# APPENDIX B - QA/QC

A Quality Assurance Project Plan (Qaquatic primary producers) were a set of field and laboratory manuals were developed to establish activities and procedures to assure chemical, biological, and physical measurements would be consistently measured between sampling teams and would meet the SWAMP requirements.

Field procedures to insure data quality include routine maintenance and calibration of sampling equipment, as well as defined sample handling and processing procedures. Field QA/QC samples evaluated potential contamination and sampling error prior to sample delivery to the analytical laboratory. Field QA/QC procedures include protocols to meet holding times, field duplicates, and field blanks. Training and field audits were conducted to insure all field teams were following proper protocols. Laboratory QA/QC samples were used to evaluate the analytical process for contamination, accuracy, and reproducibility including laboratory equipment blanks, laboratory duplicates, matrix spikes, and comparison to laboratory control standards.

The primary criteria used to evaluate the quality of the data were precision, accuracy, completeness, and representativeness:

- Precision describes how well repeated measurements agree. Precision measurements were assessed on both field and laboratory duplicates. The results of the duplicate samples were compared to the original sample to estimate the relative percent difference (RPD) between the two samples.
- Accuracy describes how close the measurement is to its true value. Accuracy is determined using calibration standards, standard reference materials, and spiked samples. The accuracy of chemical measurements will be checked measuring laboratory control standards (LCS) and matrix spike samples (MS) prior to and/or during sample analysis at the analytical laboratories. Accuracy is quantified as the percent recovery of the measured value to the expected value for the LCS and MS samples.
- Completeness is the fraction of planned data successfully collected and analyzed. There are no statistical criteria that require a certain percentage of data. However, it is expected that 90% of all measurements could be taken when anticipated. This accounts for adverse weather conditions, safety concerns, and equipment problems. Completeness was quantified by comparing the number of measurements actually collected to the number of measurements planned.
- Representativeness describes the degree to which the results of analyses represent the samples collected, and the samples in turn represent the environment from which they were taken. The sampling approach was designed not to be representative of the entire estuary; but rather to be representative of an index area within that estuary. Sampling in multiple transects and multiple quadrats within each transect insures representativeness within the index area. Furthermore, repeated measurements through time capture temporal variability.

Quality assurance activities began with establishment of a detailed field manual and extensive training to insure that protocols were implemented identically among field teams. Field methods training (how to establish macroalgae and submerged aquatic vegetation transects, use of quadrats and biomass sampling equipment, collection of sediment and water samples, etc.) was conducted on August 18, 2008. Training for how to work in an environment with endangered species was conducted on October 8, 2008 for tide water goby and October 9, 2008 for avian endangered species (e.g., Beldings savannah sparrow and clapper rail). Training for identification of common macroalgae species to genus level, and how to collect and process water samples in the field was also conducted on October 9, 2008. Training

for use of data sondes (calibration, deployment, data download and visualization) was conducted on November 3, 2008.

Following the training, each field team was subjected to a field audit to ensure that all teams were following the field protocols and collecting data in the same way. Table B.1 lists the date each field team was audited, in which estuary the audit took place, and whether the team met data quality objective acceptance limits.

**Table B.1. QA/QC Audits and intercalibration exercises.**

| Organization | Estuary | Date | DQO Acceptance |
|---|---|---|---|
| CSUCI (Sean Anderson) | Mugu | 10/21/08 | X |
| UCSB (Lisa Stratton) | UCSB Campus Lagoon | 10/13/08 | X |
| SMBRC (Pat Carter) | Ballona Wetlands | 10/14/08 | X |
| RDCSMM (Rosi Dagit) | Topanga | 10/23/08 | X |
| San Elijo Conservancy (Doug Gibson) | San Elijo | 10/27/08 | X |
| TJNEER (Jeff Crooks) | Los Pensequitos | 10/28/08 | X |
| SCCWRP (Nick Miller) | San Mateo | 11/24/08 | X |

***Index Period Sampling QA/QC***

*Sampling Equipment Maintenance*

All sampling equipment (quadrats, biomass samplers, rakes, sediment mini-cores, filter rigs, etc.) were inspected prior to each deployment for damage and/or deformities. Damaged equipment was either repaired or replaced prior to the next sampling event. Sample equipment was cleaned of mud and debris and rinsed with freshwater and allowed to dry before storage between sampling events.

*Percent Complete*

Overall sampling success for the index period sampling of primary producer communities was excellent (Table B.2). Overall 99% of all macroalgae biomass and cover was successfully sampled, 100% of submerged aquatic vegetation biomass was sampled, 92% of discrete suspended chlorophyll *a* samples were analyzed and 95% of benthic chlorophyll *a* samples were analyzed. Failure to sample during an index period was typically due to unsafe sampling conditions (e.g., Tijuana River Estuary, index period sampling was suspended during sample period 1 due to raw sewage present in the estuary). Failure to analyze chlorophyll samples (benthic or suspended) was also due to breakage or contamination of sample container in transit to the laboratory. Samples were considered contaminated for chlorophyll analysis if the sample bag (benthic) or petri dish (suspended) was cracked or found open. This was often obvious as melted water from the ice in the cooler was present in the sample.

**Table B.2. Index period primary producer community sampling percent complete.**

| Estuary | Macroalgae % Cover | Macroalgae Biomass | submerged aquatic vegetation Biomass | Suspended Chlorophyll | Benthic Chlorophyll |
|---|---|---|---|---|---|
| **OVERALL** | **99%** | **99%** | **100%** | **92%** | **95%** |
| Agua Hedionda Lagoon (AHL) | 100% | 100% | NA | 100% | 100% |
| Ballona Lagoon (BL) | 100% | 100% | 100% | 100% | 89% |
| Ballona Wetlands (BW) | 100% | 100% | NA | 100% | 100% |
| Batiquitos Lagoon (BQL) | 100% | 100% | NA | 83% | 100% |

| | | | | | |
|---|---|---|---|---|---|
| Bolsa Chica Muted (BCM) | 100% | 100% | NA | 83% | 100% |
| Bolsa Chica Fully Tidal (BCF) | 100% | 100% | NA | 83% | 100% |
| UCSB Campus Lagoon (UCL) | 100% | 100% | 100% | 83% | 100% |
| Devereux Lagoon (DL) | 100% | 100% | NA | 100% | 100% |
| Goleta Slough (GS) | 100% | 100% | 100% | 83% | 94% |
| Los Pensequitos Lagoon (LPL) | 100% | 100% | 100% | 83% | 94% |
| Mission Bay (MB) | 100% | 100% | NA | 100% | 100% |
| Mugu Lagoon Fully Tidal (MLF) | 100% | 100% | NA | 83% | 100% |
| Mugu Lagoon Muted (MLM) | 100% | 100% | NA | 83% | 83% |
| San Diego Bay Fully Tidal (SDF) | 100% | 100% | NA | 100% | 100% |
| San Diego Bay Muted (SDM) | 100% | 100% | NA | 100% | 94% |
| San Diego River (SDR) | 100% | 100% | 100% | 100% | 100% |
| San Elijo Lagoon (SEL) | 100% | 100% | NA | 100% | 100% |
| San Juan Creek (SJC) | 100% | 100% | NA | 100% | 100% |
| San Mateo Creek Lagoon (SMC) | 100% | 100% | 100% | 100% | 100% |
| Santa Ana Wetlands (SAR) | 100% | 100% | NA | 83% | 100% |
| Santa Clara River Estuary (SCR) | 100% | 100% | NA | 67% | 100% |
| Santa Margarita River Estuary (SMR) | 100% | 100% | NA | 100% | 100% |
| Seal Beach Fully Tidal (SBF) | 100% | 100% | NA | 100% | 100% |
| Seal Beach Muted (SBM) | 100% | 100% | NA | 100% | 100% |
| Tijuana River Estuary (TJE) | 83% | 83% | NA | 83% | 67% |
| Topanga Canyon Lagoon (TC) | 100% | 100% | 100% | 100% | 100% |
| Zuma Canyon Lagoon (ZC) | 100% | 100% | 100% | 83% | 100% |

Overall sampling success for index period sampling of sediment and water column chemistry for the segment and loading sites was typically excellent (Table B.3). Over 98% of all water column samples for dissolved inorganic nutrients (DIN), total nitrogen and total phosphorus (TN/TP), and total dissolved nitrogen and total dissolved phosphorus (TDN/TDP) were successfully analyzed. Over 97% of sediment samples were analyzed for percent organic carbon (%OC) and percent total nitrogen (%TN), 96% of samples were analyzed for percent total phosphorus (%TP), and 94% of samples analyzed for sediment grain size. Failures in individual estuaries were due to failure to collect the sample due to unsafe sampling conditions, failure to analyze the sample due to breakage or contamination of sample vial during transit, or in the case of sediment grain size, insufficient sample to complete the measurement. Samples were considered contaminated for nutrient analysis if the sample bag or bottle was cracked or found open. This was often obvious as melted water from the ice in the cooler was present in the sample.

**Table B.3. Index period sediment and water column chemistry percent complete.**

| Estuary | Water DIN | Water TN/TP | Water TDN/TDP | Sediment OC and TN | Sediment TP | Sediment Grain Size |
|---|---|---|---|---|---|---|
| **OVERALL** | **99%** | **98%** | **98%** | **97%** | **96%** | **94%** |
| Agua Hedionda Lagoon (AHL) | 100% | 98% | 99% | 100% | 100% | 83% |
| Ballona Lagoon (BL) | 100% | 100% | 100% | 94% | 100% | 100% |
| Ballona Wetlands (BW) | 100% | 100% | 100% | 100% | 94% | 100% |
| Batiquitos Lagoon (BQL) | 100% | 99% | 99% | 94% | 94% | 94% |
| Bolsa Chica Muted (BCM) | 100% | 100% | 100% | 94% | 94% | 100% |
| Bolsa Chica Fully Tidal (BCF) | 100% | 100% | 100% | 100% | 100% | 100% |
| UCSB Campus Lagoon (UCL) | 100% | 100% | 100% | 83% | 83% | 83% |
| Devereux Lagoon (DL) | 100% | 100% | 100% | 100% | 100% | 100% |
| Goleta Slough (GS) | 100% | 100% | 100% | 100% | 100% | 100% |
| Los Pensequitos Lagoon (LPL) | 100% | 100% | 100% | 100% | 100% | 100% |
| Mission Bay (MB) | 100% | 99% | 99% | 100% | 100% | 83% |
| Mugu Lagoon Fully Tidal (MLF) | 100% | 100% | 100% | 100% | 100% | 100% |
| Mugu Lagoon Muted (MLM) | 100% | 100% | 100% | 100% | 94% | 100% |

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|---|---|---|---|---|---|---|
| San Diego Bay Fully Tidal (SDF) | 99% | 98% | 98% | 100% | 100% | 100% |
| San Diego Bay Muted (SDM) | 100% | 100% | 100% | 100% | 100% | 100% |
| San Diego River (SDR) | 100% | 100% | 100% | 100% | 100% | 100% |
| San Elijo Lagoon (SEL) | 100% | 100% | 100% | 100% | 94% | 83% |
| San Juan Creek (SJC) | 100% | 100% | 100% | 100% | 94% | 100% |
| San Mateo Creek Lagoon (SMC) | 100% | 100% | 100% | 100% | 100% | 83% |
| Santa Ana Wetlands (SAR) | 100% | 99% | 100% | 100% | 83% | 100% |
| Santa Clara River Estuary (SCR) | 100% | 100% | 100% | 100% | 100% | 100% |
| Santa Margarita River Estuary (SMR) | 100% | 100% | 100% | 100% | 100% | 100% |
| Seal Beach Fully Tidal (SBF) | 100% | 100% | 100% | 100% | 100% | 100% |
| Seal Beach Muted (SBM) | 100% | 100% | 100% | 100% | 100% | 100% |
| Tijuana River Estuary (TJE) | 83% | 83% | 83% | 67% | 67% | 67% |
| Topanga Canyon Lagoon (TC) | 100% | 100% | 100% | 100% | 100% | 83% |
| Zuma Canyon Lagoon (ZC) | 100% | 100% | 100% | 94% | 100% | 67% |

*Sample Handling*

*Holding Times Violations*

All macroalgae and submerged aquatic vegetation biomass samples were processed within 24 hours of collection. All suspended and benthic chlorophyll *a* samples were analyzed within 28 days of collection (except samples broken or contaminated in transit, see percent complete).

To meet holding times for analysis of nutrient concentrations, water samples stored on ice and frozen within 6 hours of collection and must be analyzed within 28 days of collection. Of the samples for collected for TN, TP, TDN, and TDP, 10% exceeded the holding time of 30 days by 20 days. This was a subset of samples collected during index period 2 (January 2009). All other samples were digested within the holding times and analyzed within a week of digestion. Of the samples for dissolved inorganic nutrients ($NO_3$, $NO_2$, $NH_4$, SRP), 70% exceeded the holding time of 30 days. Holding time violations ranged from 3 days to 60 days. These data are flagged in the database. Because samples that violated holding times were stored frozen until analysis, the data is still considered acceptable.

To meet holding times for sediment nutrient content, sediments must be stored on ice and frozen within 6 hours of collection, dried within 28 days of collection and analyzed within a year of collection. All sediment samples for grain size and sediment nutrient content met the holding time requirement.

*Data Quality Objectives*

All grab samples for ambient nutrient concentrations, freshwater loading, and suspended chlorophyll *a* were collected in duplicate to assess the precision of field sampling. Duplicate samples were analyzed within the same sample batch. Field duplicates must have a relative percent difference (RPD) within 20% of RPD to satisfy the data quality objectives. Field duplicates meeting the acceptance limit vary by constituent (Table B.4). High RPDs occurred as a result of small absolute differences at low concentrations that tended to amplify the difference between duplicate samples (Figure B.1). This occurred for the following constituents: orthophosphate, nitrate, nitrite, ammonium, total nitrogen, total phosphorus, total dissolved nitrogen, and total dissolved phosphorus. Other reasons for high RPDs are due to field contamination during sample collection and filtration. Data falling in this category are flagged and the error reported in the text. High RPDs also exist for suspended chlorophyll *a*, a constituent that is not always homogenous in sample water. This was expected and so the sample design required all field teams to collect duplicates for every sample. Because discrete suspended chlorophyll *a* measurements are only used to calibrate the continuous fluorescence measurement on the data sonde, high RPDs for this measurement are not considered a QA issue.

A subset of samples were randomly selected by the technician, split in the laboratory, and run separately to assess the precision of sample analysis. Duplicate samples were analyzed within the same sample batch. Laboratory duplicates must have a relative percent difference within 20% of RPD to satisfy the data quality objectives. Laboratory duplicates meeting the acceptance limit vary by

constituent (Table B.4). Similar to field replicates, high RPDs existed for samples with low concentrations and therefore this is not considered an important QA issue. Data falling in this category are flagged and error reported in the text.

Field blank samples were collected using the same sample handling and collection equipment as field samples, except distilled- deionized water was processed instead of sample water to assess possible contamination issues. Field blanks must be below the minimum detection limit to satisfy the data quality objectives. Field blanks were collected at every segment site during each sampling event. Field blanks meeting the acceptance limit are listed in Table B.4. A large percentage of field blanks did not meet this data quality objective. After investigation it was determined that the blank water source used by one field team was contaminated, rather than contamination happening in the field by the sampling team. In order to discern potential contamination by the field team, laboratory samples of the contaminated blank water were collected directly from the distilled water tap (contaminated blank water) and compared to reverse osmosis water (clean blank water) from the same laboratory. These samples formed the baseline to compare the field blanks. RPDs between the "baseline" blank water and the field blank samples were typically in the 80 - 120% range. Therefore this is not considered a QA issue.

A laboratory blank is a sample of distilled, deionized water run through the analytical protocol to test for laboratory contamination. Laboratory blanks must be run at the beginning, end, and in the middle of every sample batch. Field and laboratory blanks must be below the target reporting limit to satisfy the data quality objectives. All of the laboratory blanks were reported to be below the level of detection, suggesting no bias from analytical techniques.

Matrix spike samples were processed in the laboratory by adding a known concentration of a specific analyte to a field sample. The sample was analyzed prior to addition of the spike and again after addition. The calculated analyte concentration was prepared and compared to the analytical concentration to test for recovery. Matrix spike results are acceptable when the percent recovery is between 80% and 120%. Matrix spike samples meeting the acceptance limit vary by constituent (Table B.4). Over 90% of laboratory control standards met acceptance criteria for percent recovery for all constituents.

Laboratory control standards are samples of known concentration run in a sample batch to test for accuracy. Measurements of laboratory control standards must be within 80-120% of the expected value to satisfy the data quality objectives. Over 90% of laboratory control standards met acceptance criteria for percent recovery for all constituents.

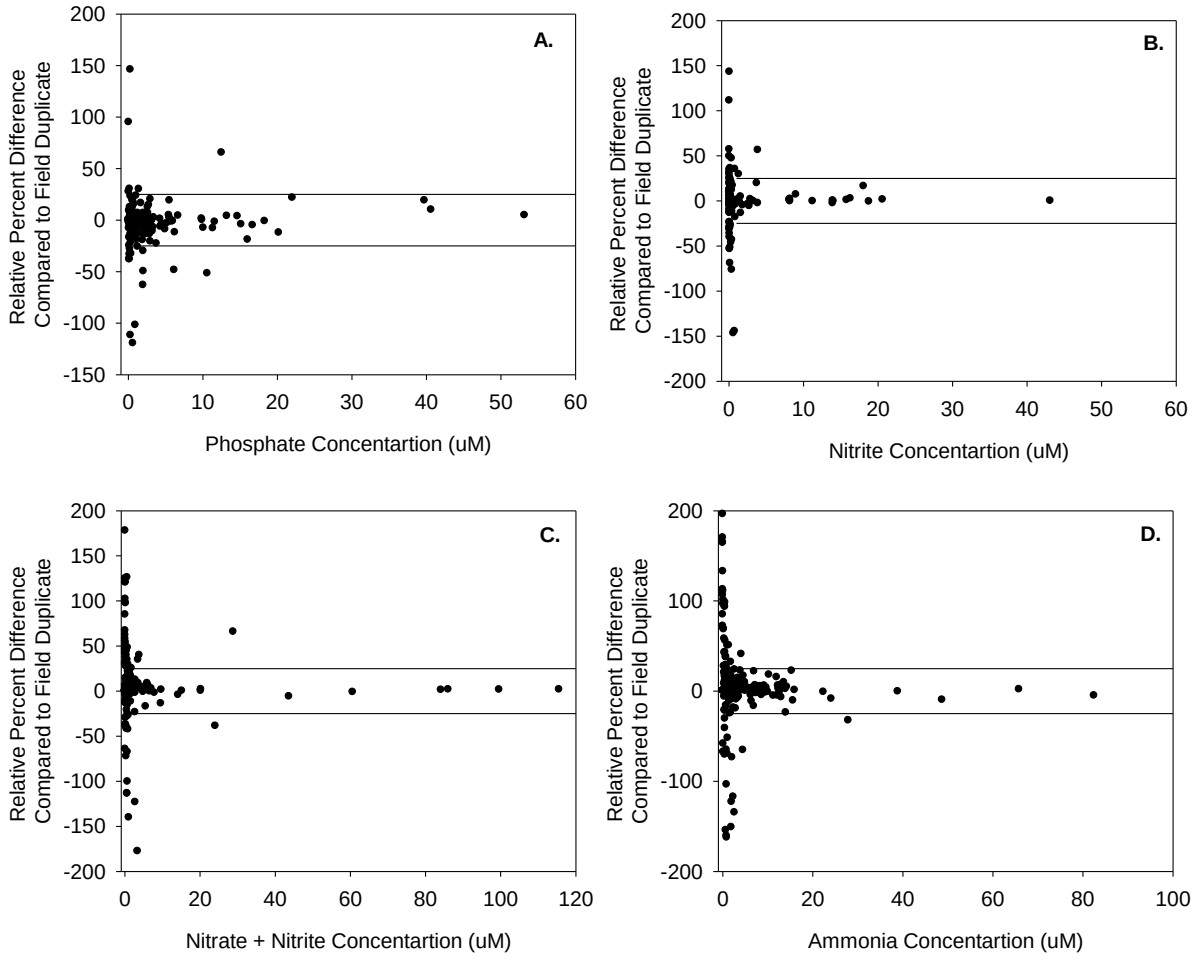


**Figure B.1. Relative percent differences (RPD) of field duplicate samples versus concentration of the sample for phosphate (A), Nitrite (B), Nitrate+Nitrite(C), and Ammonia (D). Data quality acceptance limits are indicated (±20%). Most of the DQO violations are at low concentrations where small absolute differences translate to large RPDs.**

**Table B.4. Data Quality Objectives and Levels Achieved for Analytical Results**

| Constituent | Accuracy | | | | | | Precision | | | | Recovery | | Completeness | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DQO | Percent Achieved LCS | DQO | Percent Achieved FB | DQO | Percent Achieved LB | DQO | Percent Achieved FD | DQO | Percent Achieved LD | DQO | Percent Achieved MS | DQO | Percent Achieved |
| **Water Chemistry** | | | | | | | | | | | | | | |
| Ammonia | 80-120% | 100% | <MDL | 53% | <MDL | 100% | 25% RPD | 66% | 25% RPD | 100 % | 80-120% | 100% | >90% | 99% |
| Nitrate | 80-120% | 100% | <MDL | 82% | <MDL | 99% | 25% RPD | 80% | 25% RPD | 100 % | 80-120% | 100% | >90% | 99% |
| Nitrite | 80-120% | 100% | <MDL | 42% | <MDL | 100% | 25% RPD | 67% | 25% RPD | 100 % | 80-120% | 100% | >90% | 99% |
| Ortho-phosphate | 80-120% | 100% | <MDL | 76% | <MDL | 100% | 25% RPD | 85% | 25% RPD | 100 % | 80-120% | 100% | >90% | 99% |
| Total Nitrogen (TN) | 80-120% | 100% | <MDL | 12% | <MDL | 100% | 25% RPD | 80% | 25% RPD | 96% | 80-120% | 96% | >90% | 98% |
| Total Phosphorus (TP) | 80-120% | 96% | <MDL | 33% | <MDL | 100% | 25% RPD | 70% | 25% RPD | 84% | 80-120% | 89% | >90% | 98% |
| Total Dissolved Nitrogen (TDN) | 80-120% | 100% | <MDL | 10% | <MDL | 100% | 25% RPD | 85% | 25% RPD | 94% | 80-120% | 97% | >90% | 98% |
| Total Dissolved Phosphorus (TDP) | 80-120% | 97% | <MDL | 27% | <MDL | 100% | 25% RPD | 72% | 25% RPD | 97% | 80-120% | 90% | >90% | 98% |
| Suspended Chlorophyll a | 80-120% | 100% | <MDL | 78% | <MDL | 100% | 25% RPD | 47% | 25% RPD | 98% | 80-120% | 86% | >90% | 92% |
| **Sediment Chemistry** | | | | | | | | | | | | | | |
| % Total Nitrogen | 80-120% | 100% | NA | NA | <MDL | 85% | 25% RPD | 97% | 25% RPD | 97% | 80-120% | NA | >90% | 97% |
| % Total Organic Carbon | 80-120% | 100% | NA | NA | <MDL | 80% | 25% RPD | 95% | 25% RPD | 95% | 80-120% | NA | >90% | 97% |
| % Total Phosphorus | 80-120% | 100% | NA | NA | <MDL | 100% | 25% RPD | 85% | 25% RPD | 85% | 80-120% | 100% | >90% | 96% |
| Benthic Chlorophyll a | 80-120% | 100% | <MDL | 100% | <MDL | 100% | 25% RPD | 98% | 25% RPD | 98% | 80-120% | 86% | >90% | 95% |
| Grain Size | NA | NA | NA | NA | NA | 100% | 25% RPD | 90% | 25% RPD | 90% | NA | NA | >90% | 94% |

***Continuous Monitoring QA/QC***

A YSI 6600 multi-parameter data sonde was deployed in the bottom water at a single location in each segment for continuous monitoring of water column physio-chemical parameters. The site was co-located with the transect where ambient water was collected for nutrient concentration and suspended chlorophyll *a* analysis. The following parameters were measured every 15 minutes: Water level, specific conductivity, temperature, turbidity, dissolved oxygen, pH, and chlorophyll fluorescence. A target period was established between January 1, 2009 and October 15, 2009 (288 days). Maintenance activities were conducted approximately twice monthly. These activities included cleaning and removal of sediment and debris from the sonde and sonde housing, calibration of the sonde, and battery exchanges. These activities caused minor data gaps in each data set affecting the percent completeness of the data set. A summary of the completeness of data sets overall and for each segment is listed in Table B.5. Assuming two maintenance events per month and assuming these activities were 1 to 2 days in duration, the continuous data sets should be between 85% and 95% complete for the actual deployment period. Permitting and logistics issues caused some sondes to be deployed outside the target period and therefore, percent complete for this data set is worse for some sites. For example, permitting issues delayed deployment of the data sonde in Mission Bay and the San Diego River until April 2009 and the data sonde in Seal Beach Muted Tidal had a malfunction that caused a three week data gap.

**Table B.5. Data Sonde Deployment Period For Each Segment and the Completeness of Each Data Set for the Targeted Sampling Period and for the Actual Deployment Period.**

| Estuary | Date Sonde In | Date Sonde Out | % Complete for Target Period | % Complete for Actual Deployment |
|---|---|---|---|---|
| **OVERALL** | **1/1/09** | **10/15/09** | **81%** | **91%** |
| Agua Hedionda Lagoon (AHL) | 1/9/09 | 11/04/09 | 93% | 95% |
| Ballona Lagoon (BL) | 12/23/08 | 9/17/09 | 61% | 85% |
| Ballona Wetlands (BW) | 1/14/09 | 10/23/09 | 81% | 85% |
| Batiquitos Lagoon (BQL) | 1/8/09 | 11/4/09 | 83% | 89% |
| Bolsa Chica Muted (BCM) | 1/5/09 | 10/12/09 | 93% | 96% |
| Bolsa Chica Fully Tidal (BCF) | 1/5/09 | 11/12/09 | 78% | 81% |
| UCSB Campus Lagoon (UCL) | 1/5/09 | 12/03/09 | 82% | 88% |
| Devereux Lagoon (DL) | 1/5/09 | 10/15/09 | 85% | 86% |
| Goleta Slough (GS) | 1/6/09 | 11/10/09 | 77% | 84% |
| Los Pensequitos Lagoon (LPL) | 1/6/09 | 1/08/10 | 94% | 95% |
| Mission Bay (MB) | 4/15/09 | 12/17/09 | 62% | 98% |
| Mugu Lagoon Fully Tidal (MLF) | 1/9/09 | 11/13/09 | 91% | 95% |
| Mugu Lagoon Muted (MLM) | 1/9/09 | 11/13/09 | 96% | 98% |
| San Diego Bay Fully Tidal (SDF) | 11/13/08 | 12/30/09 | 93% | 95% |
| San Diego Bay Muted (SDM) | 11/13/08 | 12/30/09 | 93% | 95% |
| San Diego River (SDR) | 4/15/09 | 2/03/10 | 63% | 98% |
| San Elijo Lagoon (SEL) | 12/19/08 | 11/20/09 | 87% | 89% |
| San Juan Creek (SJC) | 1/16/09 | 11/13/09 | 81% | 88% |
| San Mateo Creek Lagoon (SMC) | 12/19/08 | 10/23/09 | 89% | 91% |
| Santa Ana Wetlands (SAR) | 12/19/08 | 11/13/09 | 75% | 82% |
| Santa Clara River Estuary (SCR) | 2/19/09 | 10/8/09 | 80% | 97% |
| Santa Margarita River Estuary (SMR) | 12/18/08 | 11/13/09 | 83% | 85% |

| | | | | |
|---|---|---|---|---|
| Seal Beach Fully Tidal (SBF) | 1/8/09 | 11/17/09 | 91% | 92% |
| Seal Beach Muted (SBM) | 1/8/09 | 11/17/09 | 63% | 75% |
| Tijuana River Estuary (TJE) | 11/12/08 | 12/30/09 | 93% | 94% |
| Topanga Canyon Lagoon (TC) | 12/16/08 | 10/28/09 | 90% | 91% |
| Zuma Canyon Lagoon (ZC) | 12/16/08 | 10/28/09 | 77% | 80% |

Continuous monitoring data quality is typically excellent. Data quality was rated from excellent to poor based on the USGS ranking system (Table B.6). For Bight'08, the data quality objective for continuous data was that all data should fall in either the "excellent" or "good" category. Overall over 90% of the data met this objective. Table B.7 lists the percentage of data falling in the "good" or "excellent" categories for each segment site. Data falling outside these two categories was typically in the fair category. This was likely due to poor calibration or biofouling of the sensor later in the deployment period. These data are flagged in the database. Data falling in the poor category was very rare and was associated with a probe failure. These data were removed from the data set.

**Table B.6. U.S.G.S. Continuous Monitoring Data Quality Rating Based on Drift Correction**

| Parameter | Excellent | Good | Fair | Poor |
|---|---|---|---|---|
| Temperature | ≤± 0.2 | ≥± 0.2 to 0.5 | ≥± 0.5 to 0.8 | ≥± 0.8 |
| Specific Conductance | ≤± 3 | ≥± 3 to 10 | ≥± 10 to 15 | ≥± 15 |
| Dissolved Oxygen | The greater of ≤±0.3 mg/L or ≤±5% | The greater of ≥± 0.3 to 0.5 mg/L or ≥± 5 to 10% | The greater of ≥± 0.5 to 0.8 mg/L or ≥±10 to 15% | The greater of ≥± 0.8 mg/L or ≥± 15% |
| pH | ≤±0.2 | ≥± 0.2 to 0.5 | ≥± 0.5 to 0.8 | ≥± 0.8 |
| Turbidity | The greater of ≤±0.5 NTU or ≤±5% | The greater of ≥± 0.5 to 1 NTU or ≥± 5 to 10% | The greater of ≥± 1to 1.5 NTU or ≥±10 to 15% | The greater of ≥± 1.5 NTU or ≥± 15% |
| Depth | ≤±0.3 | ≥± 0.3 to 0.5 | ≥± 0.5 to 0.8 | ≥± 0.8 |
| Fluorescence | The greater of ≤±0.5 units or ≤± 5% | The greater of ≥± 0.5 to 1 units or ≥± 5 to 10% | The greater of ≥± 1to 1.5 units or ≥±10 to 15% | The greater of ≥± 1.5 units or ≥± 15% |

**Table B.7. Percentage of data that meets the data quality objective for each parameter at each segment site.**

| Estuary | Specific Conductivity | Dissolved Oxygen | pH | Turbidity | Chlorophyll Fluorescence | Depth |
|---|---|---|---|---|---|---|
| **OVERALL** | **98%** | **98%** | **95%** | **94%** | **93%** | **96%** |
| Agua Hedionda Lagoon (AHL) | 100% | 100% | 100% | 100% | 100% | 100% |
| Ballona Lagoon (BL) | 80% | 100% | 80% | 100% | 100% | 100% |
| Ballona Wetlands (BW) | 100% | 100% | 89% | 100% | 89% | 100% |
| Batiquitos Lagoon (BQL) | 100% | 100% | 100% | 100% | 100% | 100% |
| Bolsa Chica Muted (BCM) | 100% | 100% | 100% | 88% | 100% | 100% |
| Bolsa Chica Fully Tidal (BCF) | 89% | 100% | 89% | 100% | 89% | 89% |
| UCSB Campus Lagoon (UCL) | 100% | 100% | 100% | 100% | 100% | 100% |
| Devereux Lagoon (DL) | 100% | 100% | 100% | 100% | 100% | 100% |
| Goleta Slough (GS) | 100% | 100% | 100% | 100% | 100% | 100% |
| Los Pensequitos Lagoon (LPL) | 100% | 95% | 86% | 100% | 100% | 100% |

| | | | | | | |
|---|---|---|---|---|---|---|
| Mission Bay (MB) | 100% | 100% | 100% | 100% | 78% | 100% |
| Mugu Lagoon Fully Tidal (MLF) | 100% | 100% | 100% | 100% | 100% | 100% |
| Mugu Lagoon Muted (MLM) | 100% | 100% | 100% | 100% | 100% | 100% |
| San Diego Bay Fully Tidal (SDF) | 100% | 100% | 100% | 100% | 100% | 100% |
| San Diego Bay Muted (SDM) | 100% | 100% | 80% | 94% | 89% | 100% |
| San Diego River (SDR) | 89% | 78% | 85% | 100% | 100% | 100% |
| San Elijo Lagoon (SEL) | 100% | 100% | 100% | 100% | 100% | 100% |
| San Juan Creek (SJC) | 86% | 86% | 100% | 86% | 71% | 100% |
| San Mateo Creek Lagoon (SMC) | 100% | 100% | 88% | 100% | 63% | 100% |
| Santa Ana Wetlands (SAR) | 100% | 100% | 100% | 90% | 90% | 100% |
| Santa Clara River Estuary (SCR1) | 100% | 100% | 100% | 100% | 100% | 100% |
| Santa Clara River Estuary (SCR2) | 100% | 100% | 67% | 100% | 100% | 100% |
| Santa Margarita River Estuary (SMR) | 100% | 100% | 100% | 86% | 57% | 100% |
| Seal Beach Fully Tidal (SBF) | 100% | 100% | 100% | 100% | 89% | 100% |
| Seal Beach Muted (SBM) | 100% | 100% | 100% | 100% | 100% | 100% |
| Tijuana River Estuary (TJE) | 100% | 100% | 94% | 100% | 100% | 100% |
| Topanga Canyon Lagoon (TC) | 100% | 100% | 100% | 100% | 100% | 100% |
| Zuma Canyon Lagoon (ZC) | 100% | 100% | 100% | 100% | 100% | 100% |

**Assessment of Quality Assurance/ Quality Control Results**

Overall, data quality met program QA/QC objectives. All laboratory and field data generated under this program were reviewed for accuracy, precision, and completeness. Data were qualified and flagged in the project database with appropriate QA qualifiers were relevant.

Based on a review of the project DQOs and database data qualifiers, the data collected for the Bight'08 Coastal Wetlands Eutrophication Assessment was deemed appropriate for use in evaluating extent and magnitude of eutrophication by the working group. No data was rejected from the index period sampling data set and only data related to probe failure was rejected from the continuous monitoring data set. The flagged data was considered applicable with appropriate discussion of error and variability.

## References

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