding Time
pH	NA - analyzed in field	NA	NA
Conductivity/Salinity			
Temperature			
Turbidity			
Enterococcus	500 mL sterile plastic	Ice, $\leq 10^{o}$C	8 hours[1]

mL – milliliter; NA – not applicable

1 - Analysis should occur as soon as possible after sampling, preferably within 2 hours of collection. The maximum transport time to the laboratory is 6 hours, and samples should be processed within 2 hours of receipt at the laboratory

12.2 Chain-of-Custody Procedures

Samples will be considered to be in custody if they are retained as follows (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 (see example COC form in Appendix 1), 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 laboratory and are considered an integral part of the report.

12.3 Sampling Transport, Shipping, and Storage Procedures

Samples collected in the field will be delivered on ice inside coolers to EWA for analysis. Transport of the samples will be coordinated by the Field Sampling Lead to ensure that all samples are transported to the laboratory within the appropriate holding time. Prior to transport, COC forms will be filled out and the original signed COC form will be inserted in a sealed plastic bag and placed inside the cooler. The laboratory will properly and safely dispose of the samples after the analyses are complete and analytical QA/QC procedures have been reviewed and accepted. Table 12-2 contains the laboratory contact information.

Table 12-2. Analytical Laboratory Information and Point of Contact

Laboratory	Analyses Performed	Point of Contact	Delivery Address
Encina Wastewater Authority	*Enterococcus*	Daniel Mendez (760) 438-3941 x3200 dmendez@encinajpa.com	6200 Avenue Encinas Carlsbad, CA 92011

13. ANALYTICAL METHODS

13.1 Field Measurements

In situ measurements of pH, conductivity/salinity, turbidity, and temperature will be measured using a YSI 6920 multi-parameter probe (or similar). Operation of field equipment will be conducted as per manufacturer instructions. Calibrations will be performed and recorded to ensure accurate functionality of the probes. Table 13-1 details the measurement principal and limits for parameters measured in the field for water quality monitoring.

Table 13-1. Field Measurements and Achievable Limits

Parameter	Instrument	Measurement Principle	Achievable Field Limits	
			Resolution	Repeatability
pH	YSI 6920, or similar	Glass electrode	0.01 pH units	0.05 pH units
Conductivity		Alternating four-electrode	0.001 to 0.1 µS/cm (range dependent)	± 0.05% of full scale
Temperature		Thermistor	0.01 °C	± 0.10 °C
Turbidity		Scattering/transmitting light	0.1 NTU	± 0.5 NTU

µS/cm – micro Siemens per centimeter; NTU – nephelometric turbidity unit

13.2 Analytical Measurements

EWA, an ELAP-certified laboratory (Certification No. 1441) will analyze samples for *Enterococcus*. The laboratory's QA/QC Methods Manual (Appendix 4) discusses operational procedures, quality assurance, audits, facilities and equipment, and other laboratory procedures and policies.

If laboratory quality control limits are exceeded (i.e., process is out-of-control or failure), corrective action(s) shall be taken and documented, and the sample will be re-analyzed if possible. If the out-of-control process, failure, or out of calibration conditions affect project data results, notification from the Laboratory Project Manager will be sent to WESTON's QA Officer and will be filed in the project binder.

Laboratory sample disposal procedures are outlined in the laboratory's QA/QC Methods Manual (Appendix 4). Table 13-2 lists the standard analytical methods for Enterococcus analyzed by EWA.

Table 13-2. Analytes, Analytical Methods, and Target Reporting Limits

Parameter	Analytical Method	Achievable Laboratory Limits	
		Method Detection Limits[1]	Target Laboratory Reporting Limits[1]
Enterococcus	EPA 1600/SM 9230 C	1 CFU/100 mL	1 CFU/100 mL

1 - Method detection limits and reporting limits are subject to change. Reporting limit may change depending on dilution required to generate valid results. Typical reporting limit for the Lagoon is 4-10 CFU/100 mL

CFU/100 mL – colony forming units per 100 milliliters; SM - Standard Methods; EPA –Environmental Protection Agency

14. QUALITY CONTROL

14.1 Field Measurements

Field measurements of pH, conductivity/salinity, turbidity, and temperature will be made using a YSI 6920 multi-parameter probe (or similar) according to manufacturer's specifications. Calibration will be conducted prior to each sampling event. Duplicate readings will be made in the field. Proper equipment storage and maintenance procedures will be followed.

14.2 Water Sampling

QA/QC for sampling processes begins with proper collection of the samples in order to minimize the possibility of contamination. Field staff will wear powder-free nitrile gloves (or similar) at all times during sample collection. All microbiological samples will be collected in laboratory supplied, laboratory-certified, sterile, bacteria-free sample containers, kept on wet ice at $\leq$10°C during the sampling event, and placed into coolers along with completed COCs for transfer to the analytical laboratory. The field crew will ensure that sampling containers are filled properly and the requirement to avoid contamination of samples is met at all times. During each sampling event, a field log or an electronic database entry will be completed. The field data log sheets will include empirical observations of the site and water quality characteristics. The sampling team will provide field sampling SOPs and ensure all sampling personnel are trained accordingly.

Field duplicate and field blank samples will be collected at a rate of at least five percent and submitted to the laboratory to be analyzed for the constituents listed in Table 13-2. Field duplicates are collected at the same time and location as the original sample and are handled, processed, and analyzed in an identical manner. Field blanks will be used to ensure that no contamination originating from the collection, transport, or storage of environmental samples occurred. A field blank sample will be collected by transferring laboratory-certified water (i.e., autoclaved de-ionized water for culture analyses) into a sample container.

14.3 Laboratory Analyses

Laboratory quality control of the collected samples will be performed under the guidelines of this QAPP and EWA's SOPs and QA/QC Methods Manual. Quality control samples, frequency, and control limits are discussed in Element 7. Laboratory quality control checks may include the use of method blanks and laboratory control samples. For *Enterococcus* analysis, if target organisms are detected in a method blank, then the results for that batch of samples are deemed unacceptable, the batch of sterile water used to create the method blank will be labeled and removed from use, and the QA Officer will be notified immediately.

If control limits are exceeded, the Laboratory QA Officer will perform corrective actions to determine the cause of the exceedance. Analytical procedures based on laboratory SOPs will be reviewed with appropriate laboratory staff; and errors will be identified, documented, corrected, and reported. Samples will be re-analyzed, if available and within the respective holding times, if deemed necessary. If the out-of-control process or out of calibration conditions affect project data results, notification from the Laboratory Project Manager will be sent to WESTON's QA Officer and will be filed with project documents.

15. INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

15.1 Field Equipment

Prior to conducting field sampling, the Field Sampling Lead will be responsible for preparing sampling kits that include project-specific instructions, COC forms, sample labels, sampling containers, and monitoring equipment. Spare equipment, such as extra bottles, labels, etc., will be included in the field sampling kits in the event that the sampling equipment becomes lost, contaminated, or otherwise needs to be replaced or supplemented.

All equipment used for this project will be cleaned and inspected upon return from each sampling event. The YSI 6920 multi-parameter sonde (or similar) probes will be replaced at the first sign of deviation from standard solution concentrations and noted in the instrument logbook. The multi-parameter sonde will be checked by field staff for calibration within the manufacturer's guidelines which will be documented in the instrument logbook. All field staff will be responsible to ensure that the meter has been calibrated properly before each use. Before use, a full calibration of the sonde will be conducted by staff to ensure the instrument meets manufacture's specifications and will be documented in the instrument logbook (see Appendix 3). If calibration results are not within the manufacturer's specifications, sensors will be replaced with new parts. Spare parts will be stored in a secure location in order to be readily available if needed.

15.2 Analytical Laboratory

The laboratory is responsible for maintaining equipment in accordance with SOPs specified by equipment manufacturers and SOPs specified by the particular analytical method. Laboratory analysts are responsible for equipment testing, inspection, and maintenance. EWA's QA/QC Methods Manual details their equipment and systems testing, inspection, maintenance, and calibration specifications and schedule. Corrective actions will be taken to repair equipment, document the issue, and reanalyze the sample if necessary. The EWA QA Officer will notify the WESTON Project Manager of any equipment deficiencies impacting sample results or timing or result availability.

16. INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

All equipment and instruments will be operated and calibrated according to the manufacturer's recommendations as well as by criteria defined in individual SOPs. Operation and calibration of field equipment are performed by field staff personnel trained in these procedures. Documentation of all routine and special calibration information is recorded in appropriate logbooks. 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 repeated if possible.

The YSI 6920 multi-parameter sonde (or similar) used for field in-situ measurements will be calibrated according to manufacturer's guidelines and the results recorded on the calibration data sheet in the instrument logbook. If measured results do not meet the DQOs, the multi-meter will be recalibrated using the two-point calibrations methods. Calibration for pH, conductivity/salinity, and turbidity occurs prior to use (see Appendix 2 for the calibration data sheet and Appendix 3 for the SOP).

If the equipment fails to calibrate after several attempts, WESTON's Project Manager will be notified that analyses have stopped until functional equipment is available. Affected data will be flagged with appropriate qualifiers. Once equipment is functioning again, the samples will be reanalyzed if possible. Issues with an instrument will be documented and corrective actions will be recorded by the laboratory.

EWA calibrates its instruments at a frequency that ensures validity of the results. Calibration procedures follow USEPA guidelines and recommendations of the instruments manufacturers. The QA/QC Methods Manual details their equipment and systems testing, inspection, maintenance, and calibration specifications and schedule. If deficiencies are encountered, the laboratory's QA/QC Methods Manual details how corrective actions are to be conducted.

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 will receive and sign for the materials. The items will be reviewed to ensure the shipment is complete, then they will be delivered to the proper storage location. Chemicals will be dated upon receipt. Supplies will be stored appropriately and discarded on the expiration date. The equipment and supplies purchased for use in field sampling activities will be inspected for damage as they are received.

Sample containers will be provided by EWA and will be stored at WESTON's Carlsbad facility prior to use in the field. Confirmation that sample bottles are laboratory-certified clean will be made when received from the laboratory. The Field Sampling Lead will oversee this element.

EWA's procedures for acceptance of supplies and consumables are detailed in their QA/QC Methods Manual.

18. NON-DIRECT MEASUREMENTS

Recorded rainfall may be used to determine antecedent dry days prior to the wet season sampling events.

19. DATA MANAGEMENT

Data will be maintained and stored as established in Element 9. WESTON will document and track the aspects of the sample collection process, including generating field logs or electronic database entries at each site and COC forms for the samples collected. COC forms will accompany samples to the laboratory for analysis.

Photograph files will be named using site and date identifiers. Field-collected data (visual observations and field measurements) will be entered onto a field log or electronic database. After performing data checks, and ensuring that DQOs have been met, data analysis can be performed.

EWA will document and track sample receipt, storage, analyses, and reporting pertaining to laboratory analyses. Laboratory results will be stored in a database system at EWA's office and will be provided to WESTON electronically in laboratory reports and electronic data deliverables (EDDs). EWA's QA Officer will review laboratory EDD data and compare to the pdf reports to confirm that the proper parameters were analyzed and that there are no errors. After performing data checks, and ensuring that DQOs have been met, data analysis can be performed. Further details of EWA's data management protocols can be found in their QA/QC Methods Manual (Appendix 4).

WESTON's Project Manager and QA Officer will maintain and control the database of information and documents collected during this project. The QA Officer will also be responsible for submitting all surface water data, including laboratory and field QC results collected under the Study QAPP, to CEDEN. Data will be maintained as described in Element A.9. The centralized database used by WESTON is EnviroData, a proprietary database written in Microsoft Access with a Visual Basic query interface. Field and laboratory data will be entered into the database based on nomenclature developed specifically for this project. Data entry oversight will be the responsibility of WESTON's QA Officer. All data records, including field-generated data and laboratory data, will be accumulated into project-specific files that are maintained at WESTON's Carlsbad, CA, office. Results for records will be maintained for at least five years or transferred according to agreement between WESTON and the client.

GROUP C: ASSESSMENT AND OVERSIGHT

20. ASSESSMENTS AND RESPONSE ACTIONS

Data collected and analyzed for this monitoring program will be consistently assessed and documented throughout the project to determine whether the project objectives are being met. Field staff will review sampling procedures prior to conducting sampling to ensure that all methods of collection are understood and that equipment/instruments used for sample collection and analysis are functioning and ready for use. Field data sheets or electronic database entries will be reviewed prior to leaving the sample location to ensure that all samples were collected and field observations were documented. If the field staff encounters any issues related to sample collection or equipment failure that cannot be immediately corrected at the sample site, they will notify the WESTON Project Manager. Either re-sampling will occur or errors will be noted on field data sheets and reported in the project report.

Laboratory technicians are responsible for following laboratory procedures and operating analytical equipment, including conducting instrument maintenance, calibration of equipment/instruments, and performing laboratory QC sample analyses at the required frequency stated in this QAPP. The laboratory QA Officer is responsible for reviewing the associated QC results that are reported with all of the sample results to evaluate the analytical process performance, verifying that the performance criteria of this QAPP were met, recommending or approving proposed corrective actions, and verifying that corrective actions have been completed.

The need for corrective action comes from several sources, including equipment malfunction, failure of internal QA/QC checks, failure to follow-up on performance or system audit findings, and noncompliance with QA requirements. When measurement equipment or analytical methods fail QA/QC requirements, the problem(s) will be brought immediately to the attention of the laboratory supervisor and QA Officer. Corrective measures will depend entirely on the type of analysis, the extent of the error, and whether or not the error is determinant. Final approval of what the corrective measure will be is the responsibility of the Laboratory QA Officer and/or Project Manager. If failure is due to equipment malfunction, the equipment will not be used until repaired. Precision and accuracy will be reassessed, and the analysis will be rerun. Attempts will be made to reanalyze the affected parts of the analysis so that in the end, the product is not affected by failure of QC requirements. When a result in a performance audit is unacceptable, the laboratory will identify the problem(s) and implement corrective actions immediately. A step-by-step analysis and investigation to determine the cause of the problem will take place as part of the corrective action program. If the problem cannot be controlled, the laboratory will analyze the impact on data. The WESTON Project Manager will be notified if data are affected.

21. REPORTS TO MANAGEMENT

WESTON's Project Manager is responsible for preparation and submittal of project deliverables. The Laboratory QA Officer is responsible for the preparation of all data packages and laboratory reports originating from their laboratory. The WESTON Project Manager will provide the City of Carlsbad Senior Program Manager monthly deliverables in electronic format via email. The monthly deliverables will include a summary of the previous month's monitoring event and results.

A draft report will be developed for submittal to the City of Carlsbad and the RAs by November 11, 2022 and will include data collected from October 2021 through September 2022. The final report will be completed and submitted to the Regional Water Board with the 2021-2022 WQIP Annual Report by January 31, 2023. All data included in the report will be submitted to CEDEN by January 31, 2023. Table 21-1 presents the proposed schedule for management reporting.

Table 21-1. Management Report Schedule

Type of Report	Projected Delivery Dates(s)	Person(s) Responsible for Report Preparation	Report Recipients
Monthly Progress Report	varies	Project Manager (Alexander Schriewer) and Field Sampling Lead (Kyle Clouthier)	City of Carlsbad Senior Program Manager (Tim Murphy)
Draft Project Report	November 11, 2022		
Final Project Report	January 31, 2023		
Submittal of data to CEDEN	January 31, 2023		

GROUP D: VALIDATION AND USABILITY

22. DATA REVIEW, VERIFICATION, AND VALIDATION REQUIREMENTS

All data generated by this project's activities will be reviewed against the DQOs presented in Element 7 of this QAPP. The field and laboratory personnel, including QA Officers, will be responsible for verifying that the sample collection, handling, and analytical procedures were in accordance with the approved QAPP. The Field Sampling Lead will review all COC forms to ensure adherence to collection, transport to analytical laboratory, and receipt requirements are completed within appropriate holding times.

Laboratory technicians generating the data have the prime responsibility for the accuracy and completeness of data. The laboratory supervisors and QA Officers are responsible for reviewing laboratory data forms and sample logs to ensure that all requirements for sample preservation, sample integrity, data quality assessments, and equipment calibration have been met. Data that do not meet these requirements will be reanalyzed, not reported, or will be reported with qualifiers which provide adequate explanations for the data discrepancies. If data cannot be reported, WESTON's Project Manager will be notified.

23. VERIFICATION AND VALIDATION METHODS

After sampling, the field data sheets will be removed from the field logbooks, and sheets will be checked for completeness and accuracy (including sample location, sample date and time, and sample type) by WESTON's Field Sampling Lead. Any field changes or discrepancies will be noted on the field sheets. If an electronic database is used, it is the Field Sampling Lead's responsibility to review all entries, check for completeness and accuracy, and upload the data files to the database.

Copies of the COC forms with signatures from laboratory personnel showing that the laboratory has received the samples will be kept with field data sheets in a designated folder. If there are any questions, clarification from the Field Sampling Lead will be obtained as soon as possible.

Verification and validation of the laboratory data are the responsibility of the laboratory. All sample preparation and analytical activities will be documented in bound laboratory notebooks or on bench sheets. The laboratory technician generating the data has the prime responsibility for the accuracy and completeness of the data. Laboratory technicians and the Laboratory QA Officer will review the analytical data to ensure that the sample description information, analysis information, instrument calibration, and analytical results are correct and documentation is complete, and that QC samples meet performance criteria. The Laboratory Project Manager will maintain analytical reports and QA/QC documentation for this project in a database format. All corrective actions required during the analytical process that may affect sample results will be recorded by the laboratory's QA Officer and reported to WESTON's Project Manager and QA Officer.

In addition to the laboratory performing verification and validation of laboratory data, WESTON's QA Officer will review all laboratory analytical reports and EDDs when they are received from the laboratory to ensure that the data provided are complete and DQOs in this QAPP have been met. Laboratory reports/EDDs that do not meet WESTON's QC check will be returned to the laboratory with requests for correction.

WESTON's Project Manager will be responsible for final review of data analysis, monthly data summaries, and reports prior to submission to the RAs for their review.

24. RECONCILIATION WITH USER REQUIREMENTS

The goal of this monitoring program is to conduct receiving water monitoring for *Enterococcus* in the Agua Hedionda Lagoon Inner Basin to determine whether water quality conditions in the Inner Basin support REC-1 beneficial uses, as outlined in Elements 5.2 and 7.2.

The QA Officer will review the data to determine if DQOs have been met. If data do not meet the project's specifications, the QA Officer will review the errors and determine if the problem is due to calibration/maintenance, sample techniques, or other factors and they will suggest corrective action. It is expected that the problem would be corrected by retraining, revision of techniques, or replacement of supplies/equipment. If not, then the measurement quality objectives will be reviewed for feasibility. If specific DQOs are not achievable, the QA Officer will recommend appropriate modifications. Any revisions need approval by the WESTON Project Manager and the City of Carlsbad Senior Program Manager.

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