FINAL
24-HOUR TIME SERIES ANALYSIS OF DISSOLVED COPPER IN SHELTER ISLAND YACHT BASIN

TECHNICAL MEMORANDUM

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

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ACRONYMS AND ABBREVIATIONS

Amec Foster Wheeler	Amec Foster Wheeler Environment & Infrastructure, Inc. (formerly AMEC Environment & Infrastructure, Inc.)
COC	chain of custody
DI	deionized
ER	equipment rinsate
FB	field blank
GPS	Global Positioning System
ID	identification
MLLW	mean lower low water
NA	not applicable
PDF	Portable Data Format
Port of San Diego or Port	San Diego Unified Port District
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
Regional Board	San Diego Regional Water Quality Control Board
REP	replicate
SAP	Sampling and Analysis Plan
SD	standard deviation
SEM	standard error of the mean
SIYB	Shelter Island Yacht Basin
SIYB TMDL	Total Maximum Daily Load for Dissolved Copper in the San Diego Shelter Island Yacht Basin
SS	Special Study
State Board	State Water Resources Control Board
SWAMP	Surface Water Ambient Monitoring Program
Time Series Study	24-Hour Time Series Study of Dissolved Copper in SIYB
TMDL	total maximum daily load
TS	time series
USEPA	United States Environmental Protection Agency
YSI	YSI Incorporated

UNITS OF MEASURE

%	percent
±	plus or minus
°C	degree(s) Celsius
<	less than
>	greater than
≤	less than or equal to
≥	greater than or equal to
µg/L	microgram(s) per liter
µm	Micrometer
ft	feet or foot
m	meter(s)
mL	milliliter(s)
pH	hydrogen ion concentration
ppt	part(s) per thousand

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1.0 INTRODUCTION

This report presents the results of the 24-Hour Time Series Analysis of Dissolved Copper (Time Series Study) conducted in the Shelter Island Yacht Basin (SIYB) in January 2018. This water quality investigation was designed to evaluate possible variations in dissolved copper concentrations resulting from tidal fluctuations. This study was completed in January 2018 through the combined efforts of the San Diego Unified Port District (Port of San Diego or Port) and Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler).

Surface water quality monitoring is completed on an annual basis to analyze primarily for dissolved copper concentrations as part of the SIYB Dissolved Copper Total Maximum Daily Load (SIYB TMDL). The sampling is completed on similar tidal heights each year during the peak summer months (i.e., August or September); this sampling consequently does not allow for characterization of tidal influence on the surface concentrations of dissolved copper throughout the basin. In an effort to better understand tidal influence on the concentrations of dissolved copper in the surface waters of SIYB, the Time Series Study was conducted in January of 2018 over the duration of one full mixed semidiurnal tidal cycle (approximately 25 hours).

The objective of the Time Series Study is to answer the following question:

> *How do tidal variations affect the concentrations of dissolved copper in the surface waters of SIYB?*

The parameters monitored in the Time Series Study were dissolved copper and general water quality characteristics (e.g., temperature, pH, and salinity). Details regarding sample collection procedures are summarized in Section 2 (Collection Methods and Analysis) of this report, and are discussed in more detail in the project-specific Sampling and Analysis Plan (SAP)/Quality Assurance Project Plan (QAPP) (Amec Foster Wheeler, 2017a; Appendix A).

1.1 Background

Since 2011, dissolved copper concentrations in the surface waters of SIYB have been evaluated each year at six specific locations within the basin as part of the SIYB Dissolved Copper TMDL monitoring program. The annual monitoring results are submitted to the San Diego Regional Water Quality Control Board (Regional Board) as a component of the annual TMDL monitoring report.

Each year, the collection date for the annual monitoring program is selected to target a tidal cycle with a high tide of approximately +5.5 to +6.5 feet mean lower low water (MLLW), and a tidal range between consecutive high and low tides of 5 to 7 feet. Careful effort is made by field scientists to collect samples at each of the six TMDL monitoring stations from year to year at approximately the same time period relative to the tide. Furthermore, the samples are collected at the stations in the same sequence each year, moving from the mouth of the basin to bracket the slack high tide, thus providing relative consistency between monitoring years. For example, Figure 1-1 illustrates the time of collection at each TMDL station compared with tide height during the annual TMDL compliance monitoring events from 2014 through 2017 and during a special study (the 2016 Enhanced Water Quality Special Study). The special study was performed in

conjunction with the 2016 TMDL compliance monitoring to supplement the existing TMDL stations with additional stations and monitoring depths (Amec Foster Wheeler, 2017b).

Because of its configuration, the major factor responsible for water circulation in SIYB is the daily tidal exchange between the basin and San Diego Bay (Regional Board, 2005). Tidal mixing has the potential to affect the ambient concentrations of dissolved copper within the water column. Understanding the degree by which dissolved copper fluctuates over a tidal cycle will allow for a better understanding of how representative the single point-in-time annual SIYB sample dissolved copper concentrations compare to other points in the daily tidal cycle.

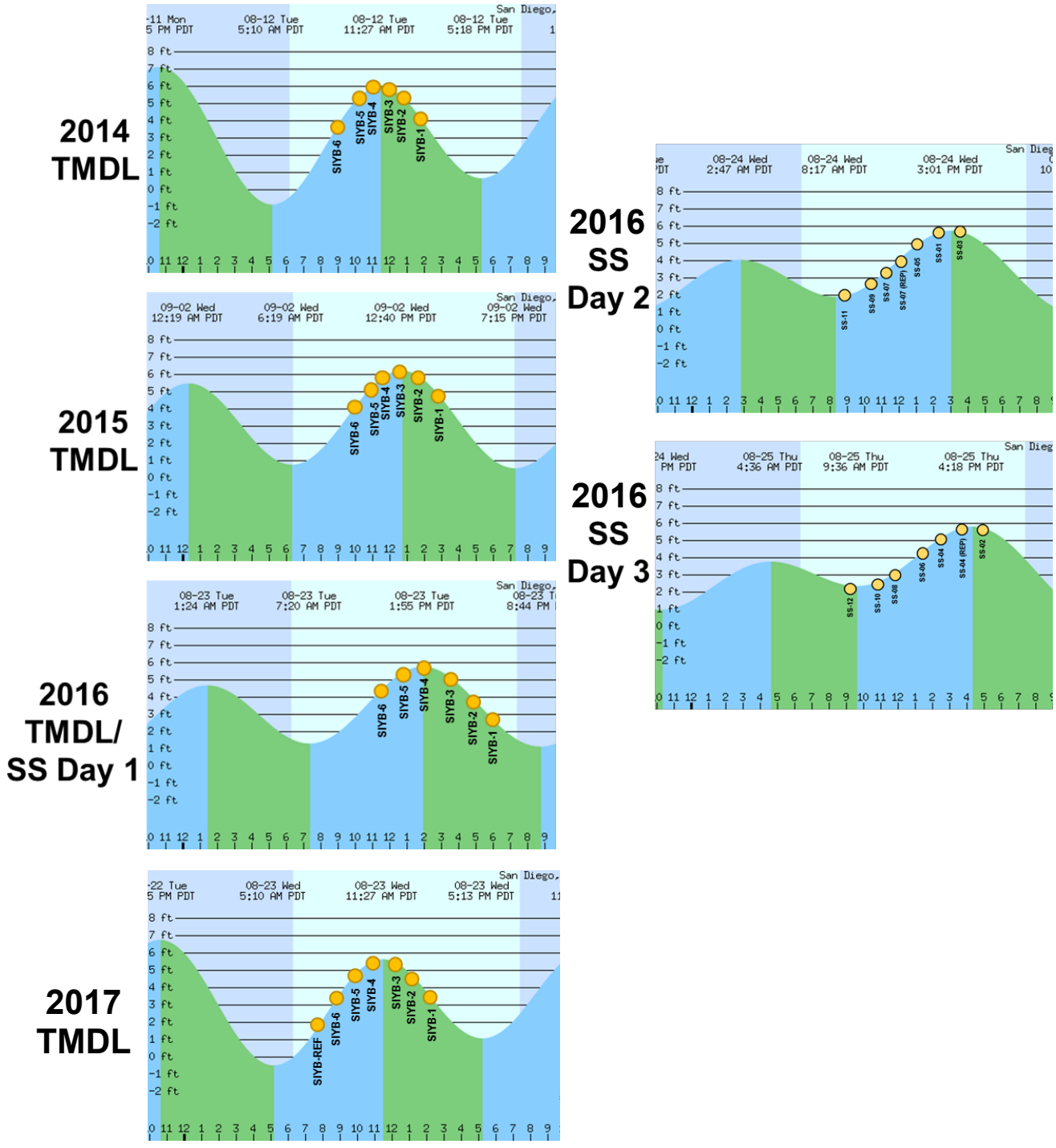

Figure 1-1. Collection Event Versus Tidal Cycle During the SIYB TMDL Monitoring Event (2014–2017) and 2016 Enhanced Water Quality Special Study Event

Note: orange dot = time of collection; SS = Special Study

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2.0 COLLECTION METHODS AND ANALYSIS

This section describes the Time Series Study collection methods, including methods to evaluate how tidal variations may influence dissolved copper levels in surface waters of SIYB, and project-specific quality assurance (QA) and quality control (QC) procedures used during water quality monitoring.

2.1 Sample Collection Methods

Water quality samples were collected from surface water (i.e., 1 meter below the surface) at three locations throughout SIYB. These locations were chosen to characterize different areas of the basin. Samples were collected approximately every two hours throughout one full mixed semidiurnal tidal cycle; the sampling days (January 3–4, 2018) were selected to specifically correspond with the tidal ranges observed during the annual TMDL monitoring.

2.1.1 Sampling Stations

As discussed in Section 2.1, samples were collected at three locations throughout SIYB that reflect distance from the mouth. Station TS-1 was located near the head of the basin, at the southwestern end of the fuel dock. Discrete water samples at this station were collected directly from the dock. Station TS-2 was located approximately mid-basin and a Port-operated vessel with non-biocide paint was used for discrete sample collection. Station TS-3 was at the mouth of SIYB at the southwestern end of the Transient Dock, and as with TS-1, discrete water samples at TS-3 were collected directly from the dock. Figure 2-1 shows the target and actual sampling locations. Target coordinates and actual sampling coordinates for the stations are provided in Table 2-1.

Table 2-1.
Station Location and Coordinates

Station ID	Location	Target Sampling Coordinates		Actual Sampling Coordinates	
		Latitude (dd.ddddd°)	Longitude (ddd·ddddd°)	Latitude (dd.ddddd°)	Longitude (ddd·ddddd°)
TS-1	Southwestern end of Pearson's Fuel Dock	32.71864	-117.22612	32.71864	-117.22612
TS-2	Mid-Basin	32.71550	-117.22989	32.71575	-117.22977
TS-3	Southwestern end of the Transient Dock	32.71013	-117.23450	32.71013	-117.23450

Notes:
ddd/dd.ddddd° = decimal degrees, ID = identification; TS = time series

Figure 2-1. Shelter Island Yacht Basin Time Series Study Sampling Locations

2.1.2 Collection Schedule

Sample collections at the three stations were performed synchronously throughout the full semidiurnal tidal cycle on January 3 and 4, 2018. As discussed, the sampling date was selected primarily on the basis of the tidal range (i.e., tidal heights similar to those selected for TMDL sampling events) and practicality (i.e., a non-holiday or weekend day for reduced vessel traffic). Table 2-2 provides the tide times and heights for the Time Series Study and the most recent TMDL monitoring event.

Table 2-2.
Tide Times and Heights for the Time Series Study and Annual TMDL Monitoring Events

Date	Low Tide	High Tide	Low Tide	High Tide	Low Tide
	time/height [feet]				
1/3/2018 (Primary)	16:42 (-1.9 ft)	23:11 (+7.0 ft)	04:15 (+1.6 ft)	10:24 (+7.0 ft)	17:29 (-1.4 ft)
8/23/2017 (2017 TMDL)	5:19 (+1.4 ft)	11:33 (+5.6 ft)	18:06 (+0.9 ft)	--	--

Field collection began at slack low tide; samples were collected approximately every 2 hours for 25 hours, bracketing two high tides. Figure 2-2 provides an illustration of the sample collection schedule timing, and Table 2-3 provides a matrix of the collection times. Collection at all three stations occurred simultaneously, using three trained sampling teams.

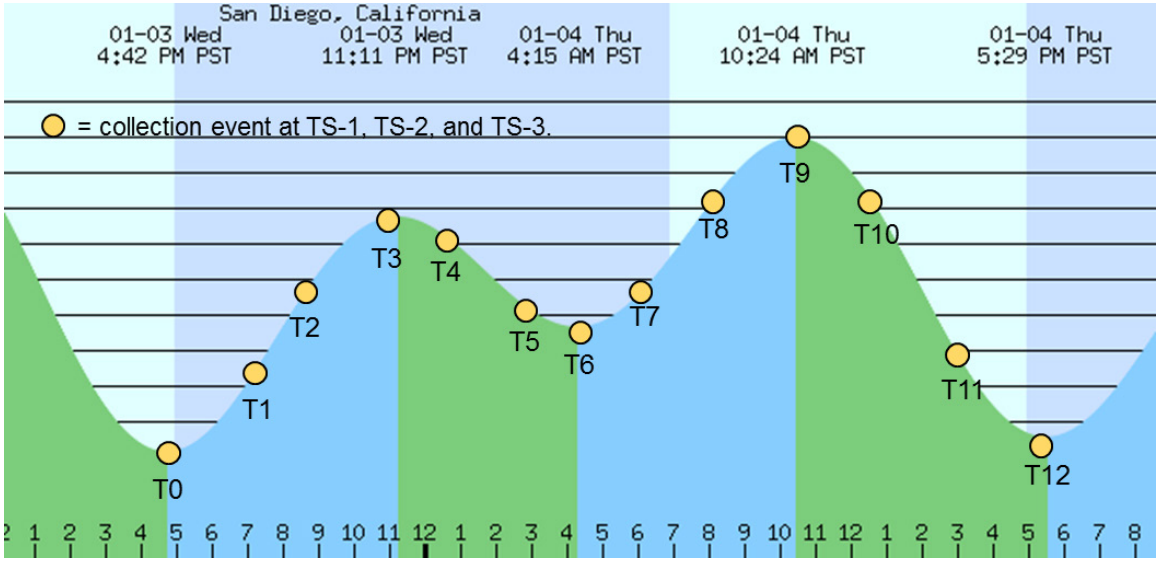

Figure 2-2. Sample Collection Relative to the Tidal Cycle (1/3/2018–1/4/2018)

Table 2-3.
Sample Collection Timing Matrix

Sample ID	Time
TS-[station]-ER	Prior to T0 collection
TS-[station]-T0	16:42 (1/3/2018)
TS-[station]-T1	18:50 (1/3/2018)
TS-[station]-T2	21:00 (1/3/2018)
TS-[station]-T3	23:11 (1/3/2018)
TS-[station]-T4	01:00 (1/4/2018)
TS-[station]-T5	03:00 (1/4/2018)
TS-[station]-T6	04:15 (1/4/2018)
TS-[station]-T7	06:20 (1/4/2018)
TS-[station]-T8	08:20 (1/4/2018)
TS-[station]-T9	10:24 (1/4/2018)
TS-[station]-T10	13:00 (1/4/2018)
TS-[station]-T11	15:15 (1/4/2018)
TS-[station]-T12	17:29 (1/4/2018)
TS-[station]-T12-REP	Immediately followed T12 collection
TS-[station]-FB	Followed T12-REP collection

Notes:
ER = equipment rinsate; FB = field blank; ID = identification; REP = replicate; TS = time series

2.1.3 Field Procedures

Collection methods are presented in Sections 2.3.1 through 2.3.5. Field procedures are described in detail in the project-specific SAP/QAPP (Amec Foster Wheeler, 2017a; Appendix A).

2.1.3.1 Collection Station Positioning

Dockside stations (TS-1 and TS-3) were accessed by land and were located using a Global Positioning System (GPS) device. The mid-basin station (TS-2) was accessed by vessel. Under the direction of the Port Harbor Police[1], positioning and anchoring safety for overnight sampling played a large role in determining the final placement of TS-2, which was positioned at the perimeter of La Playa Anchorage, closest to the main channel of SIYB.

For the mid-channel station (TS-2), the vessel was anchored on station for most of the duration of the sampling event. Upon anchoring on station, the boat engine was turned off for a period of at least 5 minutes before collection activities commenced. During all field efforts, each field team scanned the surrounding area for nearby ongoing vessel maintenance activities and took notes and photographs of these activities (and other factors of note near the collection site), when warranted.

2.1.3.2 Sample Collection Conditions

To ensure sample integrity, specific sample collection conditions were required, as described in the project-specific SAP/QAPP (Amec Foster Wheeler, 2017a; Appendix A). These conditions included taking special care during the anchoring process at TS-2 to ensure that the anchor did not cause excessive sediment resuspension. Once the boat was anchored, the engine was turned off, and a minimum period of 5 minutes elapsed prior to commencing collection activities to allow any potential resuspended sediment to settle.

2.1.3.3 Sample Collection Procedures

To ensure consistency between sampling locations, each sampling team was equipped with a precleaned Niskin bottle, prelabeled bottle kits and extra bottles, precleaned vacuum filtration system units, a filtration pump, a plastic-lined 5-gallon bucket (to store the Niskin in between sample collection times), coolers, and ice.

All sampling steps followed the Surface Water Ambient Monitoring Program (SWAMP)-defined “clean hands” techniques (State Water Resources Control Board [State Board], 2014). For each sample collection event at each station, discrete water samples were collected using a Niskin bottle deployed from the sampling vessel or dock. Surface samples at each station were collected at a depth of 1 meter. Sample timing at each station followed the schedule matrix in Table 2-3 (approximately every two hours). As required by SWAMP protocols, the program included collecting a field replicate at each station. The field replicate sample consisted of a second complete set of samples collected immediately following the collection of the last sample collected

[1] The Port Harbor Police requested via telephone correspondence that the sampling vessel be positioned outside the main channel.

at each station (TS-[station]-12). In addition to the field replicate, each batch of samples (i.e., each station) included an equipment rinse blank and field blank using laboratory-provided deionized water. The equipment rinse blank was collected prior to collection of TS-[station]-0, and the field blank was collected immediately after the collection of the replicate sample (i.e., following collection of TS-[station]-12-REP) (Table 2-3).

Discrete water samples were filtered in the field (to comply with United States Environmental Protection Agency [USEPA] Method 1640 protocol). Two 500-milliliter (mL) aliquots of water from each Niskin bottle grab sample were filtered through a precleaned[2] 0.45-micrometer (µm) glass fiber filter using a Whatman brand Klari-flex bottle top vacuum filtration system. To ensure that a clean sample was collected, the first 500-mL aliquot was discarded. The second 500-mL aliquot was directly transferred into a prelabeled nonpreserved[3] sample bottle containing ultra-pure nitric acid for preservation. The field team ensured that no airspace remained in the sample bottle once capped. Once confirmed, the sample bottle was immediately transferred to a cooler containing ice. Cooler ice was replenished during the 12-hour shift change and following the conclusion of sampling.

Following the water sample collection, field measurements of pH, temperature, and salinity of the surface water at each station (i.e., within 1 meter of the surface) were made using a YSI meter according to the manufacturer's specifications. Field measurements and any observations (if applicable) were recorded in the field log for that collection event. Completed field logs are provided in Appendix B.

2.1.3.4 Sample Collection Completeness

Upon completion of the sample collection and field measurements, the field crew completed the station- and sample-specific QA/QC checklist to ensure the completeness and accuracy of the field data logs and analytical samples (provided in Appendix B). Once the QA/QC checklist was deemed complete, the field crew prepped for the next sample collection.

Once the entire suite of samples was collected, water samples were logged on a chain-of-custody (COC) form, replaced in newly iced containers, and transported to the analytical laboratory on January 5, 2018.

2.1.3.5 Equipment Decontamination and Cleaning

Prior to field collection, the Niskin bottle was thoroughly cleaned using soapy water and then rinsed thoroughly with deionized water. Upon sample collection, the Niskin bottle was rinsed thoroughly with site water and soaked at the sampling depth (1 meter below the water surface) for at least for one minute prior to sample collection. After collection, water samples were

[2] The entire filtration apparatus was acid-washed and rinsed thoroughly with deionized (DI) water prior to sample collection.

[3] In the SAP/QAPP, it was stated that sample bottles would contain ultra-pure nitric acid for preservation. In December 29, 2017, email correspondence from the analytical laboratory, it was specified that the samples should be preserved at the laboratory.

transferred from the Niskin bottle to a laboratory-certified, contaminant-free bottle top filtration system. In between sampling times, the Niskin bottle was stored in a plastic-lined, 5-gallon bucket.

2.2 Analytical Analysis

Surface water samples were analyzed for dissolved copper following certified USEPA test methods. The analytical test methods and reporting limits are provided in Table 2-4. Surface water field measurements were taken *in situ* following each sample collection for pH, salinity, and temperature using a YSI data sonde. Measurement accuracy for *in situ* water quality measurements is provided in Table 2-4.

Table 2-4.
Analytical Methods and Measurement Accuracy

Water Quality Measurement	Method	Method Detection Limit	Reporting Limit
Dissolved Copper	USEPA Method 1640	0.0038 µg/L	0.010 µg/L
Salinity	YSI sonde	NA	± 0.1 ppt
Temperature	YSI sonde	NA	± 0.1 °C
pH	YSI sonde	NA	± 0.1 pH unit

Notes:
°C = degrees Celsius; µg/L = micrograms per liter; NA = not applicable; pH = hydrogen ion concentration; ppt = part(s) per thousand;
USEPA = United States Environmental Protection Agency; YSI = YSI Incorporated

2.2.1 Quality Assurance and Quality Control

Sampling process QA/QC included preparation prior to, during, and after collection of the samples to minimize the possibility of compromising sample integrity. The sample collection team was trained in and followed field sampling operating procedures in accordance with the Special Study SAP/QAPP (Amec Foster Wheeler, 2017a; Appendix A). COC procedures were used for all samples throughout the collection, transport, and analytical process. Completed COC forms are provided in Appendix C. The project-specific SAP/QAPP (Amec Foster Wheeler, 2017a; Appendix A) provides more information regarding COC procedures.

2.2.2 Data Review and Management

Field and laboratory data were reviewed for completeness and accuracy prior to analysis and reporting, and were stored in a database, as described in Sections 2.2.2.1 and 2.2.2.2.

2.2.2.1 Data Review

After the sampling event, field data sheets were checked for completeness and accuracy by the field crew and the Field QA Officer. In addition, all sample COC forms were checked against sample labels prior to transportation to the analytical laboratory. In the laboratory, technicians documented sample receipt and sample preparation activities in laboratory logbooks or on bench sheets. Data validation included use of dated and signed entries by technicians on the data sheets and logbooks used for samples, sample tracking and numbering systems to track the progress of samples through the laboratory, and QC criteria to reject or accept specific data. Data for

laboratory analyses were entered directly onto data sheets. Data sheets were filled out in ink and signed by the technician, who checked the sheet to ensure completeness and accuracy. The technician who generated the data had primary responsibility for the accuracy and completeness of the data. Each technician reviewed the data to ensure the following:

- The sample description information was correct and complete.
- The analysis information was correct and complete.
- The results were correct and complete.
- The documentation was complete.

All data were reviewed and verified by participating team laboratories to determine whether data quality objectives had been met, and whether appropriate corrective actions had been taken when necessary.

2.2.2.2 Data Management

All laboratory-supplied analytical results were provided as Adobe Portable Data Format (PDF) files. Analytical laboratory results were reviewed by the laboratory QA/QC Officer, and then forwarded to Amec Foster Wheeler for review and reporting. All laboratory records are provided in Appendix D.

2.2.2.3 Data Analysis

The water quality data is presented in tabular format. The dissolved copper concentrations are displayed graphically as a temporal distribution versus the tidal cycle. Analysis of water quality data includes calculations of the range, averages, and standard deviations at each station and study-wide.

3.0 RESULTS

This section discusses and summarizes the analytical chemistry results and *in situ* measurements of the January 2018 Time Series Study. Surface water samples were collected on January 3–4, 2018 at three stations within SIYB. Water samples were tested for concentrations of dissolved copper. Analytical results of the survey are presented in Table 3-1. A QA/QC summary of the analytical laboratory data is provided in Section 3.3. The chemistry results reports submitted by the analytical laboratory are provided in Appendix D.

3.1 Dissolved Copper Results

Table 3-1 provides the surface water dissolved copper concentrations measured at approximately two-hour intervals for the three stations over the 25-hour collection period. Figure 3-1 shows dissolved copper concentrations at the three respective stations throughout the tidal cycle. Figure 3-2 provides the mean concentrations ± standard deviation at each of the three stations. In general, the findings of the Time Series Study showed the following:

- Dissolved copper concentrations in the surface waters of TS-1, located at the fuel dock (nearest to the head of SIYB), ranged from 8.9 µg/L to 10 µg/L over the duration of the study. The average measured concentration over the full semidiurnal tidal cycle was 9.5 µg/L ± 0.34 µg/L (standard deviation). Concentrations over the tidal cycle were the most consistent at this station, compared with results from the other two stations.
- Dissolved copper concentrations at the surface waters of TS-2, located approximately mid-basin and mid-channel, ranged from 2.0 µg/L to 7.1 µg/L; the average concentration over the duration of the study was 5.5 µg/L ± 1.2 µg/L; concentrations varied with the tide more at this station when compared to the values measured at TS-1.
- Dissolved copper concentrations at the surface waters at TS-3, located at the southwestern end of the Transient Dock, ranged from 1.0 µg/L to 4.8 µg/L; the average concentration over the duration of the study was 3.0 µg/L ± 1.2 µg/L. Concentrations of dissolved copper generally varied the greatest with the tidal cycle at this station.

Table 3-1.
Dissolved Copper Concentrations during the SIYB Time Series Study

Sample Sequence	Station TS-1 (Pearson's Fuel Dock)	Station TS-2 (Mid-Channel)	Station TS-3 (Transient Dock)
	Concentration (µg/L)		
T0	9.5	5.5	2.7
T1	9.5	6.4	3.2
T2	9.1	4.1	4.1
T3	9.4	5.0	4.8
T4	9.6	5.7	3.5
T5	9.3	5.3	4.1
T6	9.5	5.4	3.9
T7	9.0	5.5	2.1
T8	8.9	6.4	1.2
T9	10	2.0	1.0
T10	9.8	6.2	1.4
T11	9.9	6.6	3.0
T12	9.9	7.1	3.9
T12-REP	10	7.0	3.9
ER	0.059	0.025	0.044
FB	ND	0.023	0.028

Notes:
µg/L = micrograms per liter; SIYB = Shelter Island Yacht Basin; TS = time series; ER = equipment rinsate; FB = field blank

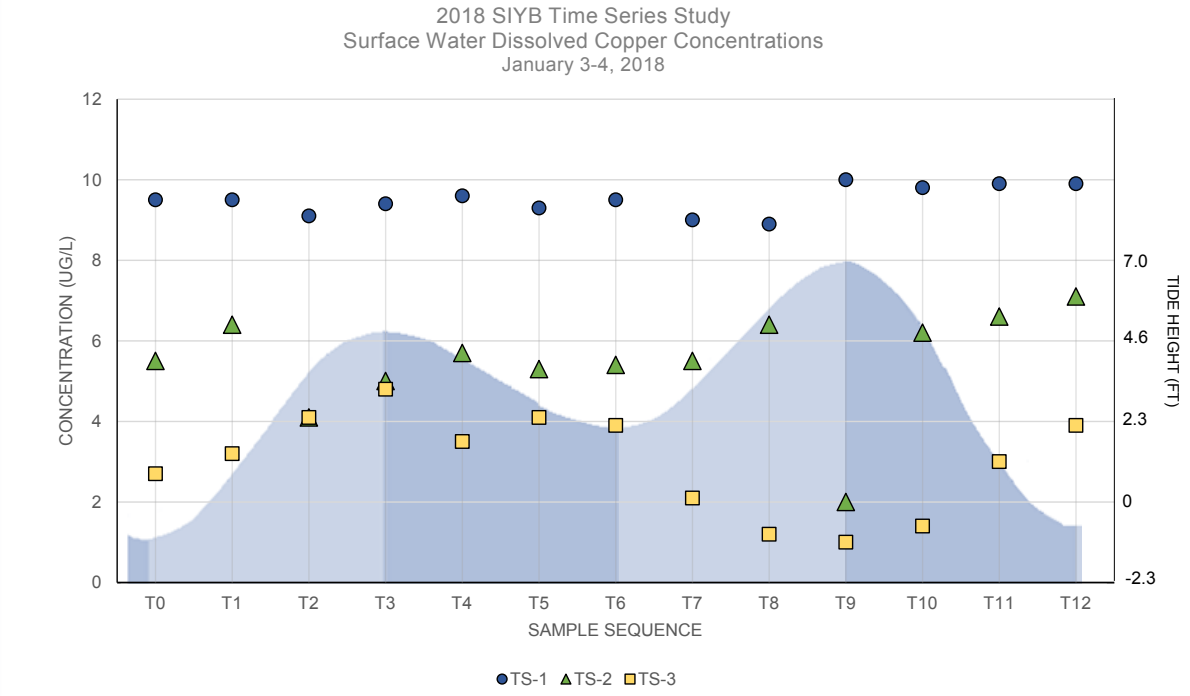

Figure 3-1. Time Series Study Surface Water Dissolved Copper Concentrations versus Tide Sequence

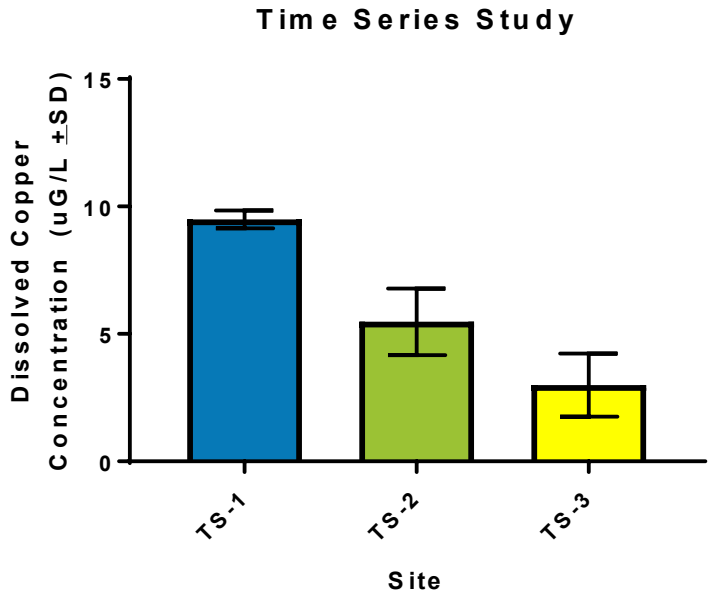

Figure 3-2. Mean Dissolved Copper Concentrations at Each Time Series Study Station

3.2 *In situ* Measurements

Following water collection, the surface water quality indicators were measured using a YSI data sonde. The ranges of each indicator at each station is presented in Table 3-2. Figures 3-3 through 3-5 present the measured values of temperature, salinity, and pH measured over the duration of the study. The field data logs are provided in Appendix E.

Table 3-2.
Range of Water Quality Measurements

Station	Temperature (°C)	pH	Salinity (ppt)
TS-1	15.9 – 16.4	8.1 – 8.5	33.3 – 33.7
TS-2	15.6 – 16.2	8.0 – 8.4	33.4 – 33.9
TS-3	15.8 – 16.2	8.0 – 8.2	33.5 – 33.7

Notes:
°C = degrees Celsius; ppt = parts per thousand

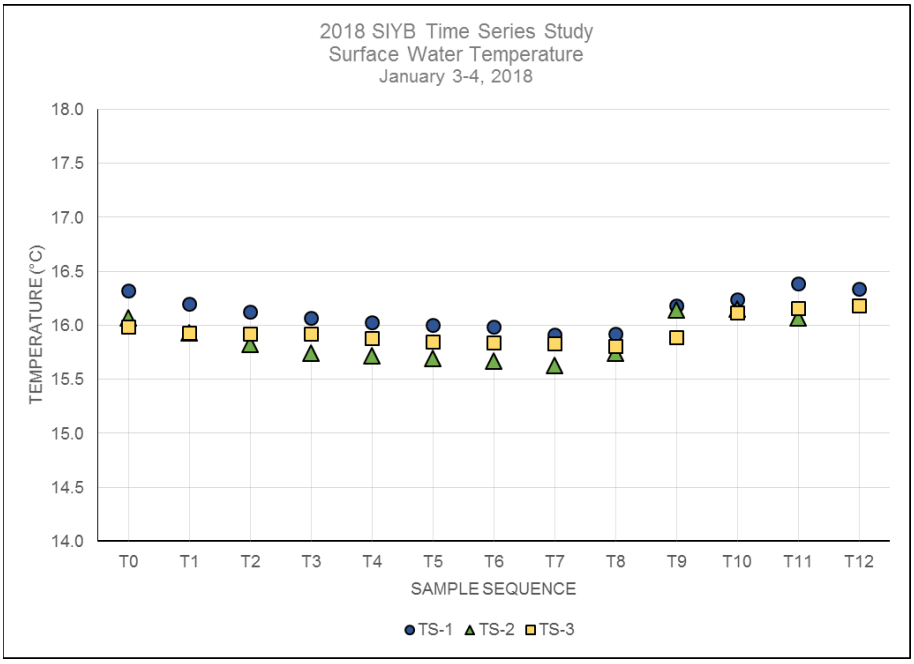

Figure 3-3. Time Series Study Surface Water Temperatures

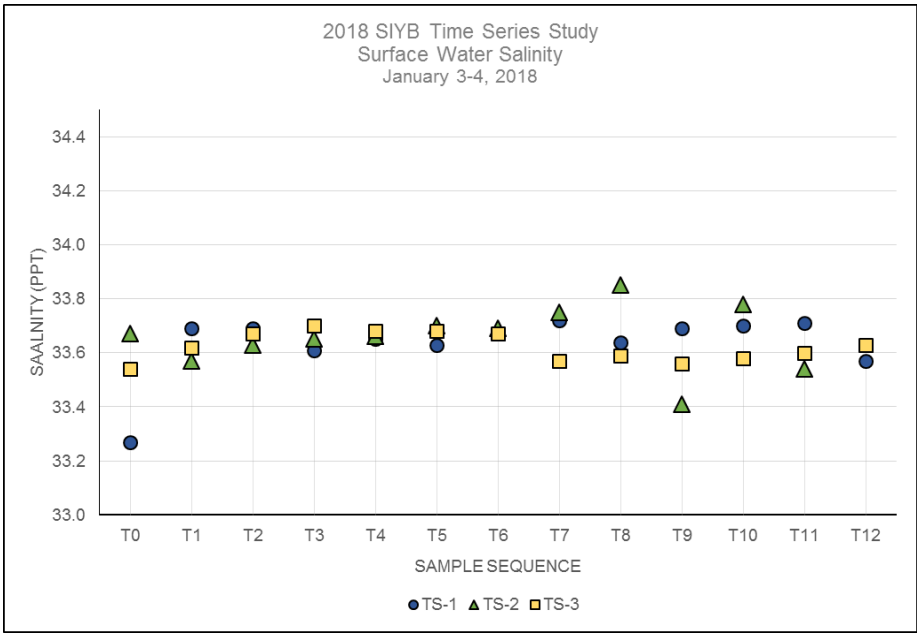

Figure 3-4. Time Series Study Surface Water Salinities

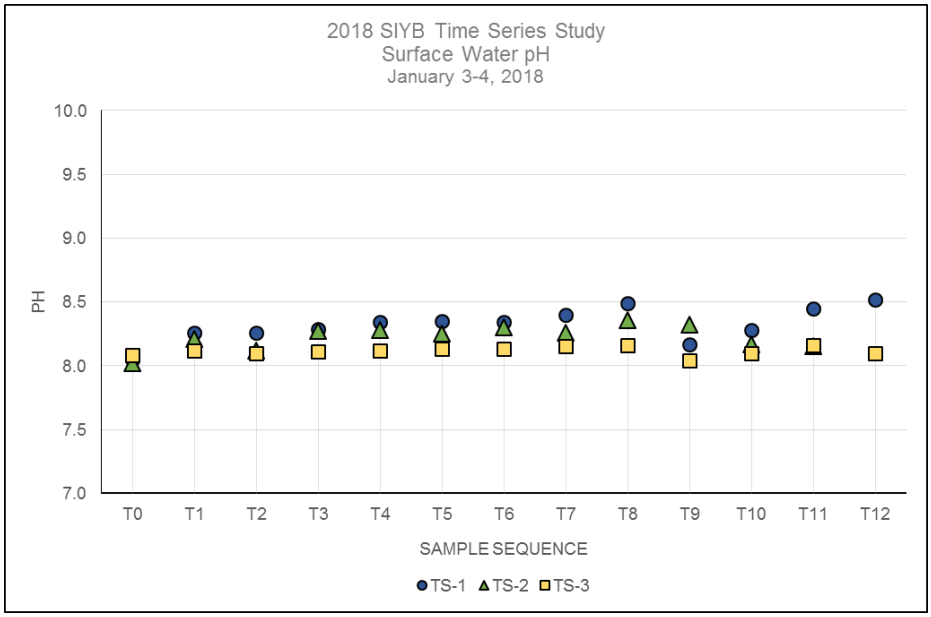

Figure 3-5. Time Series Study Surface Water pH

3.3 QA/QC Summary

All samples were submitted to the analytical laboratory on January 5, 2018. All samples were received in good condition at Weck, at or below 4°C and on ice. Samples for dissolved metals were filtered in the field using a 0.45-µm acid-rinse bottle top filtration system and preserved at the laboratory. Holding time requirements for analysis were met for all samples.

Analytical chemistry results underwent a thorough QA/QC evaluation; they were determined to meet the data quality objectives outlined in the SAP/QAPP and were deemed acceptable for reporting purposes, with the qualifications noted in the QA section of the individual laboratory reports (these issues are summarized below). The analytical laboratory reports in Appendix D have specific QA/QC sections that highlight any qualified data.

4.0 DISCUSSION

The goal of this Time Series Study was to better understand how tidal variations affects the concentration of dissolved copper in the surface waters of SIYB.

In general, the results of the Time Series Study showed the following:

- Dissolved copper concentrations at Station TS-1 (off the fuel dock) showed little variation between phase of the tide or sampling times, suggesting that tides may not have as great an influence in the back-basin areas. This is demonstrated in Figures 4-1 and 4-2. Figure 4-1 provides the squared difference from the average concentration for each sample at TS-1, which depicts the measured spread of each data point from the average concentration; the observed sample variance[4] of concentrations at TS-1 was 0.124. Figure 4-2 provides the distribution of concentrations measured at TS-1; concentrations ranged from 8.9 µg/L to 10 µg/L over the duration of the study. Overall, concentrations at TS-1 were the highest compared with results from the other two stations and variability was the least; the mean concentration (±SD) at TS-1 over the duration of the study was 9.5 µg/L ± 0.34 µg/L.
- Dissolved copper concentrations at the mid-channel station and the station closest to the mouth, TS-2 and TS-3, respectively, exhibited more variability than concentrations observed at TS-1 (Figure 4-1; sample variance at TS-2 was 1.70, sample variance at TS-3 was 1.52), suggesting that tides may affect dissolved copper concentrations over the course of a full tidal cycle. Concentrations at TS-2 were lower than those observed at TS-1; the mean concentration (±SD) of dissolved copper at TS-2 over the duration of the study was 5.5 µg/L ± 1.2 µg/L, while the concentrations ranged from 2.0 µg/L to 7.1 µg/L. Variability was the greatest at TS-2. Concentrations at TS-3 were the lowest overall for the three stations; the mean concentration (±SD) at TS-3 over the duration of the study was 3.0 µg/L ± 1.2 µg/L, and the concentrations ranged from 1.0 µg/L to 4.8 µg/L (Figure 4-2).

[4] The sample variance is determined by the sum of squares divided by the adjusted number of values in the dataset. Variance values closer to zero indicate that values within a data set are similar, while larger values indicate higher scatter of data.

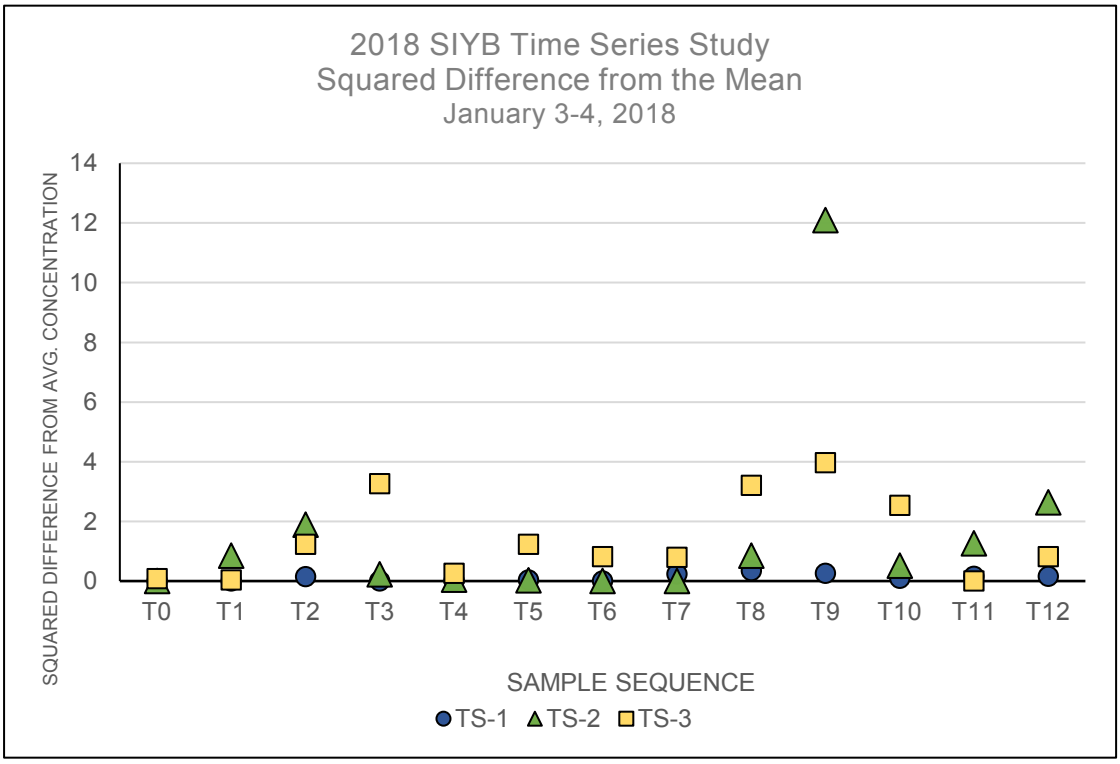

Figure 4-1. Squared differences from the Average Measured Concentrations at Each Station

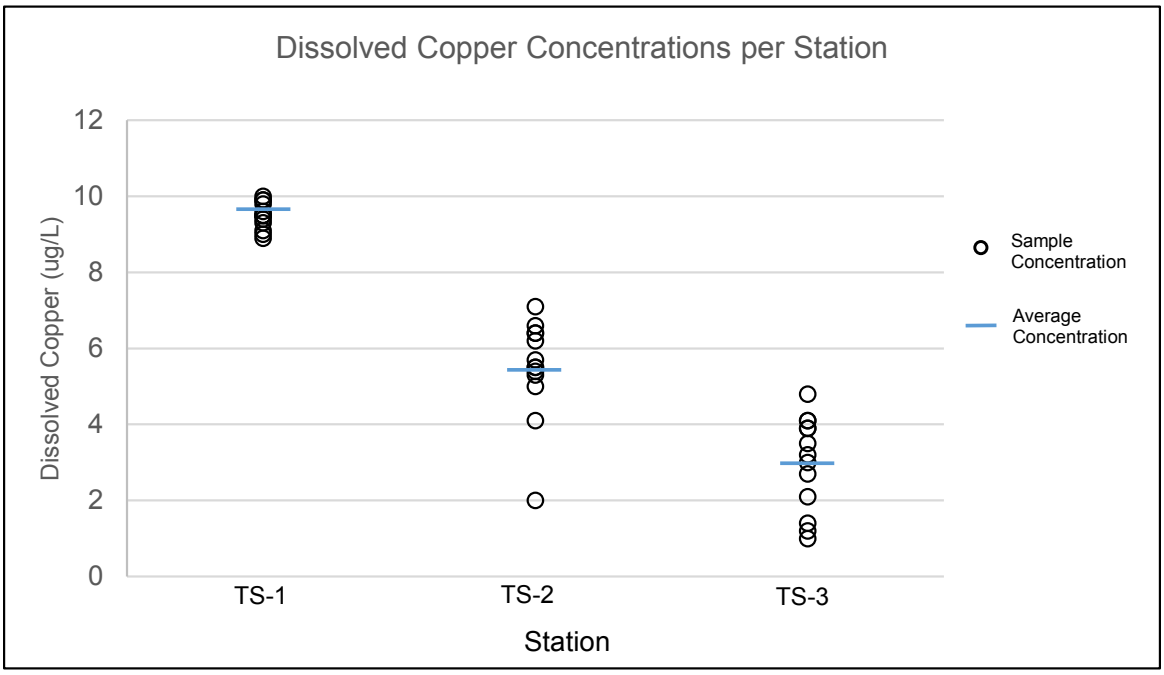

Figure 4-2. Dissolved Copper Concentrations at Each Sampling Station

Tidal Influence and TMDL Methodologies

Dissolved copper concentrations were analyzed to evaluate variations between the portion of the tidal phase sampled during the annual TMDL compliance monitoring and the portion of the tidal phase that is not captured during annual TMDL compliance monitoring. A mixed semidiurnal tidal cycle experiences two high and two low phases of varying tidal height. During the approximately 25-hour sampling, 13 discrete samples (T0-T12) were collected simultaneously at TS-1, TS-2, and TS-3. Samples T0-T1, T5-T7, and T11-T12 captured the portions of the tide that are not sampled with the bracketing methodologies used for the annual TMDL compliance monitoring (during both the ebb and flow around slack low tide; see Figure 4-3). Samples T2-T4 and T8-T10 captured the portions of the tide that are sampled with the bracketing methodologies used for the annual TMDL compliance monitoring (during both the ebb and flow around slack high tide; see Figure 4-3).

Table 4-1 summarizes the dissolved copper averages by station for each bracketed tidal phase of the mixed semidiurnal tide captured during the Time Series Study (two similar bracketed highs tides, and two different bracketed low tides, in relation to TMDL compliance tidal bracketing methodologies). There was little variability in dissolved copper concentrations observed at TS-1 during each phase of the tidal cycle (see Table 4-1). At Stations TS-2 and TS-3, greater variability in dissolved copper averages by tidal phase was observed (see Table 4-1). This concurs with the overall finding that tides may influence dissolved copper concentrations to a greater extent at locations that are closer to the mouth of the basin. When comparing the Time Series Study results by tidal phase to the average concentrations observed at the nearest TMDL Station[5], similar ranges of variability are observed during the TMDL sampling and the high tide phase of the Time Series Study (Figure 4-4). Less variability was associated with the low tide phase during the Time Series Study.

It is important to note that although there was observed variability by station and tidal phase for the Time Series Study, there were no significant differences between the high tide phase and low tide phase during the Time Series Study at TS-1 ($t(11)=0.2332$, $p=0.8199$), TS-2 ($t(11)=1.562$, $p=0.1465$) or TS-3 ($t(11)=0.8722$, $p=0.4018$; see Figure 4-4).

[5] The TMDL station concentration presented in Figure 4-4 provides the mean (±SEM) of the concentrations measured during the 2011 through 2017 annual TMDL compliance monitoring events.

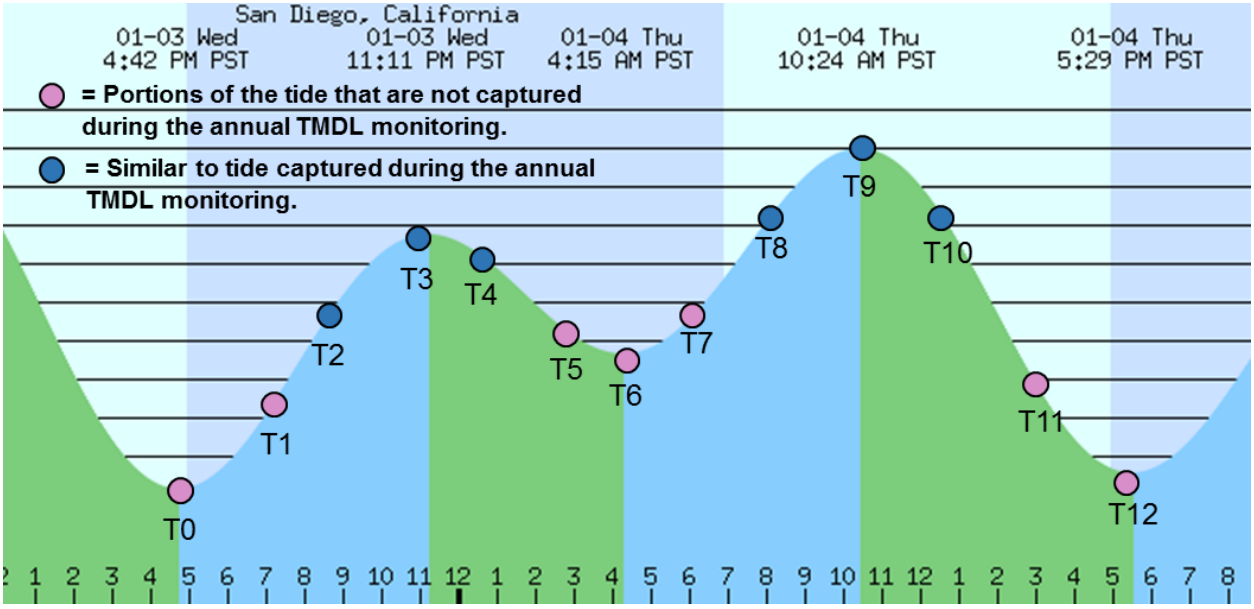

Figure 4-3. Similar and Dissimilar Tidal Swings of the Time Series Study throughout the Tidal Cycle

Table 4-1.
Comparison of Tidal Bracket Average Concentrations by Station and by Tidal Phase

Tidal Swing Captured	Time Series Study Sample Points	Average Dissolved Copper Concentration (µg/L) at Each Station		
		TS-1	TS-2	TS-3
Tidal Swing Similar to TMDL Compliance Monitoring (period around slack high)	T2, T3, T4	9.4	4.9	4.1
	T8, T9, T10	9.6	4.9	1.2
Tidal Swing Opposite to TMDL Compliance Monitoring (period around slack low)	T5, T6, T7	9.3	5.4	3.4
	T0, T1, T11, T12	9.7	6.4	3.2

µg/L = micrograms per liter; TMDL = Total Maximum Daily Load; TS = Time Series

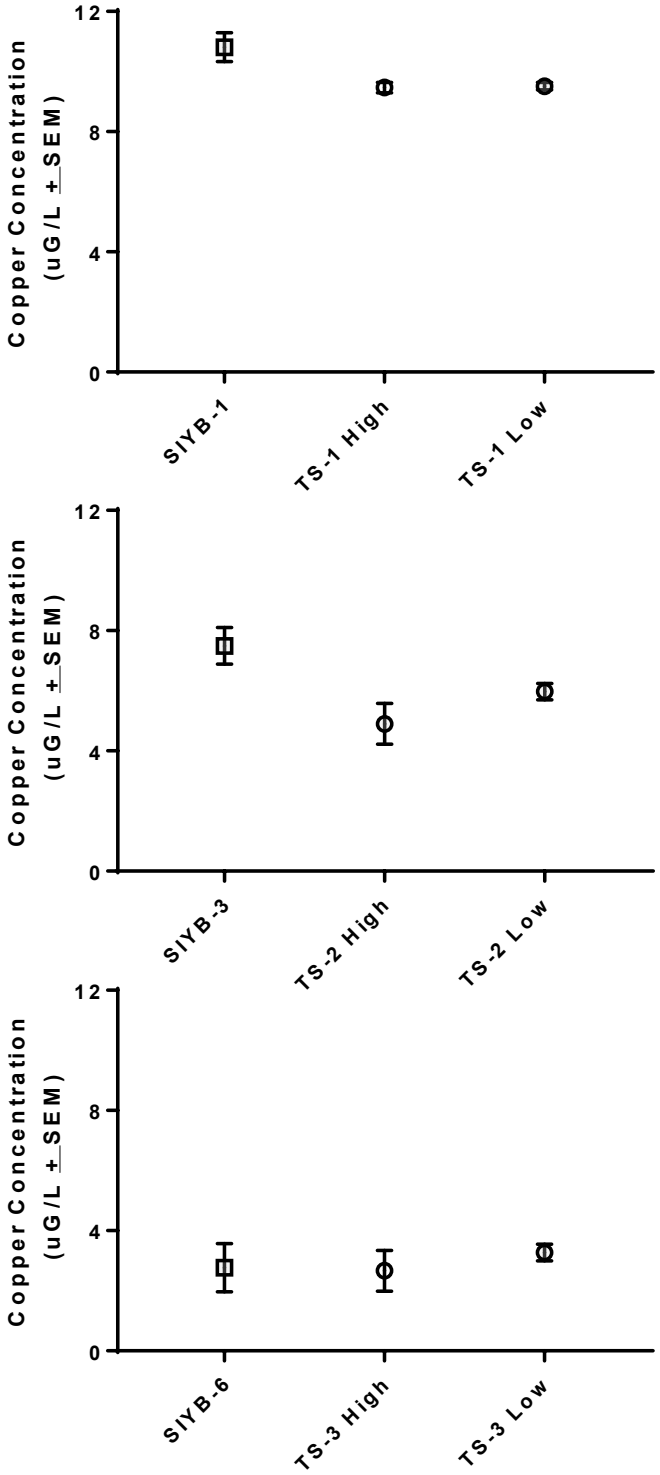

Figure 4-4. Time Series Station Comparisons by Tidal Phase as Compared to Closest TMDL Station

Note: The annual TMDL sampling event is conducted during peak summer months (August or September); the Time Series Study collection occurred in January 2018. The TMDL concentration presented in the mean of concentrations measured during the 2011 through 2017 annual TMDL compliance monitoring events.

Overall, the results of this study indicate that tidal variations may affect the dissolved copper concentrations at individual stations over the duration of one full mixed semidiurnal tide; however, less tidal influence appears to occur in the innermost portions of the basin. As such, the variability in concentrations is realized to a much lesser extent in the head of the basin (i.e., TS-1) at any phase of the tide.

Compared to TS-1, increased variability at TS-2 and TS-3 may be a result of stronger tidal influence occurring at the mouth and mid-basin compared to the head of the basin. This may be further supported by the greater variability observed during the high tide phase. As evidenced by salinity and dissolved copper data at TS-2 and TS-3, a noticeable pulse of water with lower salinity and lower dissolved copper concentrations was captured during sampling time T9 (see Table 3-1). Whether T9 data represents tidal influence or a potential freshwater pocket not related to tidal influence cannot be determined by this data set; however, this data highlights an example of variability that may be present over the course of one full mixed semidiurnal tide.

Tidal variations do seem to affect the dissolved copper concentrations in surface waters of SIYB, to extents dependent on location within the basin. This variability is (1) the least prominent at the head of the basin (i.e., TS-1), where variability between samples was relatively small; (2) more prominent at the locations closer to the mouth of the basin (i.e.,TS-2 and TS-3), (3) more prominent between tidal phases closer to the mouth of the basin (i.e., TS-2 and TS-3), and (4) not significantly different at each station between the high and low tidal phases captured during the Time Series Study.

5.0 REFERENCES

Amec Foster Wheeler. 2017a. 24-Hour Time Series Analysis of Dissolved Copper in Shelter Island Yacht Basin. Sampling and Analysis Plan and Quality Assurance Project Plan. December.

Amec Foster Wheeler. 2017b. 2016 Shelter Island Yacht Basin Enhanced Water Quality Special Study Final Report. March.

California Regional Water Quality Control Board, San Diego Region (Regional Board) (2005). Total Maximum Daily Load for Dissolved Copper in Shelter Island Yacht Basin, San Diego Bay. Resolution No. R9 2005 0019 Basin Plan Amendment and Technical Report.

California State Water Resources Control Board (State Board) (2014). *Collections of Water and Bed Sediment Samples with Associated Field Measurements and Physical Habitat in California*. Version 1.1. Updated March 2014. http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/collect_bed_sediment_update.pdf

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APPENDIX A
24-HOUR TIME SERIES ANALYSIS OF DISSOLVED COPPER IN SIYB SAMPLING AND ANALYSIS PLAN/ QUALITY ASSURANCE PROJECT PLAN

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FINAL

24-HOUR TIME SERIES ANALYSIS OF DISSOLVED COPPER IN SHELTER ISLAND YACHT BASIN

SAMPLING AND ANALYSIS PLAN & QUALITY ASSURANCE PROJECT PLAN

Prepared for:
San Diego Unified Port District

Prepared by:

Amec Foster Wheeler Environment & Infrastructure, Inc.
9210 Sky Park Court, Suite 200
San Diego, California 92123

December 2017

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

Amec Foster Wheeler	Amec Foster Wheeler Environment & Infrastructure, Inc.
COC	chain-of-custody
CRM	Certified Reference Material
Cu	Copper
DI	de-ionized
DQO	data quality objective
ELAP	California Environmental Laboratory Accreditation Program
FD	field duplicate
ID	identification
LCS	laboratory control standard
LD	laboratory duplicate
MS	matrix spike
MSD	matrix spike duplicate
NA	not applicable
NIST	National Institute of Standards and Technology
pH	hydrogen ion concentration
PM	Project Manager
Port	Port of San Diego
ppt	parts per thousand
QA	quality assurance
QA/QC	quality assurance and quality control
QAM	Quality Assurance Manual
QAPP	Quality Assurance Project Plan
QC	quality control
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SIYB	Shelter Island Yacht Basin
SM	Standard Methods
SOP	Standard Operating Procedure
SRM	Standard Reference Material
SWAMP	Surface Water Ambient Monitoring Program
State Board	State Water Resources Control Board
Time Series Study	SIYB Time Series Analysis of Dissolved Copper
TMDL	Total Maximum Daily Load
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
Weck	Weck Laboratories, Inc.
WQO	water quality objective
YSI	YSI Incorporated

UNITS OF MEASURE

<	less than
±	plus or minus
%	percent
°C	degrees Celsius
µg	microgram(s)
µg/L	micrograms per liter
µm	micrometer(s)
mg/L	milligrams per liter
mL	milliliter(s)
ppt	parts per thousand

1.0 INTRODUCTION

This combined Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) has been prepared for a 24-Hour Time Series Analysis of Dissolved Copper (Time Series Study) to be conducted in the Shelter Island Yacht Basin (SIYB). The Time Series Study is a water quality investigation designed to evaluate possible variations in dissolved copper concentrations resulting from tidal fluctuations. This plan was prepared by Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler)[1] for the Port of San Diego (Port).

Surface water quality monitoring is completed on an annual basis to analyze primarily for dissolved copper concentrations as part of the SIYB dissolved copper Total Maximum Daily Load (TMDL) (further described in Section 3.0). The sampling is completed on similar tidal heights each year during the peak summer months (i.e., August or September), which consequently does not allow for any characterization of tidal influence on the surface concentrations of dissolved copper throughout the basin. In an effort to better understand the basin dynamics of SIYB and the effects that tidal flushing may have on the concentrations of dissolved copper in the surface waters of SIYB, a single-day Time Series Study will be conducted. The Time Series Study will assess dissolved copper concentrations in surface waters within SIYB during one full mixed semidiurnal tidal cycle (approximately 25 hours).

The objective of the Time Series Study is to answer the following question:

> *How do tidal variations affect the concentrations of dissolved copper in the surface waters of SIYB?*

The scope of work for the Time Series Study is outlined in this SAP. The study will include:

- Collection of discrete surface water (1 meter deep) samples at three locations in SIYB (i.e., one station each in the mouth of the basin, mid-basin, and at the head of the basin) approximately every two hours over the course of a full day (two full tidal cycles).
- Collection of measurements for pH, temperature, and salinity at all stations using portable field meters after collection of each water sample.
- Analysis of all samples for concentrations of dissolved copper.

This SAP/QAPP provides detailed information on the design and implementation of the Time Series Study. It is organized as follows:

- Section 1, **Introduction** to Time Series Study including purpose and objectives.
- Section 2, **Project Management** overview of the project personnel, roles and responsibilities of the key team members, and lines of communication.
- Section 3, **Project Background and Objectives** for the goals and objectives of the Times Series Study.

[1] Amec Foster Wheeler's parent company is now owned by Wood plc.

- Section 4, **Sampling and Analysis Plan** with detailed information on the design of the Times Series Study, collection locations and timing, sample collection techniques, sample handling and chain of custody (COC), field measurements and analytical tests to be conducted, data analysis techniques, and project schedules.
- Section 5, **Quality Assurance Project Plan** outlining the procedures to ensure that collection and handling of water samples, collection of field data, and analytical analysis of water samples are conducted with a high degree of quality assurance and quality control (QA/QC).
- Section 6, **Report Preparation** to list information that will be compiled and submitted to the Port at the conclusion of the Times Series Study.
- Section 7, **References** for literature sources and reports cited in this document.

2.0 PROJECT MANAGEMENT

This section presents project personnel, team organization, roles and responsibilities of key team members, and lines of communication for field and laboratory activities.

2.1 SAP/QAPP Distribution

Table 2-1 identifies those individuals who will receive one copy of the approved SAP/QAPP.

Table 2-1.
SAP/QAPP Distribution List

Title	Name (Affiliation)	Signature/Date
Project Manager	Kelly Tait (Port of San Diego)	
Project Manager and Field Quality Assurance (QA) Officer	Barry Snyder (Amec Foster Wheeler)	
Field Project Manager	Corey Sheredy (Amec Foster Wheeler)	
Analytical QA Officer	Rolf Schottle (Amec Foster Wheeler)	
Analytical Laboratory Project Manager	Chris Samatmanakit (Weck Laboratory)	

2.2 Project Organization

Project Personnel and Roles

Amec Foster Wheeler will organize field sampling logistics and equipment, provide sample collection and oversight for laboratory analysis of samples, perform data analysis, and provide a report of the Time Series Study results as an appendix in the 2017 Shelter Island Yacht Basin Dissolved Copper TMDL Annual Report. Individual roles for project personnel are outlined in Table 2-2 and Figures 2-1 and 2-2.

Kelly Tait is the Project Manager (PM) for the Port. Ms. Tait will be responsible for project administration and will serve as the lead contact at the Port.

Barry Snyder is the PM and Field Quality Assurance (QA) Officer for Amec Foster Wheeler. Mr. Snyder will be responsible for overall project management, organization, contracts, and oversight. In addition, he will serve as the Field QA Officer and will oversee field-related QA/QC procedures.

Corey Sheredy is the Field PM for Amec Foster Wheeler. Ms. Sheredy will oversee coordination and execution of the field effort, including organization of field staff and scheduling of sampling days, and will be responsible for overseeing data analysis and finalizing the project report.

Rolf Schottle is the Analytical QA Officer for analytical chemistry for Amec Foster Wheeler. Mr. Schottle will be responsible for guaranteeing the validity of all QA/QC procedures and will ensure that analytical chemistry data reported by the laboratory and Amec Foster Wheeler has been generated in compliance with the appropriate protocols. Mr. Schottle will also be responsible for coordination with the analytical laboratory and will work with the Analytical Laboratory PM to ensure that proper QC procedures are followed.

Tyler Huff is the Field Health & Safety Officer and Field Support for Amec Foster Wheeler. Mr. Huff will ensure that all health and safety protocols are followed during field activities.

Chris Samatmanakit is the Analytical Laboratory PM for Weck Laboratories, Inc. (Weck). Mr. Samatmanakit will be responsible for providing analytical chemistry data in an approved and quality-controlled (QC) format.

Table 2-2.
Project Personnel Roles and Contact Information

Name (Affiliation)	Project Role(s)	Contact Information
Kelly Tait (Port of San Diego)	Port Project Manager	(619) 686-6372 (office) (619) 348-1690 (mobile) (619) 686-6467 (fax) ktait@portofsandiego.org
Barry Snyder (Amec Foster Wheeler)	Project Manager and Field QA Officer	(858) 300-4320 (office) (858) 354-8340 (mobile) (858) 300-4321 (fax) barry.snyder@amecfw.com
Corey Sheredy (Amec Foster Wheeler)	Field Project Manager	(858) 300-4316 (office) (831) 359-7761 (mobile) (858) 300-4321 (fax) corey.sheredy@amecfw.com
Rolf Schottle (Amec Foster Wheeler)	Analytical QA Officer	(858) 300-4323 (office) (619) 985-2405 (mobile) (858) 300-4321 (fax) rolf.schottle@amecfw.com
Tyler Huff (Amec Foster Wheeler)	Field Support and Field Health and Safety Officer	(858) 300-4322 (office) (858) 449-2334 (mobile) (858) 300-4321 (fax) tyler.huff@amecfw.com
Chris Samatmanakit (Weck Laboratories)	Analytical Laboratory Project Manager	(626) 336-2139 ext. 141 (office) (626) 336-2634 (fax) chris.samatmanakit@wecklabs.com

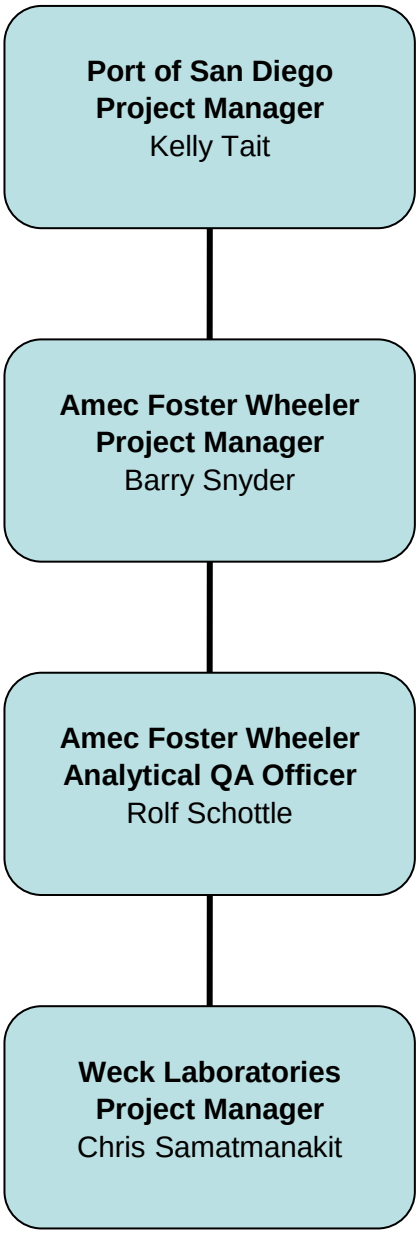

Figure 2-1. Project Organization - Analytical Component

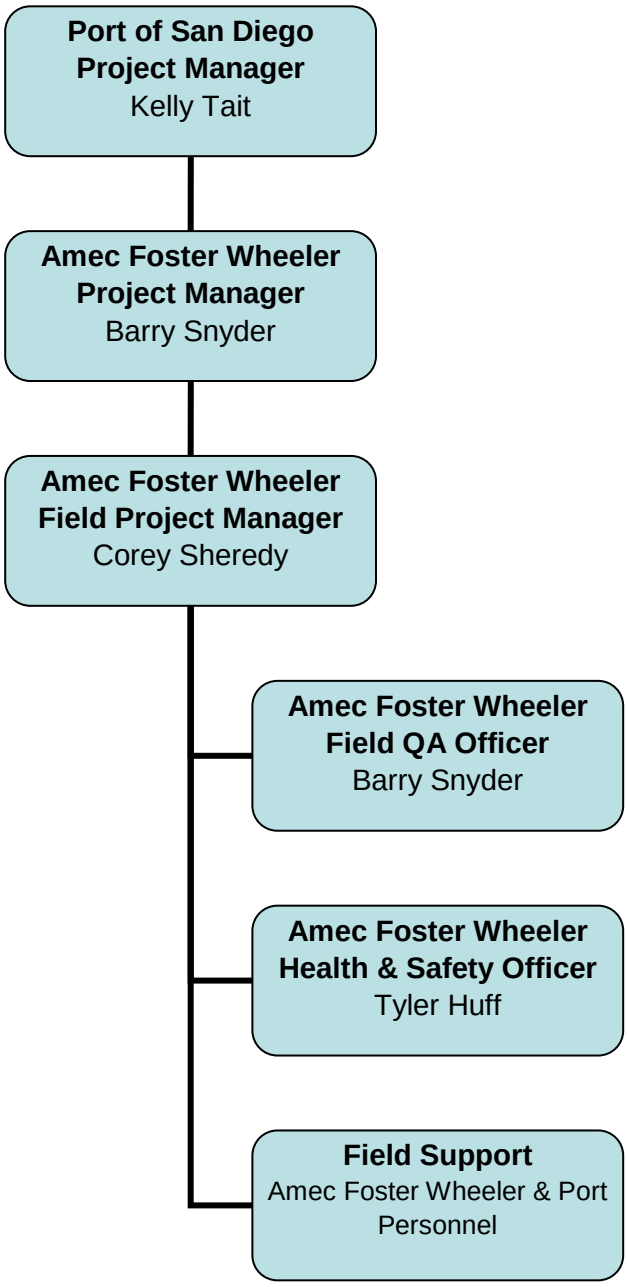

Figure 2-2. Project Organization - Field Component

2.3 Quality Assurance Officers' Roles

The QA Officers are responsible for guaranteeing the overall quality of the data produced and reported throughout the project. Specific duties of the QA Officers include:

- Conducting audits of ongoing tests, data packages, and completed reports;
- Conducting audits of the routine QC documentation of field and laboratory procedures;
- Communicating potential QC problems to the staff; and
- Ensuring that all problems are resolved.

The QA Officers are also responsible for issuing QA reports to management, maintaining a current Quality Assurance Manual (QAM), and issuing QAPPs as required. The QA Officers also ensure that data reported have been generated in compliance with the QAM and the appropriate protocols. The QA Officers are knowledgeable in the quality system standard defined under the California Department of Health Services Environmental Laboratory Accreditation Program (ELAP).

Barry Snyder and Rolf Schottle are the project QA Officers. Mr. Snyder, in the role of Field QA Officer, will oversee sample collection activities to ensure that proper sampling procedures are employed. Mr. Snyder will provide QA checklists to each sampling team member that will be completed after each sample is collected. As Analytical QA Officer, Mr. Schottle will work directly with the Analytical Laboratory PM, Mr. Samatmanakit, to ensure that proper QC procedures are followed.

Mr. Snyder and Mr. Schottle will also review and assess procedures against plan requirements during the life of the project and will evaluate the need for any corrective actions. Mr. Snyder or Mr. Schottle may stop actions conducted by the team if there are significant deviations from required practices or if there is evidence of a systematic failure. Mr. Samatmanakit will also have the same authority for laboratory-related operations.

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3.0 BACKGROUND

Since 2011, dissolved copper concentrations in the surface waters of SIYB have been evaluated each year at six specific locations within the basin as part of the SIYB Dissolved Copper TMDL monitoring program. The annual monitoring results are submitted to the San Diego Regional Water Quality Control Board as a component of the annual TMDL monitoring report.

Each year, the SIYB Dissolved Copper TMDL collection date is selected to target a high tide of approximately 5.5 to 6.5 feet, and a tidal range between consecutive high and low tides of 5 to 7 feet. Careful effort is made by field scientists to perform collection at each of the six TMDL monitoring stations from year to year at approximately the same time period relative to the tide. Furthermore, the stations are collected in the same sequence every year moving from the mouth of the basin to bracket the slack high tide. This effort allows for consistency between monitoring years. As an example, Figure 3-1 illustrates time of collection at each TMDL station compared to the tide during TMDL compliance monitoring during 2014, 2015 and 2016.

Daily tidal exchange circulates the water in the basin. These tidal fluctuations have the potential to affect the concentration of dissolved copper and particulates within the water column. As stated above, to ensure consistency over monitoring years and develop a comparable long-term data set, the SIYB annual water quality monitoring program design was not intended to capture tidal fluctuations. As such, this Time Series Study is being conducted to evaluate how tidal variations may influence the dissolved copper concentrations in the surface waters of SIYB over the course of one full mixed semidiurnal tidal cycle (approximately 25 hours).

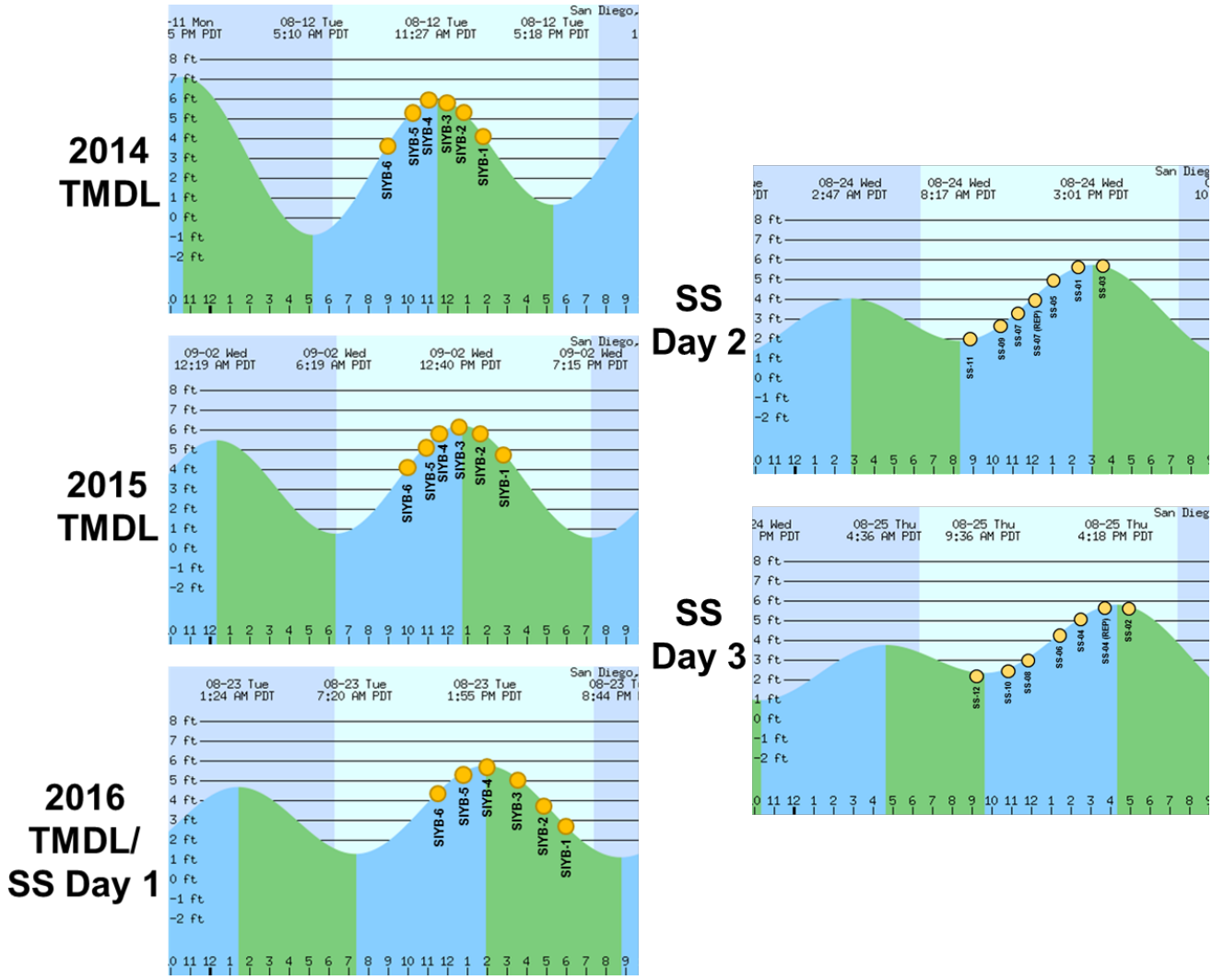

Figure 3-1. Collection Event versus Tidal Cycle during the SIYB TMDL Monitoring Event (2014-2016) and 2016 Enhanced Water Quality Special Study Event

Note: orange dot = time of collection; SS = Special Study

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4.0 SAMPLING AND ANALYSIS PLAN

Sampling methodology, sample collection and handling and analytical test methods to be employed by the field and laboratory teams are discussed in this section.

4.1 Sampling Design

Water quality samples will be collected from surface water (i.e., 1 meter below the surface) at three locations throughout the basin. Locations were chosen to characterize several different areas of the basin. Samples will be collected every two hours to characterize the effect of one mixed semidiurnal tidal cycle; sampling days will be selected to specifically correspond with the tidal ranges observed during the annual TMDL monitoring.

4.1.1 Sample Collection Stations

As discussed in Section 4.1, samples will be collected at three locations throughout SIYB to provide representation of locations throughout the basin that are reflective of distance from the mouth. Station TS-1 will be placed near the head of the basin, at the southwest end of Pearson's Fuel Dock. Discrete water samples at this station will be collected directly from the dock. Station TS-2 is located approximately mid-basin, and is only accessible using a vessel. A Port-operated vessel with either with no paint or coated with a non-biocide paint will be used for collection; vessel operation procedures are outlined in Section 4.4. Station TS-3 will be placed at the mouth of SIYB at the southwest end of the Transient Dock. As with TS-1, discrete water samples at TS-3 will be collected directly from the dock. Figure 4-1 shows the target sampling locations. Target coordinates for the stations are provided in Table 4-1.

Table 4-1.
Station Location and Coordinates

Station ID	Location	Target Coordinate	
		Latitude (dd.ddddd°)	Longitude (ddd.ddddd°)
TS-1	Southwest end of Pearson's Fuel Dock	32.71864	-117.22612
TS-2	Mid-Basin	32.71550	-117.22989
TS-3	Southwest end of the Transient Dock	32.71013	-117.23450

Notes: ddd/dd.ddddd° = decimal degrees, TS = time series, SIYB = Shelter Island Yacht Basin

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Figure 4-1. Shelter Island Yacht Basin Time Series Sampling Locations

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Shelter Island Yacht Basin Water Quality Time Series Study
Sample Locations
San Diego, CA

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4.2 Collection Schedule

Collection at the three stations will be performed synchronously throughout two full tidal cycles. Table 4-2 provides the proposed primary sampling date, contingency dates, and tide times and heights. Dates were selected primarily based upon the tidal range (i.e., similar to tides selected during the TMDL sampling events), and practicality (i.e., a non-holiday or weekend day for reduced vessel traffic). Factors that could possibly delay the collection event to the proposed contingency dates may include an unusual climactic event (e.g., monsoonal rain, hurricane, tsunami, etc.) or other unforeseen but catastrophic occurrence.

Table 4-2.
Annual TMDL Monitoring Station Coordinates

Proposed Date	Low Tide	High Tide	Low Tide	High Tide	Low Tide
	time/ height [ft]				
1/3/2018 (Primary)	16:42 (-1.9 ft)	23:11 (+7.0 ft)	04:15 (+1.6 ft)	10:24 (+7.0 ft)	17:29 (-1.4 ft)
1/4/2018 (1st Contingency)	17:29 (-1.4 ft)	00:02 (+4.7 ft)	05:12 (+1.8 ft)	11:14 (+6.3 ft)	18:16 (-0.9 ft)
1/31/2018 (2nd Contingency)	15:40 (-2.0 ft)	22:01 (+5.0 ft)	03:19 (+1.0 ft)	09:28 (+7.2 ft)	16:20 (-1.7 ft)
1/16/2018 (3rd Contingency)	15:33 (-0.8 ft)	21:56 (+4.1 ft)	02:46 (+2.0 ft)	08:57 (+6.3 ft)	16:02 (-0.7 ft)

Field collection will begin at slack low tide and samples will be collected every two hours for 25 hours, bracketing two high tides. Figure 4-2 provides an illustration of the sample collection schedule timing, and Table 4-3 provides a matrix of the collection times for the primary sampling date. Collection at the three stations will occur simultaneously by utilizing three trained field teams.

Figure 4-2. Sample Collection Relative to the Tidal Cycle (1/3/2018)

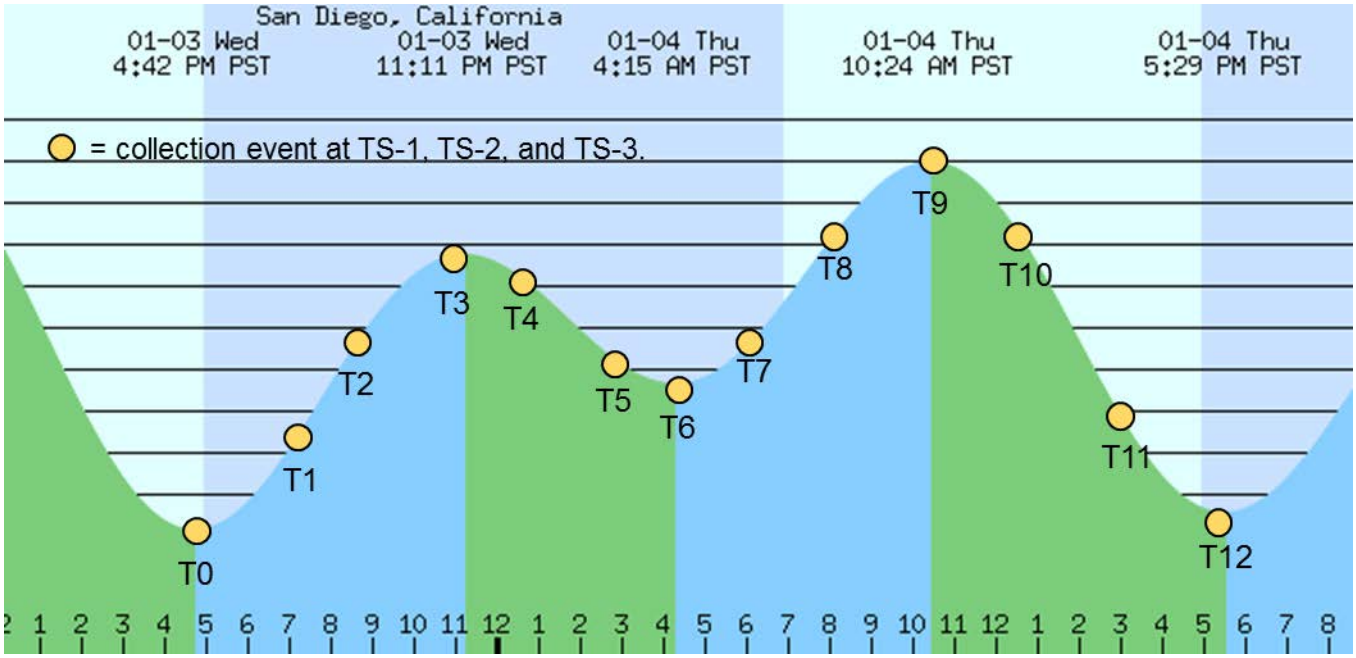

Table 4-3.
Sample Collection Timing Matrix.

Note: Assuming the primary collection date (1/3/2018)

Sample ID	Time
TS-[station]-ER	Prior to T0 collection
TS-[station]-T0	16:42 (1/3/2018)
TS-[station]-T1	18:50 (1/3/2018)
TS-[station]-T2	21:00 (1/3/2018)
TS-[station]-T3	23:11 (1/3/2018)
TS-[station]-T4	01:00 (1/4/2018)
TS-[station]-T5	03:00 (1/4/2018)
TS-[station]-T6	04:15 (1/4/2018)
TS-[station]-T7	06:20 (1/4/2018)
TS-[station]-T8	08:20 (1/4/2018)
TS-[station]-T9	10:24 (1/4/2018)
TS-[station]-T10	13:00 (1/4/2018)
TS-[station]-T11	15:15 (1/4/2018)
TS-[station]-T12	17:29 (1/4/2018)
TS-[station]-T12-REP	Immediately following T12 collection
TS-[station]-FB	Following T12-REP collection

ER = Equipment Rinsate; FB = Field Blank;
REP = Replicate; TS = Time Series.

4.3 Collection Station Positioning

Dockside stations will be accessed by land, and will be located using a Global Positioning System (GPS) device. The mid-basin station (TS-2) must be accessed by vessel, and will be located using a differential GPS. Following the TMDL Monitoring Plan (Amec Foster Wheeler, 2017), the collection location for TS-2 will be done within approximately ±3 meters of the target coordinate listed in Table 4-1.

4.4 Field Collection Procedures

To ensure consistency between each sampling location, each sampling team will be equipped with a pre-cleaned Niskin bottle, pre-labeled bottle kits and extra bottles, pre-cleaned vacuum filtration system units, a filtration pump, a plastic-lined 5-gallon bucket and DI water (for decontamination of the Niskin), coolers, and ice. For the mid-channel station (TS-2), the vessel will be anchored on station for the duration of the sampling event. Upon anchoring on station, the boat engine will be turned off and a period of at least 5 minutes will pass before collection activities can commence. Should the sampling vessel need to up anchor (i.e., for health or safety reasons) in between sample collections, the 5-minute waiting period will be repeated prior to the next sample collection. During all field efforts, each field team will scan the surrounding area for nearby ongoing vessel maintenance activities. The field crew will record notes and take photographs of these activities (and other factors of note near the collection site), if warranted.

All sampling steps will follow Surface Water Ambient Monitoring Program (SWAMP) defined “clean hands” techniques (State Water Resources Control Board [State Board], 2014). For each sample collection event at each station, discrete water samples will be collected using a Niskin bottle deployed from the sampling vessel or dock. Surface samples at each station will be collected at 1-meter depth. To ensure this exact depth is sampled, the line on the Niskin bottle will be pre-marked with the appropriate depth. Sample timing will follow the schedule matrix provided in Table 4-3 (approximately every two hours). As required by SWAMP protocols, the monitoring program will include the addition of a field replicate. The field replicate sample will consist of a second complete set of samples collected immediately following the collection of the last sample collected at each station (TS-[station]-12). In addition to the field replicate, each batch of samples (i.e., each station) will include an equipment rinse blank and field blank using laboratory-provided deionized water. The equipment rinse blank will be collected prior to collection of TS-[station]-0, The field blank will be collected immediately after the collection of the replicate sample (i.e., following collection of TS-[station]-12-REP) (Table 4-3).

Discrete water samples will be filtered in the field (in agreement with United States Environmental Protection Agency (USEPA) 1640 protocol. Two 500-milliliter (mL) aliquots of water from each Niskin bottle grab sample will each be filtered through a pre-cleaned[2] 0.45-micrometer (µm) glass fiber filter using a Whatman brand Klari-flex bottle top vacuum filtration system. To ensure a clean sample is collected, the first 500 mL aliquot will be discarded. The second 500 mL aliquot will be directly transferred into a pre-labeled sample

[2] The entire filtration apparatus will be acid-washed and rinsed thoroughly with de-ionized (DI) water prior to sample collection.

bottle containing ultra-pure nitric acid for preservation. The field team will ensure that no airspace remains in the sample bottle once capped. Once confirmed, the sample bottle will be immediately transferred to a cooler containing ice. Cooler ice will be replenished during the 12-hour shift change, and following the conclusion of sampling.

Following the water sample collection, field measurements of pH, temperature, and salinity of the surface water at each station (i.e., within 1 meter of the surface) will be made using a YSI meter according to the manufacturer's specifications. Field measurements and any observations (if applicable) will be recorded in the field log for that collection event. An example of the field log is provided as Attachment A.

Once the entire suite of samples has been collected, water samples will be logged on a COC form (Attachment B), and the form will be placed in the cooler for transport to Weck. Samples will be stored at 4 degrees Celsius (°C) during the transportation process.

4.5 Equipment Decontamination and Cleaning

Prior to each sampling event, the Niskin bottle will be cleaned using soapy water followed by a thorough rinse with deionized water. Upon deployment, the Niskin bottle will also be rinsed thoroughly with site water and soaked at the sampling depth (1 meter below the water surface) for at least for one minute prior to sample collection. After collection, water samples will be transferred from the Niskin bottle to laboratory-certified, contaminant-free bottles that are the appropriate type and contain the correct preservative for the required analyses. In between sampling times, the Niskin bottle will be stored in a plastic-lined, 5-gallon bucket filled with deionized water.

4.6 Sample Processing, Handling, and Custody

Water samples will be uniquely identified by labeling laboratory-provided containers with sample labels in indelible ink. All labels will include the project title, appropriate identification number, date and time of sample collection, and preservation method. The field crew will inspect the sample collection bottles before and after they are filled to ensure that each sample bottle is correctly labeled with station location and analysis type. After each sample collection, the field crew will complete a QA form to verify bottle information and ensure labeling accuracy.

Samples will be kept on ice from the time of sample collection until delivery to the analytical laboratory. All samples will be transferred to the appropriate laboratory and analyses initiated within the method specified holding time (Table 4-4). Additionally, appropriate volumes of each sample will be archived at Weck in case any analyses need to be repeated for confirmation. All analyses will be conducted by Weck, a California ELAP accredited laboratory for all the specific tests required for this program.

Table 4-4. Sample Holding Times

Analyte	Holding Time
Field Measurements	
pH	Field Collected
Salinity	Field Collected
Temperature	Field Collected
Water	
Dissolved Copper	180 days

4.7 Field Sampling Preservation, Packaging, and Shipment

During each sampling event, samples will be preserved by placing the sample bottles in wet-iced coolers immediately after collection. Field samples will be shipped via courier with appropriate COC forms within 24 hours of completion of the sampling event.

4.8 Chain-of-Custody Records

Proper COC procedures will be used throughout the sample collection, transport, and analytical process. The principal documents used to identify samples and to document possession are COC records, field logbooks, checklists, and field tracking forms. The COC process is initiated during sample collection. A COC record will be provided with each sample or group of samples. Each employee who has custody of the samples will sign the form and will ensure that the samples are not left unattended and are properly secured.

Documentation of sample handling and COC includes the following:

- Client and project name,
- 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, and
- Shipping company and waybill information or courier.

Completed COC forms will be placed into a plastic envelope and kept inside the cooler containing the samples. A courier will deliver the water samples from the Amec Foster Wheeler Office to the analytical laboratory following the day of collection. Upon delivery of the samples to the analytical laboratory, the COC form will be signed by the person receiving the samples. Copies of the COC records will be included in the final reports prepared by the analytical laboratory.

4.9 Analytical Methods

Water samples will be analyzed for dissolved copper; water will be measured in the field for salinity, temperature, and pH (Table 4-5). Dissolved copper analyses will follow USEPA methods. Analytical methods, detection, and reporting limits are presented in Table 4-5.

Table 4-5.
Laboratory Analytical Methods and Detection Limits

Water Quality Measurement	Method	Method Detection Limit	Reporting Limit
Dissolved Copper	USEPA 1640	0.0038 µg/L	0.010 µg/L
Salinity	YSI Pro Plus	NA	± 0.1 ppt
Temperature	YSI Pro Plus	NA	± 0.1 °C
pH	YSI Pro Plus	NA	± 0.1 pH unit

Notes:
°C = degrees Celsius; ± = plus or minus; µg/L = microgram(s) per liter; NA = not applicable; pH = hydrogen ion concentration; ppt = part(s) per thousand; USEPA = United States Environmental Protection Agency; YSI = YSI Incorporated.

4.10 Data Analysis

Summary data tables and figures will be created only after the raw data have passed through the QA/QC criteria, as described in Section 4.8. Finalized data will be summarized in an appendix in the 2017 SIYB Dissolved Copper TMDL Annual Monitoring Report in tables, and dissolved copper concentrations will be displayed graphically as a temporal distribution. These results will help to address the study objective described in Section 1.0.

4.11 Data Review

Following the field event, field data sheets and checklists will be checked for completeness and accuracy by the field crew and the Field QA Officer (Mr. Snyder). In addition, all sample COCs will be checked against sample labels prior to samples being transported to the laboratories. In the laboratory, technicians will document sample receipt and sample preparation activities in laboratory logbooks or on bench sheets.

In the laboratory, data validation will include use of dated and signed entries by technicians on the data sheets and logbooks used for samples, sample tracking and numbering systems to track the progress of samples through the laboratory, and QC criteria to reject or accept specific data. Data for laboratory analyses will be entered directly onto data sheets. Data sheets will be filled out in ink and signed by the technician, who is responsible for checking the sheet to ensure completeness and accuracy. The technician who generated the data will have the prime responsibility for the accuracy and completeness of the data.

Each technician will review the data to ensure the following:

- Sample description information is correct and complete,
- Analysis information is correct and complete,

- Results are correct and complete, and
- Documentation is complete.

All data will be reviewed and verified by the analytical laboratory to determine whether data quality objectives have been met and whether appropriate corrective actions have been taken, when necessary, as detailed in this SAP/QAPP.

4.12 Data Management

The analytical laboratory will supply analytical results in both hard copy and electronic formats and will be responsible for ensuring that both forms are accurate. After completion of the data review by the laboratory, hard copy results will be placed in the project files; results in electronic format will be imported into a database system. The database is discussed in further detail in Section 5.4.1.

4.13 Laboratory Quality Assurance and Quality Control

The analytical laboratory will provide a QA/QC narrative that describes the results of the standard QA/QC protocols that accompany analysis of field samples. All hard copies of results will be maintained in the project files. In addition, backup copies of results generated by the laboratory will be maintained at its facility. At a minimum, the laboratory reports will contain results of the laboratory analysis, QA/QC results, all protocols and any deviations from the project SAP/QAPP, and a case narrative of COC details. Laboratory QA/QC requirements are discussed in detail in Section 5.0.

4.14 Health and Safety

The sampling will be conducted over a 24-hour period. There will be a personnel shift after 12 hours to alleviate the hazard of sleep deprivation and/or physical exhaustion. The Harbor Police will be notified of sampling activities and team members will have contact information for the Harbor Police in case any threatening situation arises. Because sampling for one station will be conducted from a boat, dangerous situations can arise. Field personnel will be aware of safety hazards and take appropriate precautions. A health and safety tailgate meeting will be held prior to field activities for all three field teams, including after the 12-hour shift change. During this meeting, site-specific hazards will be discussed and addressed appropriately.

4.14.1 Use of Boats and Working Over Water

Work will be conducted from a boat within and on docks around SIYB; therefore, special considerations are required. All watercraft will be operated according to the applicable navigational rules and regulations. The boat will be operated by a certified captain with United States Coast Guard (USCG) small vessel training. Personnel working on the boat will be trained according to internal SOPs. The primary hazards associated with the operation and use of boats include drowning, heat stress, and injuries from falling. A USCG approved personal flotation device must be available for each person onboard. Wet conditions increase the chances of slipping; therefore, engineering controls such as guardrails will be installed on the vessel.

A float plan will be prepared for each trip and submitted to the safety officer or project manager. At a minimum, it will include the destination, expected time of return, personnel onboard, and a description of the vessel. The float plan will be used if the field crew does not return or notify the shore contact at a specified time, and a rescue is needed. A weather forecast will be reviewed prior to field sampling. High winds may pose potential hazardous conditions within the harbor.

5.0 QUALITY ASSURANCE

5.1 Field and Analytical QA/QC Procedures

Strict QA/QC procedures will be employed throughout the entire study, from mobilization through delivery of samples to the laboratories. Extra care will be taken to minimize the possibility of compromising sample integrity. The sample collection team will be trained in and follow field sampling standard operating procedures (SOPs), as described in this document. A QA/QC log will be completed following each sample collection event to review each step of the sample and data collection process. These checks will ensure that collection procedures are consistent between sampling events and among all three stations, and that all required field data are recorded correctly and completely. The QA/QC log is provided in Attachment C.

Field team members will take care to avoid contamination of samples at all times by employing the SWAMP clean-hands technique and will wear powder-free nitrile gloves during sample collection. In addition, the Field Manager will ensure that the sample collection boat is either un-painted or painted with a non-biocide hull paint containing no copper. All samples will be collected in laboratory-supplied, laboratory-certified, contaminant-free sample bottles containing the correct preservative (if applicable).

The sampling team will be familiar with this SAP/QAPP and field sampling SOPs to ensure that all sampling personnel are trained accordingly. Additionally, the field team members will be made aware of the significance of the project's method detection limits and the requirement to avoid contamination of samples at all times.

Field equipment will checked and calibrated for operation in accordance with the manufacturer's specifications (calibration records will be recorded and maintained), and will be inspected for damage prior to and when returned from use. Observations of activities surrounding the sampling area will be recorded on field data sheets at each station and during movement between stations (i.e., boat hull cleaning, boat washing, etc.). Photographs will also be taken if necessary.

As required by SWAMP protocols, the Time Series Study will include field replicates. The purpose of a field replicate is to assess variability in sampling procedures as well as ambient conditions. The field replicate sample will consist of a second complete set of samples collected during one sampling interval at each of the stations. The field replicate samples will be analyzed for the same suite of chemicals as the test samples. In addition to the field replicate samples, the study will also include one equipment rinse blank and one field blank, as specified by SWAMP protocols.

The Time Series Study will include the following QA/QC elements:

- ✓ Verification of laboratory certifications
- ✓ Field mobilization and equipment checklists
- ✓ Field sampling QA/QC checklists at each station
- ✓ Field equipment calibrations records at each station
- ✓ Observations for hull cleaning or other water-quality-impacting activities near sample collection stations
- ✓ Staff training on QAPP-required field procedures
- ✓ Field conditions and water quality data sheets

For this study, the analytical laboratory chosen to conduct the analyses is required to (1) be certified to conduct the analyses for the constituents of concern, (2) be certified for the specific analysis methods required for this program, and (3) hold a valid ELAP certificate at the time the Time Series Study is initiated and the samples are analyzed. The QA objectives for chemical analysis to be followed by the analytical laboratory are detailed in its laboratory QA manual and this QAPP. The objectives for accuracy and precision involve all aspects of the testing process, including the following:

- Methods and SOPs
- Calibration methods and frequency
- Data analysis, validation, and reporting
- Internal QC
- Preventive maintenance
- Procedures to ensure data accuracy and completeness

Results of all laboratory QC analyses will be reported with the final data. Any QC samples that fail to meet the specified QC criteria in the methodology or QAPP will be identified and the corresponding data will be appropriately qualified in the final report. The final report will include a separate section that discusses any QA/QC issues encountered during the sampling activities, as well as the corrective actions taken to address any issues satisfactorily.

5.2 Assessments and Response Actions

The Analytical Laboratory PM at Weck, Chris Samatmanakit, will receive a copy of this SAP/QAPP prior to submission of samples and will be required to sign off that he has read and understands all of the expectations for Weck outlined in this SAP/QAPP. The Amec Foster Analytical QA Officer, Rolf Schottle, will be immediately notified by phone, with a follow-up in writing, of any incident that results in the need for corrective action as described in the following sections.

5.2.1 Corrective Action Plans

An out-of-control event is defined as any occurrence failing to meet pre-established criteria. A nonconformance is a deficiency in characteristic, documentation, or procedure sufficient to make the quality indeterminate or unacceptable. An out-of-control event is a subcategory of nonconformance. Any out-of-control events observed, whether in the field or in the laboratory, will be immediately communicated to the Amec Foster Wheeler PM and Analytical QA Officer to determine the appropriate course of action.

When either situation (out-of-control event or nonconformance) is identified, it will be categorized as follows:

- **Deficiency** – Recognition that a specific requirement (e.g., program, process, or procedure) has been violated.
- **Observation** – Recognition of an activity or action that might be improved, but is not in violation of a specific requirement. Left unaddressed, the activity or action might develop into a deficiency.

5.2.2 Criteria Used for Determination of an Out-of-Control Event

Factors that affect data quality (e.g., failure to meet calibration criteria, inadequate recordkeeping, improper storage, or preservation of samples) require investigation and corrective action.

When a nonconformance is recognized, each individual involved with the analysis in question has an interactive role and responsibility. This process is described in the following two paragraphs.

- **Analytical Laboratory PM** – The Analytical Laboratory PM, Mr. Samatmanakit, must review all analytical and QC data for reasonableness, accuracy, and clerical errors. In an out-of-control event, Mr. Samatmanakit will notify the Analytical QA Officer, Mr. Schottle, immediately (within 24–48 hours) by telephone and email. Mr. Samatmanakit and Mr. Schottle will work together to solve the problem. In this case, Mr. Schottle will notify the Amec Foster Wheeler PM, Barry Snyder, of the issue and the proposed remedy. This process will prevent the reporting of suspect data by stopping work on the analysis in question and ensuring that all results that are suspect are repeated, if possible, after the source of the error is determined and remedied.
- **Analytical QA Officer** – The Analytical QA Officer, Mr. Schottle, will report to the Amec Foster Wheeler PM, Mr. Snyder, on the status of the problem. Mr. Snyder will then notify the Port PM, Kelly Tait, immediately (24–48 hours) by phone with a follow-up notification in writing if the work is affected by an out-of-control event or the results of an internal audit. In the event that a QC measure is out of control and the data are to be reported, qualifiers will be reported together with sampling results. Mr. Schottle is responsible for reviewing nonconformance report forms, recommending or approving proposed corrective actions, and verifying that corrective actions have been completed.

5.2.3 Procedures for Stopping Analyses

Whenever the analytical system is out of control, investigation and correction efforts are initiated by all concerned personnel. Best professional judgment will be used by the person(s) notified to rectify the problem in accordance with the QAPP.

If the problem is instrumental or specific only to preparation of a sample batch, samples will be reprocessed after the instrument is repaired and recalibrated.

5.2.4 Corrective Action

The need for corrective action may arise from various possible sources: equipment malfunction, failure of internal QA/QC checks, failure of follow up on performance or system audit findings, or noncompliance with QA requirements.

When measurement equipment or analytical methods fail QA/QC requirements, the problem(s) will immediately be brought to the attention of the appropriate Analytical Laboratory PM, who will notify the appropriate QA Officer immediately. Corrective measures will depend entirely on the type of analysis, the extent of the error, and whether the error is determinant or not. The corrective action is determined by the Analytical Laboratory PM and the QA Officer. However, final approval is the responsibility of the Amec Foster Wheeler PM, Mr. Snyder.

The Amec Foster Wheeler PM, Mr. Snyder, is responsible for preparing and submitting all project reports. Draft and final reports will summarize the data collected for this project.

5.3 Data Validation and Usability

Data validation is the process whereby data are filtered and accepted or rejected on the basis of a set of criteria. It is a systematic procedure of reviewing a body of data against a set of criteria to provide assurance of its validity prior to its intended use. Data are checked for accuracy and completeness. The data validation process consists of data generation, reduction, and review (Section 5.3). Requirements of the ELAP Standard and Good Automated Laboratory Practices (Document 2185) (USEPA, 1995) are followed for computer processing, manipulation, reporting, storage, and retrieval of data.

Data reduction, validation, and reporting are ongoing processes that involve the Analytical Laboratory PM, QA Officers, and Amec Foster Wheeler PM.

5.4 Verification and Validation Methods

5.4.1 Database Generation

Upon completion of the survey, the field data sheets will be removed from the field logbooks, and the sheets will be checked for completeness and accuracy by the applicable QA Officer or Amec Foster Wheeler PM, Mr. Snyder. Appropriate field sheets must be present and filled out completely. If there are any questions, clarification from field personnel will be obtained as soon as possible. Field data sheets and the field logbooks will be placed into folders by data type,

labeled with the data type and survey name, and filed in the appropriate filing cabinet. Field sheets will also be scanned, and electronic copies stored in the project folder on Amec Foster Wheeler's San Diego server.

In the laboratory, technicians will document sample preparation activities in bound laboratory notebooks or on bench sheets. Data validation includes use of dated and signed entries by technicians on the data sheets and logbooks used for samples, sample tracking and numbering systems to track the progress of samples through the laboratory, and QC criteria to reject or accept specific data.

The data for laboratory analyses will be entered directly onto data sheets. Data sheets must be filled out in ink and signed by the technician, who is responsible for checking the sheet to ensure completeness and accuracy.

The technician who generates the data has the prime responsibility for the accuracy and completeness of the data. Each technician reviews the data to ensure the following:

- Sample description information is correct and complete.
- Analysis information is correct and complete.
- Results are correct and complete.
- Documentation is complete.

Data sheets are submitted to the Analytical Laboratory PM and Analytical QA Officer. A tracking sheet is initialed when the data are ready for transmittal to a data entry operator. Original data sheets are not allowed to leave laboratory facilities. If for any reason data entry is performed by an employee, but not at Amec Foster Wheeler's facilities, data sheets are copied, and the originals are kept with the Analytical Laboratory PM and Analytical QA Officer.

Data files are assigned a job number and are given a file name, which will be used when the file is put on compact disk.

5.4.2 Error Checking and Verification

The raw data file is printed and 100 percent of the raw data is checked against the original data by the applicable QA Officer or designee. Any errors found are corrected on the raw data printout and on the data entry sheets. If no errors are found, the station checked is marked "OK." The process is continued until no errors are found in the check. After the raw data are checked, each sheet is marked with the date the check was completed and the initials of the applicable QA Officer or designee. The raw data printout used for error checking is saved and filed with the data entry sheets. Any errors in the raw data file are corrected, and the establishment program is rerun.

After the database has been established, the data entry copies may be discarded, and the original data entry sheets and raw data printouts are filed.

Further data validation is performed by the Analytical Laboratory PM. Validation is accomplished by performing routine audits of the data collection and flow procedures and by monitoring QC sampling results.

Data validation includes use of dated and signed entries by the technicians and Analytical Laboratory PM on the bench sheets and notebooks used for samples, sample tracking and numbering systems to track the progress of samples through the laboratory, and QC criteria to reject or accept specific data.

In the data review process, the data are compared with information (e.g., sample history, sample preparation, and QC sample data) to evaluate the validity of the results. Corrective action is minimized by developing and implementing routine internal system controls. Analysts are provided specific criteria that must be met for each procedure, operation, or measurement system.

5.5 Reconciliation with User Requirements

The Amec Foster Wheeler QA Officers (Barry Snyder and Rolf Schottle) will review data after each survey to determine whether data quality objectives (DQOs) have been met. If data do not meet the project's specifications, the applicable QA Officer will review the errors, communicate verbally and in writing with laboratory QA Officers as appropriate, and determine whether the problem is a result of calibration/maintenance, sampling techniques, or other factors. 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 the problem is not corrected by these methods, then the DQOs will be reviewed for feasibility. If specific DQOs are not achievable, the applicable QA Officer will recommend appropriate modifications. Any revisions need approval by the Amec Foster Wheeler PM, Barry Snyder, and the Port PM, Kelly Tait.

5.6 Quality Objectives for Criteria for Measurement of Data

The laboratory will follow in-house QA/QC plans, and any deviations will be documented in the analytical reports. DQOs applicable to water samples collected for this project consist of accuracy, precision, recovery, and completeness for the following field testing and chemistry analyses types (Table 5-1):

Table 5-1.
Summary of Data Quality Objectives

Measurement or Analysis Type	Applicable Data Quality Objective
Field Testing Temperature Salinity pH	Accuracy, Precision, Completeness
Analytical Chemistry Laboratory Analyses Dissolved Copper	Accuracy, Precision, Recovery, Completeness
Chemical Reporting Limits	Accuracy, Precision

Specific DQOs are presented in Table 5-2, along with acceptability criteria for each measurement.

Table 5-2. Data Quality Objectives for Laboratory and Field Measurements

Group	Parameter	Calibration	Accuracy[1]	Precision		Percent Complete
Field Testing	Temperature pH Salinity	NIST (temp) three point calibration (pH) Salinity standard	± 0.1 °C ± 0.1 pH ± 0.1 ppt	FD		100
Laboratory Analyses	Metals	SRM/CRM or MS/MSD, LCS[2]	83–109% (Cu) 80–118% (Zn)	LD, FD, and MS/MSD	<25%	100

Notes:
1 The objectives are applicable unless the method or manufacturer specifies more stringent requirements.
2 Reported LCS limits for copper were statistically derived by Weck Laboratories, Sept. 2012.
°C = degrees Celsius; < = less than; µg/L = micrograms per liter; % = percent; ± = plus or minus; CRM = Certified Reference Material; Cu = copper; FD = field duplicate; LCS = laboratory control sample; MS = matrix spike; MSD = matrix spike duplicate; NA = not applicable; ppt = part(s) per thousand; NIST = National Institute of Standards and Technology; SRM = Standard Reference Material

Acceptance criteria will be based on the implementation of acceptable and recognized QA/QC procedures. Acceptable data require proper sample collection and handling methods, sample preparation and analytical procedures, holding times, and QA protocols.

Accuracy is defined as the difference between the measured value of an indicator and its true or expected value, which is an estimate of systematic error or net bias. Accuracy will be ensured for trace metals.

Recovery of laboratory control standard (LCS) and matrix spike (MS) recoveries using method specific performance-based control limits. Based upon previous results, the spike levels chosen for this project is10 micrograms per liter (µg/L) for copper.

Precision is defined as the measure of agreement among repeated measurements of the same property under identical or substantially similar conditions, calculated either as a range or as a standard deviation. The precision of instrument-related field measurements will be assessed for field instruments by measuring three replicate readings for all three parameters at each station. At one selected location, the replicated field measurements will be reported as the mean, and the precision will be calculated as the standard deviation of the measurements. The precision of chemistry laboratory measurements will be assessed by comparison of the sample result to that for a duplicate sample in addition to comparisons between the laboratory MS and matrix spike duplicate (MSD). Precision will be measured by the degree of agreement between the sample and the laboratory duplicate (LD) or the MS and MSD results. Samples within a ±25% relative percent difference (RPD) between the sample result and duplicate result will be accepted as unqualified results.

Completeness is a measure of the proportion of the expected, valid data (i.e., data not associated with some criterion of potential unacceptability) that is actually collected during a measurement process. The objective for completeness is 100 percent for each measurement process.

The analytical reporting limits for copper are below the relevant regulatory criteria for assessment of aquatic health, meeting this DQO, as presented in Table 5-2. The method detection limits are below the SWAMP reporting limits and preliminary benchmarks in accordance with the DQOs.

5.7 Special Training Needs/Certifications

All field personnel will be trained and will have experience in proper field sampling and sample handling techniques, including COC procedures, prior to sampling. These techniques will be reviewed prior to each sampling event and all field personnel will provide a signature to document the training.

Weck is accredited by the California Department of Public Health ELAP (National ELAP Certificate #04229CA) for the analysis of metals using USEPA Method 1640.

5.7.1 Training and Certification Documentation

All personnel are responsible for complying with the QA/QC requirements that pertain to their organizational/technical function. Technical staff member musts have a combination of experience and education to adequately demonstrate a specific knowledge of their particular functions and a general knowledge of laboratory operations, test methods, QA/QC procedures, and records management. A training sign-in sheet will document that field personnel are trained and experienced in all handling techniques and procedures.

5.7.2 Field Sampling

Field personnel will be trained in proper sampling techniques, sample handling, sample preservation and storage, sample transport, COC, and standard operating procedures.

5.7.3 Analytical Laboratory

The training program for the analytical chemistry laboratory begins with reviewing the SOP for a new task. The Analytical Laboratory PM, Chris Samatmanakit, demonstrates the procedure to the trainee, shows the appropriate steps in the SOP, and explains the significance of each step. The trainee later performs the procedure under the supervision of Mr. Samatmanakit. At this time, questions are answered and parts of the procedure may be demonstrated again to the trainee. The trainee continues to work under the direct supervision until he/she can demonstrate the procedure with competence and full understanding. This process may be short or long, depending on the procedure. Once the trainee has demonstrated competence, Mr. Samatmanakit completes a training form. At this time, the employee can work without supervision. This documentation is kept in files organized by individual with a separate form for each task. On an annual basis, the analyst is requalified, and this requalification is documented on the training form as well.

5.7.4 Training Personnel

Amec Foster Wheeler's Field PM, Corey Sheredy, and/or Field QA Officer, Barry Snyder, will verify that training is provided for field personnel in proper field sampling techniques prior to work initiation to ensure that consistent and appropriate sampling, sample handling/storage, and COC procedures are followed.

5.8 Documents and Records

Amec Foster Wheeler will document and track aspects of the sample collection process, including generating field logs at each site and COC forms for all samples collected. COC forms will accompany water samples to the analytical laboratory. The analytical laboratory will document and track all aspects of sample receipt and storage, analyses, and reporting.

Amec Foster Wheeler will maintain a database of information collected throughout this project. After verification and final database establishment, the raw data files and databases will be copied onto CD for storage onsite. All original data sheets, statistical worksheets, and reports produced will be accumulated into project-specific files maintained in file cabinets at the Amec Foster Wheeler office after the report has been submitted. Final report text and tables are also stored on disk and provided to the Port. After data submissions, directories are archived for storage offsite. All records will be maintained for at least five years or transferred according to agreement between the company and the client, should the laboratory transfer ownership. All records and analyses pertaining to accreditation are kept for a minimum of five years. If there is a change in company ownership, accreditation records for at least the previous five years must be transferred to the new owner.

Analytical results gathered at Weck will be stored in a database system at their main office and will be provided to Amec Foster Wheeler's PM, Barry Snyder, and Analytical QA Officer, Rolf Schottle, electronically. Data received from outside contractors will be kept exactly as received (electronically); data are error checked and processed into Amec Foster Wheeler's database system.

Persons responsible for maintaining records for this project are as follows: Mr. Snyder, Amec Foster Wheeler's PM, will oversee the operations of the project, including field QA, and will arbitrate any issues relative to records retention and any decisions to discard records. The Analytical Laboratory PM, Mr. Samatmanakit, will maintain all chemistry records; and the Field PM, Ms. Sheredy, will maintain the data at Amec Foster Wheeler and will maintain all sample collection, sample transport, COC, and field analyses forms.

Copies of this QAPP will be distributed to the Port's PM, Kelly Tait. Updates to this QAPP will be distributed in like manner, and all previous versions will be discarded from the project file.

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

6.0 REPORT PREPARATION

The Time Series Study is being conducted to supplement information collected during the annual SIYB TMDL monitoring program. As such, the report for the Time Series Study will be limited to addressing the study question identified in Section 1 (Introduction) and will be submitted to the San Diego Regional Water Quality Control Board as an appendix to the 2017 SIYB Dissolved Copper TMDL Annual Report.

The Time Series Study technical write-up will provide a summary of water quality sampling results. In addition, the report will include a QA/QC assessment of field and analytical data.

At a minimum, the following information will be included in the Time Series Study technical write-up:

1. *Introduction*. A presentation of the study objectives.
2. *Sampling collection methods*. This section will provide detailed information on collection locations, number of samples, and collection methods. Target and actual sampling locations will be depicted on a site map.
3. *Sample analyses*. Laboratory analytical methods, sample handling and transport, lab QA/QC results, and other pertinent information will be described.
4. *Results*. A presentation of the Time Series Study results in tabular and graphic form will be included in this section.
5. *Discussion.* This section will include a discussion of the Times Series Study results in relation to the study question.
6. *QA/QC Summary.* This section will discuss adherence to project-specific QAPP requirements, QA/QC issues to be addressed, and any necessary corrective actions.

The tables, figures, and write-up will be reviewed by at least two Amec Foster Wheeler staff, including, at a minimum, the PM and a QA Officer. The document will also be reviewed by a technical editor. The report will be returned to the office staff for any corrections, and the final draft will then be reviewed again by the Amec Foster Wheeler PM. The Amec Foster Wheeler PM will sign the letter of transmittal for delivery of the report to the Port PM.

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7.0 REFERENCES

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California State Water Resources Control Board (State Board) (2014). *Collections of Water and Bed Sediment Samples with Associated Field Measurements and Physical Habitat in California*. Version 1.1. Updated March 2014. http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/collect_bed_sediment_update.pdf

United States Environmental Protection Agency (USEPA). 1995. *Good Automated Laboratory Practices*. EPA/200/B-95/006. USEPA Resources Management. Triangle Park, NC.

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ATTACHMENT A

FIELD LOG FORMS

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FIELD WATER QUALITY DATA SHEET

Station Identification: _____

Date: (mm/dd/yyyy) _____

Time Started: (hh:mm) _____ Ended: (hh:mm) _____

GPS: (WGS84) Lat. _____ Long. _____

Tide (ft): _____ : _____

Weather conditions: _____

Wind (mph): _____

Sea State Conditions _____

Physical Water Quality Measurements

Time of collection:	**pH**	**Salinity (ppt)**	**Temperature (°C)**
Measurement:			

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes: _____

ATTACHMENT B

CHAIN-OF-CUSTODY FORMS

CHAIN OF CUSTODY RECORD

Weck Laboratories, Inc.
Analytical Laboratory Services - Since 1964
14859 East Clark Avenue : Industry : CA 91745
Tel 626-336-2139 ♦ Fax 626-336-2634 ♦ www.wecklabs.com

STANDARD

CLIENT NAME:	PROJECT:
Amec Foster Wheeler E&I, Inc.	Port of San Diego - Shelter Island Yacht Basin 24hr Water Quality Study
ADDRESS:	PHONE: 858-300-4316
9210 Sky Park Ct., Suite 200	FAX: 858-300-4301
San Diego, CA 92123	EMAIL: corey.sheredy@amecfw.com; barry.snyder@amecfw.com
PROJECT MANAGER	SAMPLER
Corey Sheredy / Barry Snyder	Corey Sheredy (CCS)

SPECIAL HANDLING

- ☐ Same Day Rush 150%
- ☐ 24 Hour Rush 100%
- ☐ 48-72 Hour Rush 75%
- ☐ 4 - 5 Day Rush 30%
- ☐ Rush Extractions 50%
- ☐ 10 Business Days
- ☐ QA/QC Data Package

Charges will apply for weekends/holidays

Method of Shipment:

ID# (For lab Use Only)	DATE SAMPLED	TIME SAMPLED	SMPL TYPE	SAMPLE IDENTIFICATION/SITE LOCATION	# OF CONT.	ANALYSES REQUESTED: Dissolved Copper Method EPA 1640 MDL 0.004 µg/L, RL= 0.01 µg/L	ANALYSES REQUESTED: Dissolved Zinc Method EPA 1640 MDL 0.036 µg/L, RL = 0.20 µg/L	COMMENTS
			seawater	TS-[1,2,3]-T0	1	X	X	
			seawater	TS-[1,2,3]-T1	1	X	X	
			seawater	TS-[1,2,3]-T2	1	X	X	
			seawater	TS-[1,2,3]-T3	1	X	X	
			seawater	TS-[1,2,3]-T4	1	X	X	
			seawater	TS-[1,2,3]-T5	1	X	X	
			seawater	TS-[1,2,3]-T6	1	X	X	
			seawater	TS-[1,2,3]-T7	1	X	X	
			seawater	TS-[1,2,3]-T8	1	X	X	
			seawater	TS-[1,2,3]-T9	1	x	x	

RELINQUISHED BY	DATE / TIME	RECEIVED BY
RELINQUISHED BY	DATE / TIME	RECEIVED BY
RELINQUISHED BY	DATE / TIME	RECEIVED BY

SAMPLE CONDITION:

Actual Temperature:

Received On Ice	Y / N
Preserved	Y / N
Evidence Seals Present	Y / N
Container Intact	Y / N
Preserved at Lab	Y / N

SAMPLE TYPE CODE:

AQ=Aqueous
NA= Non Aqueous
SL = Sludge
DW = Drinking Water
WW = Waste Water
RW = Rain Water
GW = Ground Water
SO = Soil
SW = Solid Waste
OL = Oil
OT = Other Matrix

SPECIAL REQUIREMENTS / BILLING INFORMATION

1) Samples are preseved and filtered in the field; 2) FB = Field Blank; 3) ER = Equipment Rinsate (Equipment Blank); 4) REP = Replicate
5) WECK will contact Amec FW PM within 24 hours if any sample anomalies are found; 6) SPIKE level at the following amounts = Copper = 10 ug/L; Zinc = 30 ug/L;
7) Select pages from Amec FW QAPP included for reference;

Weck Laboratories, Inc.
Analytical Laboratory Services - Since 1964
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Tel 626-336-2139 ♦ Fax 626-336-2634 ♦ www.wecklabs.com

CHAIN OF CUSTODY RECORD

STANDARD

CLIENT NAME:	PROJECT:
Amec Foster Wheeler E&I, Inc.	Port of San Diego - Shelter Island Yacht Basin 24hr Water Quality Study
ADDRESS:	PHONE: 858-300-4316
9210 Sky Park Ct., Suite 200	FAX: 858-300-4301
San Diego, CA 92123	EMAIL: corey.sheredy@amecfw.com, barry.snyder@amecfw.com
PROJECT MANAGER	SAMPLER
Corey Sheredy / Barry Snyder	Corey Sheredy (CCS)

ID# (For lab Use Only)	DATE SAMPLED	TIME SAMPLED	SMPL TYPE	SAMPLE IDENTIFICATION/SITE LOCATION	# OF CONT.	Dissolved Copper Method EPA 1640 MDL 0.004 µg/L RL= 0.01 µg/L	Dissolved Zinc Method EPA 1640 MDL 0.036 µg/L RL= 0.20 µg/L								
			seawater	TS-[1,2,3]-T10	1	X	X								
			seawater	TS-[1,2,3]-T11	1	X	X								
			seawater	TS-[1,2,3]-T12	1	X	X								
			seawater	TS-[1,2,3]-T12-REP	1	X	X								
			seawater	TS-[1,2,3]-FB	1	X	X								
			seawater	TS-[1,2,3]-ER	1	X	X								

ANALYSES REQUESTED

SPECIAL HANDLING

- ☐ Same Day Rush 150%
- ☐ 24 Hour Rush 100%
- ☐ 48-72 Hour Rush 75%
- ☐ 4 - 5 Day Rush 30%
- ☐ Rush Extractions 50%
- ☐ 10 Business Days
- ☐ QA/QC Data Package

Charges will apply for weekends/holidays

Method of Shipment:

COMMENTS

RELINOUISHED BY	DATE / TIME	RECEIVED BY
RELINQUISHED BY	DATE / TIME	RECEIVED BY
RELINQUISHED BY	DATE / TIME	RECEIVED BY

SAMPLE CONDITION:

Actual Temperature:

Received On Ice	Y / N
Preserved	Y / N
Evidence Seals Present	Y / N
Container Intact	Y / N
Preserved at Lab	Y / N

SAMPLE TYPE CODE:

AQ=Aqueous
NA= Non Aqueous
SL = Sludge
DW = Drinking Water
WW = Waste Water
RW = Rain Water
GW = Ground Water
SO = Soil
SW = Solid Waste
OL = Oil
OT = Other Matrix

SPECIAL REQUIREMENTS / BILLING INFORMATION

1) Samples are preseved and filtered in the field; 2) FB = Field Blank; 3) ER = Equipment Rinsate (Equipment Blank); 4) REP = Replicate

5) WECK will contact AMEC PM within 24 hours if any sample anomalies are found; 6) SPIKE level at the following amounts = Copper = 10 ug/L; Zinc = 30 ug/L;

7) Select pages from AMEC QAPP included for reference;

ATTACHMENT C

QA CHECKLIST

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FIELD SAMPLING QA CHECKLIST

Station Location: TS- **Date/Time:**

Mark each box with Y, N, or NA

Field Procedures

1. Upon arriving at the sampling location, the following site observations are being recorded:

Vessel has been anchored (if at TS-2)	
Station GPS coordinates (approx. ± 3 m) and station identification verified and recorded	
Tide recorded	
Weather conditions recorded	
Surface water conditions (incl. currents) recorded	
General site observations recorded	
Check for boat cleaning operations in the area, document if applicable	

2. Sampling procedures:

TS-1-ER

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	
Field staff wearing fresh, powder free nitrile gloves	
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	
Sampling instrument given site water rinse prior to deployment for at least 1 minute	
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket filled with DI water	
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	
Sample bottles correctly labeled and match the station identification	
Sample bottles correctly labeled with date and time	
Staff avoided contaminating samples at all times	
pH and salinity readings taken following sample collection	
PPE properly removed and disposed of upon completion	
Field notes have been recorded for this collection event	
Water samples placed in cooler with wet ice	

FIELD SAMPLING QA CHECKLIST

TS-1-T0

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	
Field staff wearing fresh, powder free nitrile gloves	
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	
Sampling instrument given site water rinse prior to deployment for at least 1 minute	
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket filled with DI water	
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	
Sample bottles correctly labeled and match the station identification	
Sample bottles correctly labeled with date and time	
Staff avoided contaminating samples at all times	
pH and salinity readings taken following sample collection	
PPE properly removed and disposed of upon completion	
Field notes have been recorded for this collection event	
Water samples placed in cooler with wet ice	

TS-1-T1

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	
Field staff wearing fresh, powder free nitrile gloves	
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	
Sampling instrument given site water rinse prior to deployment for at least 1 minute	
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket filled with DI water	
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	
Sample bottles correctly labeled and match the station identification	
Sample bottles correctly labeled with date and time	
Staff avoided contaminating samples at all times	
pH and salinity readings taken following sample collection	
PPE properly removed and disposed of upon completion	
Field notes have been recorded for this collection event	
Water samples placed in cooler with wet ice	

FIELD SAMPLING QA CHECKLIST

TS-1-T2

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	
Field staff wearing fresh, powder free nitrile gloves	
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	
Sampling instrument given site water rinse prior to deployment for at least 1 minute	
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket filled with DI water	
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	
Sample bottles correctly labeled and match the station identification	
Sample bottles correctly labeled with date and time	
Staff avoided contaminating samples at all times	
pH and salinity readings taken following sample collection	
PPE properly removed and disposed of upon completion	
Field notes have been recorded for this collection event	
Water samples placed in cooler with wet ice	

TS-1-T3

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	
Field staff wearing fresh, powder free nitrile gloves	
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	
Sampling instrument given site water rinse prior to deployment for at least 1 minute	
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket filled with DI water	
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	
Sample bottles correctly labeled and match the station identification	
Sample bottles correctly labeled with date and time	
Staff avoided contaminating samples at all times	
pH and salinity readings taken following sample collection	
PPE properly removed and disposed of upon completion	
Field notes have been recorded for this collection event	
Water samples placed in cooler with wet ice	

FIELD SAMPLING QA CHECKLIST

TS-1-T4

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	
Field staff wearing fresh, powder free nitrile gloves	
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	
Sampling instrument given site water rinse prior to deployment for at least 1 minute	
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket filled with DI water	
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	
Sample bottles correctly labeled and match the station identification	
Sample bottles correctly labeled with date and time	
Staff avoided contaminating samples at all times	
pH and salinity readings taken following sample collection	
PPE properly removed and disposed of upon completion	
Field notes have been recorded for this collection event	
Water samples placed in cooler with wet ice	

TS-1-T5

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	
Field staff wearing fresh, powder free nitrile gloves	
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	
Sampling instrument given site water rinse prior to deployment for at least 1 minute	
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket filled with DI water	
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	
Sample bottles correctly labeled and match the station identification	
Sample bottles correctly labeled with date and time	
Staff avoided contaminating samples at all times	
pH and salinity readings taken following sample collection	
PPE properly removed and disposed of upon completion	
Field notes have been recorded for this collection event	
Water samples placed in cooler with wet ice	

FIELD SAMPLING QA CHECKLIST

TS-1-T6

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	
Field staff wearing fresh, powder free nitrile gloves	
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	
Sampling instrument given site water rinse prior to deployment for at least 1 minute	
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket filled with DI water	
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	
Sample bottles correctly labeled and match the station identification	
Sample bottles correctly labeled with date and time	
Staff avoided contaminating samples at all times	
pH and salinity readings taken following sample collection	
PPE properly removed and disposed of upon completion	
Field notes have been recorded for this collection event	
Water samples placed in cooler with wet ice	

TS-1-T7

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	
Field staff wearing fresh, powder free nitrile gloves	
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	
Sampling instrument given site water rinse prior to deployment for at least 1 minute	
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket filled with DI water	
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	
Sample bottles correctly labeled and match the station identification	
Sample bottles correctly labeled with date and time	
Staff avoided contaminating samples at all times	
pH and salinity readings taken following sample collection	
PPE properly removed and disposed of upon completion	
Field notes have been recorded for this collection event	
Water samples placed in cooler with wet ice	

FIELD SAMPLING QA CHECKLIST

TS-1-T8

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	
Field staff wearing fresh, powder free nitrile gloves	
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	
Sampling instrument given site water rinse prior to deployment for at least 1 minute	
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket filled with DI water	
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	
Sample bottles correctly labeled and match the station identification	
Sample bottles correctly labeled with date and time	
Staff avoided contaminating samples at all times	
pH and salinity readings taken following sample collection	
PPE properly removed and disposed of upon completion	
Field notes have been recorded for this collection event	
Water samples placed in cooler with wet ice	

TS-1-T9

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	
Field staff wearing fresh, powder free nitrile gloves	
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	
Sampling instrument given site water rinse prior to deployment for at least 1 minute	
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket filled with DI water	
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	
Sample bottles correctly labeled and match the station identification	
Sample bottles correctly labeled with date and time	
Staff avoided contaminating samples at all times	
pH and salinity readings taken following sample collection	
PPE properly removed and disposed of upon completion	
Field notes have been recorded for this collection event	
Water samples placed in cooler with wet ice	

FIELD SAMPLING QA CHECKLIST

TS-1-T10

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	
Field staff wearing fresh, powder free nitrile gloves	
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	
Sampling instrument given site water rinse prior to deployment for at least 1 minute	
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket filled with DI water	
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	
Sample bottles correctly labeled and match the station identification	
Sample bottles correctly labeled with date and time	
Staff avoided contaminating samples at all times	
pH and salinity readings taken following sample collection	
PPE properly removed and disposed of upon completion	
Field notes have been recorded for this collection event	
Water samples placed in cooler with wet ice	

TS-1-T11

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	
Field staff wearing fresh, powder free nitrile gloves	
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	
Sampling instrument given site water rinse prior to deployment for at least 1 minute	
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket filled with DI water	
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	
Sample bottles correctly labeled and match the station identification	
Sample bottles correctly labeled with date and time	
Staff avoided contaminating samples at all times	
pH and salinity readings taken following sample collection	
PPE properly removed and disposed of upon completion	
Field notes have been recorded for this collection event	
Water samples placed in cooler with wet ice	

FIELD SAMPLING QA CHECKLIST

TS-1-T12

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	
Field staff wearing fresh, powder free nitrile gloves	
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	
Sampling instrument given site water rinse prior to deployment for at least 1 minute	
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket filled with DI water	
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	
Sample bottles correctly labeled and match the station identification	
Sample bottles correctly labeled with date and time	
Staff avoided contaminating samples at all times	
pH and salinity readings taken following sample collection	
PPE properly removed and disposed of upon completion	
Field notes have been recorded for this collection event	
Water samples placed in cooler with wet ice	

TS-1-T12-REP

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	
Field staff wearing fresh, powder free nitrile gloves	
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	
Sampling instrument given site water rinse prior to deployment for at least 1 minute	
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket filled with DI water	
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	
Sample bottles correctly labeled and match the station identification	
Sample bottles correctly labeled with date and time	
Staff avoided contaminating samples at all times	
pH and salinity readings taken following sample collection	
PPE properly removed and disposed of upon completion	
Field notes have been recorded for this collection event	
Water samples placed in cooler with wet ice	

FIELD SAMPLING QA CHECKLIST

TS-1-FB

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	
Field staff wearing fresh, powder free nitrile gloves	
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	
Sampling instrument given site water rinse prior to deployment for at least 1 minute	
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket filled with DI water	
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	
Sample bottles correctly labeled and match the station identification	
Sample bottles correctly labeled with date and time	
Staff avoided contaminating samples at all times	
pH and salinity readings taken following sample collection	
PPE properly removed and disposed of upon completion	
Field notes have been recorded for this collection event	
Water samples placed in cooler with wet ice	

4. Data Recording:

Water samples properly logged on COC form	
Proper persons have signed the COC	

5. Sample Storage:

Water samples properly stored on ice in a cooler	
Cooler and samples hand delivered to labs	
Completed COC included with courier to hand deliver to labs	

Additional Notes:

FIELD SAMPLING QA CHECKLIST

Signature of QA/QC Personnel:_____ **Date/Time**_____

Print Name/Company:_____

APPENDIX B
QA/QC FIELD CHECKLIST FORMS

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FIELD SAMPLING QA CHECKLIST

Station Location: **TS-1**

Mark each box with Y, N, or NA

Field Procedures

1. Upon arriving at the sampling location, the following site observations are being recorded:

Vessel has been anchored (if at TS-2)	N/A
Station GPS coordinates (approx. ± 3 m) and station identification verified and recorded or identified on a map	Y
Tide recorded	Y
Weather conditions recorded	Y
Surface water conditions (incl. currents) recorded	Y
General site observations recorded	Y
Check for boat cleaning operations in the area, document if applicable	Y

2. Sampling procedures:

TS-1-ER

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	NA
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	NA
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	NA
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/3/18 16:22 **Initials:** CN	

FIELD SAMPLING QA CHECKLIST

TS-1-T0

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	Y
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/9/18 17:07	**Initials:** CN

TS-1-T1

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	Y
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	Y
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/9/18 19:15	**Initials:** CN

FIELD SAMPLING QA CHECKLIST

TS-1-T2

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	N/A
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	Y
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/3/18 21:24 **Initials:** CN	

TS-1-T3

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	N/A
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	Y
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/3/18 23:34 **Initials:** CN	

FIELD SAMPLING QA CHECKLIST

TS-1-T4

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	N/A
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	Y
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/4/18 01:28	**Initials:** CN

TS-1-T5

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	N/A
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	Y
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/4/18 09:20	**Initials:** CN

FIELD SAMPLING QA CHECKLIST

TS-1-T6

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	Y
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/4/17 0440 **Initials:** AR	

TS-1-T7

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	N/A
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	~~NA~~ Y
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/4/18 **Initials:** KB	

FIELD SAMPLING QA CHECKLIST

TS-1-T8

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	Y
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/4/18 0830	**Initials:** EW

TS-1-T9

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	Y
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/4/18 1030	**Initials:** EW

FIELD SAMPLING QA CHECKLIST

TS-1-T10

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	Y
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/4/18 1310 **Initials:** EW	

TS-1-T11

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	Y
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/4/18 1525 **Initials:** EW	

FIELD SAMPLING QA CHECKLIST

TS-1-T12

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	Y
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/4/18 **Initials:** CCS	

TS-1-T12-REP

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	Y
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/4/18 **Initials:** CCS	

FIELD SAMPLING QA CHECKLIST

TS-1-FB

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	NA
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	NA
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	NA
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/9/18	**Initials:** CCS

4. Data Recording:

Water samples properly logged on COC form	Y
Proper persons have signed the COC	Y

5. Sample Storage:

Water samples properly stored on ice in a cooler	Y
Cooler and samples hand delivered to labs	Y
Completed COC included with courier to hand deliver to labs	Y

Additional Notes:

Signature of QA/QC Personnel: _____ **Date/Time** 1/5/2018

Print Name/Company: Corey Shumway

FIELD SAMPLING QA CHECKLIST

Station Location: **TS-2**

Mark each box with Y, N, or NA

Field Procedures

1. Upon arriving at the sampling location, the following site observations are being recorded:

Vessel has been anchored (if at TS-2)	Y
Station GPS coordinates (approx. ± 3 m) and station identification verified and recorded or identified on a map	Y
Tide recorded	Y
Weather conditions recorded	Y
Surface water conditions (incl. currents) recorded	Y
General site observations recorded	Y
Check for boat cleaning operations in the area, document if applicable	Y

2. Sampling procedures:

TS-2-ER

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	NA
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	NA
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	NA
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/2/18 1615 **Initials:** CCS	

FIELD SAMPLING QA CHECKLIST

TS-2-T0

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	Y
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	NA
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/3/18 1655 **Initials:** KT	

TS-2-T1

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	Y
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	NA
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/3/18 **Initials:** CLA	

FIELD SAMPLING QA CHECKLIST

TS-2-T2

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	Y
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	NA
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/3/18 21:12 **Initials:** KT	

TS-2-T3

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	Y
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	NA
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/3/18 23 22 **Initials:** KT	

FIELD SAMPLING QA CHECKLIST

TS-2-T4

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	Y
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	N/A
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/4/18 1111 **Initials:** KT	

TS-2-T5

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	Y
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	N/A
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/4/18 312 **Initials:** KT	

FIELD SAMPLING QA CHECKLIST

TS-2-T6

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	Y
Field staff wearing fresh, powder free nitrile gloves	Y
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	NA
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	Y
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	Y
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	Y
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	Y
Sample bottles correctly labeled and match the station identification	Y
Sample bottles correctly labeled with date and time	Y
Staff avoided contaminating samples at all times	Y
Temperature, pH, and salinity readings taken following sample collection	Y
PPE properly removed and disposed of upon completion	Y
Field notes have been recorded for this collection event	Y
Water samples placed in cooler with wet ice	Y
Date & Time: 1/4/18 427 **Initials:** KT	

TS-2-T7

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	~
Field staff wearing fresh, powder free nitrile gloves	~
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	NA
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	~
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	~
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	~
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	~
Sample bottles correctly labeled and match the station identification	~
Sample bottles correctly labeled with date and time	~
Staff avoided contaminating samples at all times	~
Temperature, pH, and salinity readings taken following sample collection	~
PPE properly removed and disposed of upon completion	~
Field notes have been recorded for this collection event	~
Water samples placed in cooler with wet ice	~
Date & Time: **Initials:**	

FIELD SAMPLING QA CHECKLIST

TS-2-T8

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	✓
Field staff wearing fresh, powder free nitrile gloves	✓
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	NA
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	✓
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	✓
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	✓
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	✓
Sample bottles correctly labeled and match the station identification	✓
Sample bottles correctly labeled with date and time	✓
Staff avoided contaminating samples at all times	✓
Temperature, pH, and salinity readings taken following sample collection	✓
PPE properly removed and disposed of upon completion	✓
Field notes have been recorded for this collection event	✓
Water samples placed in cooler with wet ice	✓
Date & Time: **Initials:**	

TS-2-T9

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	✓
Field staff wearing fresh, powder free nitrile gloves	✓
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	NA
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	✓
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	✓
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	✓
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	✓
Sample bottles correctly labeled and match the station identification	✓
Sample bottles correctly labeled with date and time	✓
Staff avoided contaminating samples at all times	✓
Temperature, pH, and salinity readings taken following sample collection	✓
PPE properly removed and disposed of upon completion	✓
Field notes have been recorded for this collection event	✓
Water samples placed in cooler with wet ice	✓
Date & Time: **Initials:**	

FIELD SAMPLING QA CHECKLIST

TS-2-T10

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	
Field staff wearing fresh, powder free nitrile gloves	
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	NA
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	
Sample bottles correctly labeled and match the station identification	
Sample bottles correctly labeled with date and time	
Staff avoided contaminating samples at all times	
Temperature, pH, and salinity readings taken following sample collection	
PPE properly removed and disposed of upon completion	
Field notes have been recorded for this collection event	
Water samples placed in cooler with wet ice	
Date & Time: **Initials:**	

TS-2-T11

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	
Field staff wearing fresh, powder free nitrile gloves	
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	NA
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	
Sample bottles correctly labeled and match the station identification	
Sample bottles correctly labeled with date and time	
Staff avoided contaminating samples at all times	
Temperature, pH, and salinity readings taken following sample collection	
PPE properly removed and disposed of upon completion	
Field notes have been recorded for this collection event	
Water samples placed in cooler with wet ice	
Date & Time: **Initials:**	

FIELD SAMPLING QA CHECKLIST

TS-2-T12

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	✓
Field staff wearing fresh, powder free nitrile gloves	✓
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	NA
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	✓
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	✓
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	✓
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	✓
Sample bottles correctly labeled and match the station identification	✓
Sample bottles correctly labeled with date and time	✓
Staff avoided contaminating samples at all times	✓
Temperature, pH, and salinity readings taken following sample collection	✓
PPE properly removed and disposed of upon completion	✓
Field notes have been recorded for this collection event	✓
Water samples placed in cooler with wet ice	✓
Date & Time: **Initials:**	

TS-2-T12-REP

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	✓
Field staff wearing fresh, powder free nitrile gloves	✓
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	NA
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	✓
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	✓
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	✓
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	✓
Sample bottles correctly labeled and match the station identification	✓
Sample bottles correctly labeled with date and time	✓
Staff avoided contaminating samples at all times	✓
Temperature, pH, and salinity readings taken following sample collection	✓
PPE properly removed and disposed of upon completion	✓
Field notes have been recorded for this collection event	✓
Water samples placed in cooler with wet ice	✓
Date & Time: **Initials:**	

FIELD SAMPLING QA CHECKLIST

TS-2-FB

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	✓
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	NA
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	NA
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	✓
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	✓
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	✓
Sample bottles correctly labeled and match the station identification	✓
Sample bottles correctly labeled with date and time	✓
Staff avoided contaminating samples at all times	✓
Temperature, pH, and salinity readings taken following sample collection	NA
PPE properly removed and disposed of upon completion	✓
Field notes have been recorded for this collection event	✓
Water samples placed in cooler with wet ice	✓
Date & Time: **Initials:**	

4. Data Recording:

Water samples properly logged on COC form	✓
Proper persons have signed the COC	✓

5. Sample Storage:

Water samples properly stored on ice in a cooler	✓
Cooler and samples hand delivered to labs	✓
Completed COC included with courier to hand deliver to labs	✓

Additional Notes:

Signature of QA/QC Personnel: _____ **Date/Time** 1/5/2018

Print Name/Company: Corey Shuredy

FIELD SAMPLING QA CHECKLIST

Station Location: **TS-3**

Mark each box with Y, N, or NA

Field Procedures

1. Upon arriving at the sampling location, the following site observations are being recorded:

Vessel has been anchored (if at TS-2)	NA
Station GPS coordinates (approx. ± 3 m) and station identification verified and recorded or identified on a map	Y
Tide recorded	Y
Weather conditions recorded	Y
Surface water conditions (incl. currents) recorded	Y
General site observations recorded	Y
Check for boat cleaning operations in the area, document if applicable	Y

2. Sampling procedures:

TS-3-ER

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	✓
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	NA
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	NA
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	✓
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	✓
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	✓
Sample bottles correctly labeled and match the station identification	✓
Sample bottles correctly labeled with date and time	✓
Staff avoided contaminating samples at all times	✓
Temperature, pH, and salinity readings taken following sample collection	NA
PPE properly removed and disposed of upon completion	✓
Field notes have been recorded for this collection event	✓
Water samples placed in cooler with wet ice	✓
Date & Time: 1618 1/3/18 **Initials:** TH	

FIELD SAMPLING QA CHECKLIST

TS-3-T0

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	N/A
Field staff wearing fresh, powder free nitrile gloves	✓
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	✓
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	✓
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	✓
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	✓
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	✓
Sample bottles correctly labeled and match the station identification	✓
Sample bottles correctly labeled with date and time	✓
Staff avoided contaminating samples at all times	✓
Temperature, pH, and salinity readings taken following sample collection	✓
PPE properly removed and disposed of upon completion	✓
Field notes have been recorded for this collection event	✓
Water samples placed in cooler with wet ice	✓
Date & Time: 1708 1/3/17 **Initials:** JM	

TS-3-T1

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	N/A
Field staff wearing fresh, powder free nitrile gloves	✓
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	✓
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	✓
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	✓
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	✓
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	✓
Sample bottles correctly labeled and match the station identification	✓
Sample bottles correctly labeled with date and time	✓
Staff avoided contaminating samples at all times	✓
Temperature, pH, and salinity readings taken following sample collection	✓
PPE properly removed and disposed of upon completion	✓
Field notes have been recorded for this collection event	✓
Water samples placed in cooler with wet ice	✓
Date & Time: 1905 1/3/17 **Initials:** JM	

FIELD SAMPLING QA CHECKLIST

TS-3-T2

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	✓
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	✓
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	✓
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	✓
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	✓
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	✓
Sample bottles correctly labeled and match the station identification	✓
Sample bottles correctly labeled with date and time	✓
Staff avoided contaminating samples at all times	✓
Temperature, pH, and salinity readings taken following sample collection	✓
PPE properly removed and disposed of upon completion	✓
Field notes have been recorded for this collection event	✓
Water samples placed in cooler with wet ice	✓
Date & Time: 2115 1/3/18 **Initials:** TH	

TS-3-T3

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	✓
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	✓
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	✓
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	✓
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	✓
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	✓
Sample bottles correctly labeled and match the station identification	✓
Sample bottles correctly labeled with date and time	✓
Staff avoided contaminating samples at all times	✓
Temperature, pH, and salinity readings taken following sample collection	✓
PPE properly removed and disposed of upon completion	✓
Field notes have been recorded for this collection event	✓
Water samples placed in cooler with wet ice	✓
Date & Time: ~~0~~ 2325 1/3/18 **Initials:** TH	

FIELD SAMPLING QA CHECKLIST

TS-3-T6

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	✓
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	✓
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	✓
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	✓
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	✓
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	✓
Sample bottles correctly labeled and match the station identification	✓
Sample bottles correctly labeled with date and time	✓
Staff avoided contaminating samples at all times	✓
Temperature, pH, and salinity readings taken following sample collection	✓
PPE properly removed and disposed of upon completion	✓
Field notes have been recorded for this collection event	✓
Water samples placed in cooler with wet ice	✓
Date & Time: 0430 1/4/18 **Initials:** TM	

TS-3-T7

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	✓
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	✓
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	✓
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	✓
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	✓
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	✓
Sample bottles correctly labeled and match the station identification	✓
Sample bottles correctly labeled with date and time	✓
Staff avoided contaminating samples at all times	✓
Temperature, pH, and salinity readings taken following sample collection	✓
PPE properly removed and disposed of upon completion	✓
Field notes have been recorded for this collection event	✓
Water samples placed in cooler with wet ice	✓
Date & Time: **Initials:**	

FIELD SAMPLING QA CHECKLIST

TS-3-T8

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	✓
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	✓
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	✓
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	✓
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	✓
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	✓
Sample bottles correctly labeled and match the station identification	✓
Sample bottles correctly labeled with date and time	✓
Staff avoided contaminating samples at all times	✓
Temperature, pH, and salinity readings taken following sample collection	✓
PPE properly removed and disposed of upon completion	✓
Field notes have been recorded for this collection event	✓
Water samples placed in cooler with wet ice	✓
Date & Time: **Initials:** BL	

TS-3-T9

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	✓
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	✓
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	✓
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	✓
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	✓
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	✓
Sample bottles correctly labeled and match the station identification	✓
Sample bottles correctly labeled with date and time	✓
Staff avoided contaminating samples at all times	✓
Temperature, pH, and salinity readings taken following sample collection	✓
PPE properly removed and disposed of upon completion	✓
Field notes have been recorded for this collection event	✓
Water samples placed in cooler with wet ice	✓
Date & Time: **Initials:** BL	

FIELD SAMPLING QA CHECKLIST

TS-3-T10

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	✓
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	✓
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	✓
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	✓
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	✓
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	✓
Sample bottles correctly labeled and match the station identification	✓
Sample bottles correctly labeled with date and time	✓
Staff avoided contaminating samples at all times	✓
Temperature, pH, and salinity readings taken following sample collection	✓
PPE properly removed and disposed of upon completion	✓
Field notes have been recorded for this collection event	✓
Water samples placed in cooler with wet ice	✓
Date & Time: 1 **Initials:** BL	

TS-3-T11

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	✓
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	✓
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	✓
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	✓
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	✓
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	✓
Sample bottles correctly labeled and match the station identification	✓
Sample bottles correctly labeled with date and time	✓
Staff avoided contaminating samples at all times	✓
Temperature, pH, and salinity readings taken following sample collection	✓
PPE properly removed and disposed of upon completion	✓
Field notes have been recorded for this collection event	✓
Water samples placed in cooler with wet ice	✓
Date & Time: 1 **Initials:** BL	

FIELD SAMPLING QA CHECKLIST

TS-3-T12

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	✓
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	✓
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	✓
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	✓
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	✓
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	✓
Sample bottles correctly labeled and match the station identification	✓
Sample bottles correctly labeled with date and time	✓
Staff avoided contaminating samples at all times	✓
Temperature, pH, and salinity readings taken following sample collection	✓
PPE properly removed and disposed of upon completion	✓
Field notes have been recorded for this collection event	✓
Water samples placed in cooler with wet ice	✓
Date & Time: **Initials:** BT	

TS-3-T12-REP

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	✓
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	✓
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	✓
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	✓
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	✓
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	✓
Sample bottles correctly labeled and match the station identification	✓
Sample bottles correctly labeled with date and time	✓
Staff avoided contaminating samples at all times	✓
Temperature, pH, and salinity readings taken following sample collection	✓
PPE properly removed and disposed of upon completion	✓
Field notes have been recorded for this collection event	✓
Water samples placed in cooler with wet ice	✓
Date & Time: **Initials:** BT	

FIELD SAMPLING QA CHECKLIST

TS-3-FB

Vessel engine has been shut off for 3-5 minutes prior to sampling (TS-2 only)	NA
Field staff wearing fresh, powder free nitrile gloves	✓
Sampling depth delineated on sampling instrument with a clear marking (sampling must occur within 1 m of surface)	NA
Sampling instrument given site water rinse prior to deployment for at least 2-3 minutes	NA
If in between sampling stations, sampling instrument stored in plastic lined, 5-gallon bucket	✓
SWAMP protocols utilized to avoid sample contamination (i.e., clean hands/dirty hands technique)	✓
Samples bottles and containers are the correct type and preservation in accordance with SAP/ QAPP	✓
Sample bottles correctly labeled and match the station identification	✓
Sample bottles correctly labeled with date and time	✓
Staff avoided contaminating samples at all times	✓
Temperature, pH, and salinity readings taken following sample collection	NA
PPE properly removed and disposed of upon completion	✓
Field notes have been recorded for this collection event	✓
Water samples placed in cooler with wet ice	✓
Date & Time: **Initials:** BT	

4. Data Recording:

Water samples properly logged on COC form	✓
Proper persons have signed the COC	✓

5. Sample Storage:

Water samples properly stored on ice in a cooler	✓
Cooler and samples hand delivered to labs	✓
Completed COC included with courier to hand deliver to labs BT	✓

Additional Notes:

Signature of QA/QC Personnel: _____ **Date/Time** 1/5/2018

Print Name/Company: Corey Shrewsbury

APPENDIX C
CHAIN-OF-CUSTODY FORMS

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8A050 40

Weck Laboratories, Inc.
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CHAIN OF CUSTODY RECORD

STANDARD

Page 1 Of 6

CLIENT NAME:	PROJECT:
Amec Foster Wheeler E&I, Inc.	SIYB Times Series Study
ADDRESS:	PHONE: 831-359-7761
9210 Sky Park Ct., Suite 200	FAX: 858-300-4301
San Diego, CA 92123	EMAIL: corey.sheredy@amecfw.com
PROJECT MANAGER	SAMPLER
Barry Snyder / Corey Sheredy	

SPECIAL HANDLING

- ☐ Same Day Rush 150%
- ☐ 24 Hour Rush 100%
- ☐ 48-72 Hour Rush 75%
- ☐ 4 - 5 Day Rush 30%
- ☐ Rush Extractions 50%
- ☑ 10 Business Days
- ☐ QA/QC Data Package

Charges will apply for weekends/holidays

Method of Shipment:

COMMENTS

ID# (For lab Use Only)	DATE SAMPLED	TIME SAMPLED	SMPL TYPE	SAMPLE IDENTIFICATION/SITE LOCATION	# OF CONT.	Dissolved Copper[1,2] Method EPA 1640 MDL 0.0038 ug/L, RL= 0.01 ug/L									
TS-1-T0	01/03/18	1642	seawater	TS-1-T0	1	X									
TS-1-T1	01/03/18	1850	seawater	TS-1-T1	1	X									
TS-1-T2	01/03/18	2100	seawater	TS-1-T2	1	X									
TS-1-T3	01/03/18	2311	seawater	TS-1-T3	1	X									
TS-1-T4	01/04/18	100	seawater	TS-1-T4	1	X									
TS-1-T5	01/04/18	300	seawater	TS-1-T5	1	X									
TS-1-T6	01/04/18	415	seawater	TS-1-T6	1	X									
TS-1-T7	01/04/18	620	seawater	TS-1-T7	1	X									
TS-1-T8	01/04/18	820	seawater	TS-1-T8	1	X									
TS-1-T9	01/04/18	1024	seawater	TS-1-T9	1	X									
TS-1-T10	01/04/18	1300	seawater	TS-1-T10	1	X									

RELINQUISHED BY	DATE / TIME	RECEIVED BY
[signature]	1-5-18 9:45	[signature]
[signature]	1-5-18 12:10	[signature] 1-5-18 12:10
RELINQUISHED BY	DATE / TIME	RECEIVED BY

SAMPLE CONDITION:

Actual Temperature: 3.1

Received On Ice	(Y) / N
Preserved	(Y) / N
Evidence Seals Present	Y / (N)
Container Intact	Y / (N)
Preserved at Lab	Y (N)

SAMPLE TYPE CODE:

AQ=Aqueous
NA= Non Aqueous
SL = Sludge
DW = Drinking Water
WW = Waste Water
RW = Rain Water
GW = Ground Water
SO = Soil
SW = Solid Waste
OL = Oil
OT = Other Matrix

SPECIAL REQUIREMENTS / BILLING INFORMATION

1) Diss. metals were field filtered using 0.45 um bottletop filt. System. LAB ACTION: PRESERVE IMMEDIATELY.

2) SPIKE level at the following amounts: Copper = 10 ug/L, ~~Zinc = 30 ug/L; &~~ WECK will contact Amec PM within 24 hours if any sample anomalies are found;

4) Select pages from Amec FW QAPP included for reference.

8A0504D

CHAIN OF CUSTODY RECORD

STANDARD

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Page 2 Of 6

CLIENT NAME:	PROJECT:
Amec Foster Wheeler E&I, Inc.	SIYB Times Series Study
ADDRESS: 9210 Sky Park Ct., Suite 200, San Diego, CA 92123	PHONE: 831-359-7761 / FAX: 858-300-4301 / EMAIL: corey.sheredy@amecfw.com
PROJECT MANAGER: Barry Snyder / Corey Sheredy	SAMPLER

ID# (For lab Use Only)	DATE SAMPLED	TIME SAMPLED	SMPL TYPE	SAMPLE IDENTIFICATION/SITE LOCATION	# OF CONT.	Dissolved Copper[1,2] Method EPA 1640 MDL 0.0038 µg/L, RL= 0.01 µg/L
X TS-1-T11	01/04/18	1515	seawater		1	X
X TS-1-T12	01/04/18	1729	seawater		1	X
X TS-1-T12-REP	01/04/18	1739	seawater		1	X
X TS-1-ER	01/03/18	1605 ~~1525~~	DI		1	X
X TS-1-FB	01/04/18	1748	DI		1	X

SPECIAL HANDLING

- ☐ Same Day Rush 150%
- ☐ 24 Hour Rush 100%
- ☐ 48-72 Hour Rush 75%
- ☐ 4 - 5 Day Rush 30%
- ☐ Rush Extractions 50%
- ☑ 10 Business Days
- ☐ QA/QC Data Package

Charges will apply for weekends/holidays

Method of Shipment:

COMMENTS

RELINQUISHED BY	DATE / TIME	RECEIVED BY
	1-5-18 9:45 AM	
RELINQUISHED BY	DATE / TIME	RECEIVED BY
	1-5-18 12:10	1-5-18 12:10
RELINQUISHED BY	DATE / TIME	RECEIVED BY

SAMPLE CONDITION:

Actual Temperature: 3.1

Received On Ice	Y / N
Preserved	Y / N
Evidence Seals Present	Y / N
Container Intact	Y / N
Preserved at Lab	Y / N

SAMPLE TYPE CODE:

AQ=Aqueous
NA= Non Aqueous
SL = Sludge
DW = Drinking Water
WW = Waste Water
RW = Rain Water
GW = Ground Water
SO = Soil
SW = Solid Waste
OL = Oil
OT = Other Matrix

SPECIAL REQUIREMENTS / BILLING INFORMATION

1) Diss. metals were field filtered using 0.45 um bottletop filt. System. LAB ACTION: PRESERVE IMMEDIATELY.

2) SPIKE level at the following amounts: Copper = 10 ug/L, ~~Zinc = 30 ug/L~~, 3) WECK will contact Amec PM within 24 hours if any sample anomalies are found;

4) Select pages from Amec FW QAPP included for reference.

8A05040

CHAIN OF CUSTODY RECORD

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CLIENT NAME:	PROJECT:
Amec Foster Wheeler E&I, Inc.	SIYB Times Series Study
ADDRESS: 9210 Sky Park Ct., Suite 200, San Diego, CA 92123	PHONE: 831-359-7761 FAX: 858-300-4301 EMAIL: corey.sheredy@amecfw.com
PROJECT MANAGER: Barry Snyder / Corey Sheredy	SAMPLER

ANALYSES REQUESTED

SPECIAL HANDLING

- ☐ Same Day Rush 150%
- ☐ 24 Hour Rush 100%
- ☐ 48-72 Hour Rush 75%
- ☐ 4 - 5 Day Rush 30%
- ☐ Rush Extractions 50%
- ☑ 10 Business Days
- ☐ QA/QC Data Package

Charges will apply for weekends/holidays

Method of Shipment:

ID# (For lab Use Only)	DATE SAMPLED	TIME SAMPLED	SMPL TYPE	SAMPLE IDENTIFICATION/SITE LOCATION	# OF CONT.	Dissolved Copper[12] Method EPA 1640 MDL 0.0038 µg/L, RL= 0.01 µg/L									COMMENTS
TS-2-T0	01/03/18	1642	seawater	TS-2-T0	1	X									
TS-2-T1	01/03/18	1850	seawater	TS-2-T1	1	X									
TS-2-T2	01/03/18	2100	seawater	TS-2-T2	1	X									
TS-2-T3	01/03/18	2311	seawater	TS-2-T3	1	X									
TS-2-T4	01/04/18	100	seawater	TS-2-T4	1	X									
TS-2-T5	01/04/18	300	seawater	TS-2-T5	1	X									
TS-2-T6	01/04/18	415	seawater	TS-2-T6	1	X									
TS-2-T7	01/04/18	620	seawater	TS-2-T7	1	X									
TS-2-T8	01/04/18	820	seawater	TS-2-T8	1	X									
TS-2-T9	01/04/18	1024	seawater	TS-2-T9	1	X									
TS-2-T10	01/04/18	1300	seawater	TS-2-T10	1	X									

RELINQUISHED BY	DATE / TIME	RECEIVED BY
[signature]	1-5-18 9:45 AM	Heather Sanchez
Heather Sanchez	1-5-18 12:10	[signature] 1-5-18 12:10
RELINQUISHED BY	DATE / TIME	RECEIVED BY

SAMPLE CONDITION:

Actual Temperature: 3.1

Received On Ice	Y / N
Preserved	Y / N
Evidence Seals Present	Y / N
Container Intact	Y / N
Preserved at Lab	Y / N

SAMPLE TYPE CODE:

AQ=Aqueous
NA= Non Aqueous
SL = Sludge
DW = Drinking Water
WW = Waste Water
RW = Rain Water
GW = Ground Water
SO = Soil
SW = Solid Waste
OL = Oil
OT = Other Matrix

SPECIAL REQUIREMENTS / BILLING INFORMATION

1) Diss. metals were field filtered using 0.45 um bottletop filt. System. LAB ACTION: PRESERVE IMMEDIATELY.
2) SPIKE level at the following amounts: Copper = 10 ug/L, ~~Zinc = 30 ug/L~~ 3) WECK will contact Amec PM within 24 hours if any sample anomalies are found;
4) Select pages from Amec FW QAPP included for reference.

8A05040

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CHAIN OF CUSTODY RECORD

STANDARD

CLIENT NAME: Amec Foster Wheeler E&I, Inc.

ADDRESS: 9210 Sky Park Ct., Suite 200, San Diego, CA 92123

PROJECT: SIYB Times Series Study

PHONE: 831-359-7761
FAX: 858-300-4301
EMAIL: corey.sheredy@amecfw.com

PROJECT MANAGER: Barry Snyder / Corey Sheredy

SAMPLER

ID# (For lab Use Only)	DATE SAMPLED	TIME SAMPLED	SMPL TYPE	SAMPLE IDENTIFICATION/SITE LOCATION	# OF CONT.	Dissolved Copper[1,2] Method EPA 1640 MDL 0.0038 µg/L, RL= 0.01 µg/L
TS-2-T11	01/04/18	1515	seawater		1	X
TS-2-T12	01/04/18	1729	seawater		1	X
TS-2-T12-REP	01/04/18	1739	seawater		1	X
TS-2-ER	01/03/18	1530	DI		1	X
TS-2-FB	01/04/18	1750	DI		1	X

ANALYSES REQUESTED

SPECIAL HANDLING

- ☐ Same Day Rush 150%
- ☐ 24 Hour Rush 100%
- ☐ 48-72 Hour Rush 75%
- ☐ 4 - 5 Day Rush 30%
- ☐ Rush Extractions 50%
- ☑ 10 Business Days
- ☐ QA/QC Data Package

Charges will apply for weekends/holidays

Method of Shipment:

COMMENTS

RELINQUISHED BY	DATE / TIME	RECEIVED BY
[signature]	1-5-18 9:45 am	[signature]
[signature]	1-5-18 12:10	[signature] 1-5-18 12:10

SAMPLE CONDITION:

Actual Temperature: 31

Received On Ice	(Y) / N
Preserved	(Y) / N
Evidence Seals Present	Y / (N)
Container Intact	Y / (N)
Preserved at Lab	Y / (N)

SAMPLE TYPE CODE:

AQ=Aqueous
NA= Non Aqueous
SL = Sludge
DW = Drinking Water
WW = Waste Water
RW = Rain Water
GW = Ground Water
SO = Soil
SW = Solid Waste
OL = Oil
OT = Other Matrix

SPECIAL REQUIREMENTS / BILLING INFORMATION

1) Diss. metals were field filtered using 0.45 um bottletop filt. System. LAB ACTION: PRESERVE IMMEDIATELY.
2) SPIKE level at the following amounts: Copper = 10 ug/L, ~~Zinc = 50 ug/L~~; 3) WECK will contact Amec PM within 24 hours if any sample anomalies are found;
4) Select pages from Amec FW QAPP included for reference.

8A05040

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STANDARD

CLIENT NAME: Amec Foster Wheeler E&I, Inc.

PROJECT: SIYB Times Series Study

ADDRESS: 9210 Sky Park Ct., Suite 200, San Diego, CA 92123

PHONE: 831-359-7761
FAX: 858-300-4301
EMAIL: corey.sheredy@amecfw.com

PROJECT MANAGER: Barry Snyder / Corey Sheredy

SAMPLER:

SPECIAL HANDLING

- ☐ Same Day Rush 150%
- ☐ 24 Hour Rush 100%
- ☐ 48-72 Hour Rush 75%
- ☐ 4 - 5 Day Rush 30%
- ☐ Rush Extractions 50%
- ☑ 10 Business Days
- ☐ QA/QC Data Package

Charges will apply for weekends/holidays

Method of Shipment:

COMMENTS

ID# (For lab Use Only)	DATE SAMPLED	TIME SAMPLED	SMPL TYPE	SAMPLE IDENTIFICATION/SITE LOCATION	# OF CONT.	ANALYSES REQUESTED: Dissolved Copper[1,2] Method EPA 1640 MDL 0.0038 µg/L, RL= 0.01 µg/L
TS-3-T0	01/03/18	1642	seawater	TS-3-T0	1	X
TS-3-T1	01/03/18	1850	seawater	TS-3-T1	1	X
TS-3-T2	01/03/18	2100	seawater	TS-3-T2	1	X
TS-3-T3	01/03/18	2311	seawater	TS-3-T3	1	X
TS-3-T4	01/04/18	100	seawater	TS-3-T4	1	X
TS-3-T5	01/04/18	300	seawater	TS-3-T5	1	X
TS-3-T6	01/04/18	415	seawater	TS-3-T6	1	X
TS-3-T7	01/04/18	620	seawater	TS-3-T7	1	X
TS-3-T8	01/04/18	820	seawater	TS-3-T8	1	X
TS-3-T9	01/04/18	1024	seawater	TS-3-T9	1	X
TS-3-T10	01/04/18	1300	seawater	TS-3-T10	1	X

RELINQUISHED BY	DATE / TIME	RECEIVED BY
[signature]	1-5-18 (Ce: 4)	[signature]
[signature]	1-5-18 12:10	[signature] 1-5-18 12:10

SAMPLE CONDITION:

Actual Temperature: 3.1

Received On Ice	(Y) / N
Preserved	(Y) / N
Evidence Seals Present	Y / (N)
Container Intact	Y / (N)
Preserved at Lab	Y / (N)

SAMPLE TYPE CODE:

AQ=Aqueous
NA= Non Aqueous
SL = Sludge
DW = Drinking Water
WW = Waste Water
RW = Rain Water
GW = Ground Water
SO = Soil
SW = Solid Waste
OL = Oil
OT = Other Matrix

SPECIAL REQUIREMENTS / BILLING INFORMATION

1) Diss. metals were field filtered using 0.45 um bottletop filt. System. LAB ACTION: PRESERVE IMMEDIATELY.

2) SPIKE level at the following amounts: Copper = 10 ug/L, ~~Zinc = 80 ug/L~~) WECK will contact Amec PM within 24 hours if any sample anomalies are found;

4) Select pages from Amec FW QAPP included for reference.

8AV5040

CHAIN OF CUSTODY RECORD

Weck Laboratories, Inc.
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STANDARD

Page 6 Of 6

CLIENT NAME:	PROJECT:
Amec Foster Wheeler E&I, Inc.	SIYB Times Series Study
ADDRESS: 9210 Sky Park Ct., Suite 200, San Diego, CA 92123	PHONE: 831-359-7761 / FAX: 858-300-4301 / EMAIL: corey.sheredy@amecfw.com
PROJECT MANAGER: Barry Snyder / Corey Sheredy	SAMPLER

ID# (For lab Use Only)	DATE SAMPLED	TIME SAMPLED	SMPL TYPE	SAMPLE IDENTIFICATION/SITE LOCATION	# OF CONT.	Dissolved Copper[1,2] Method EPA 1640 MDL 0.0038 µg/L, RL = 0.01 µg/L									
TS-3-T11	01/04/18	1515	seawater	TS-3-T11	1	X									
TS-3-T12	01/04/18	1729	seawater	TS-3-T12	1	X									
TS-3-T12-REP	01/04/18	1745	seawater	TS-3-T12-REP	1	X									
TS-3-ER	01/03/18	1600	DI	TS-3-ER	1	X									
TS-3-FB	01/04/18	1800	DI	TS-3-FB	1	X									

ANALYSES REQUESTED

SPECIAL HANDLING

- ☐ Same Day Rush 150%
- ☐ 24 Hour Rush 100%
- ☐ 48-72 Hour Rush 75%
- ☐ 4 - 5 Day Rush 30%
- ☐ Rush Extractions 50%
- ☑ 10 Business Days
- ☐ QA/QC Data Package

Charges will apply for weekends/holidays

Method of Shipment:

COMMENTS

RELINQUISHED BY	DATE / TIME	RECEIVED BY
[signature]	1-5-18 4:45	[signature]
[signature]	1-5-18 12:10	[signature] 1-5-18 12:10

SAMPLE CONDITION:

Actual Temperature: 3.1

Received On Ice	Y / N
Preserved	Y / N
Evidence Seals Present	Y / N
Container Intact	Y / N
Preserved at Lab	Y / N

SAMPLE TYPE CODE:
AQ=Aqueous
NA= Non Aqueous
SL = Sludge
DW = Drinking Water
WW = Waste Water
RW = Rain Water
GW = Ground Water
SO = Soil
SW = Solid Waste
OL = Oil
OT = Other Matrix

SPECIAL REQUIREMENTS / BILLING INFORMATION

1) Diss. metals were field filtered using 0.45 um bottletop filt. System. LAB ACTION: PRESERVE IMMEDIATELY.

2) SPIKE level at the following amounts: Copper = 10 ug/L, ~~Zinc = 30 ug/L~~, 3) WECK will contact Amec PM within 24 hours if any sample anomalies are found;

4) Select pages from Amec FW QAPP included for reference.

APPENDIX D
ANALYTICAL REPORTS

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WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Work Orders: 8A05040

Project: SIYB Times Series Study

Attn: Barry Snyder

Client: Amec Foster Wheeler - San Diego 2
9210 Sky Park Court, Suite 200
San Diego, CA 92123

Report Date: 1/19/2018
Received Date: 1/5/2018
Turnaround Time: Normal
Phones: (858) 300-4320
Fax: (858) 300-4301
P.O. #:
Billing Code:

DoD-ELAP #L2457 ● ELAP-CA #1132 ● EPA-UCMR #CA00211 ● Guam-EPA #17-008R ● HW-DOH # ● ISO 17025 #L2457.01 ● LACSD #10143 ● NELAP-OR #4047 ● NJ-DEP #CA015

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. This analytical report must be reproduced in its entirety.

Dear Barry Snyder,

Enclosed are the results of analyses for samples received 1/05/18 with the Chain-of-Custody document. The samples were received in good condition, at 3.1 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Chris Samatmanakit
Project Manager

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Amec Foster Wheeler - San Diego 2
9210 Sky Park Court, Suite 200
San Diego, CA 92123

Project Number: SIYB Times Series Study

Project Manager: Barry Snyder

Reported:
01/19/2018 10:47

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
TS-1-T0	Client	8A05040-01	Water	01/03/18 16:42	
TS-1-T1	Client	8A05040-02	Water	01/03/18 18:50	
TS-1-T2	Client	8A05040-03	Water	01/03/18 21:00	
TS-1-T3	Client	8A05040-04	Water	01/03/18 23:11	
TS-1-T4	Client	8A05040-05	Water	01/04/18 01:00	
TS-1-T5	Client	8A05040-06	Water	01/04/18 03:00	
TS-1-T6	Client	8A05040-07	Water	01/04/18 04:15	
TS-1-T7	Client	8A05040-08	Water	01/04/18 06:20	
TS-1-T8	Client	8A05040-09	Water	01/04/18 08:20	
TS-1-T9	Client	8A05040-10	Water	01/04/18 10:24	
TS-1-T10	Client	8A05040-11	Water	01/04/18 13:00	
TS-1-T11	Client	8A05040-12	Water	01/04/18 15:15	
TS-1-T12	Client	8A05040-13	Water	01/04/18 17:29	
TS-1-T12-REP	Client	8A05040-14	Water	01/04/18 17:39	
TS-1-ER	Client	8A05040-15	Water	01/03/18 16:05	
TS-1-FB	Client	8A05040-16	Water	01/04/18 17:45	
TS-2-T0	Client	8A05040-17	Water	01/03/18 16:42	
TS-2-T1	Client	8A05040-18	Water	01/03/18 18:50	
TS-2-T2	Client	8A05040-19	Water	01/03/18 21:00	
TS-2-T3	Client	8A05040-20	Water	01/03/18 23:11	
TS-2-T4	Client	8A05040-21	Water	01/04/18 01:00	
TS-2-T5	Client	8A05040-22	Water	01/04/18 03:00	
TS-2-T6	Client	8A05040-23	Water	01/04/18 04:15	
TS-2-T7	Client	8A05040-24	Water	01/04/18 06:20	
TS-2-T8	Client	8A05040-25	Water	01/04/18 08:20	
TS-2-T9	Client	8A05040-26	Water	01/04/18 10:24	
TS-2-T10	Client	8A05040-27	Water	01/04/18 13:00	
TS-2-T11	Client	8A05040-28	Water	01/04/18 15:15	
TS-2-T12	Client	8A05040-29	Water	01/04/18 17:29	
TS-2-T12-REP	Client	8A05040-30	Water	01/04/18 17:39	
TS-2-ER	Client	8A05040-31	Water	01/03/18 15:30	
TS-2-FB	Client	8A05040-32	Water	01/04/18 17:50	
TS-3-T0	Client	8A05040-33	Water	01/03/18 16:42	
TS-3-T1	Client	8A05040-34	Water	01/03/18 18:50	
TS-3-T2	Client	8A05040-35	Water	01/03/18 21:00	
TS-3-T3	Client	8A05040-36	Water	01/03/18 23:11	
TS-3-T4	Client	8A05040-37	Water	01/04/18 01:00	
TS-3-T5	Client	8A05040-38	Water	01/04/18 03:00	
TS-3-T6	Client	8A05040-39	Water	01/04/18 04:15	
TS-3-T7	Client	8A05040-40	Water	01/04/18 06:20	
TS-3-T8	Client	8A05040-41	Water	01/04/18 08:20	
TS-3-T9	Client	8A05040-42	Water	01/04/18 10:24	
TS-3-T10	Client	8A05040-43	Water	01/04/18 13:00	
TS-3-T11	Client	8A05040-44	Water	01/04/18 15:15	
TS-3-T12	Client	8A05040-45	Water	01/04/18 17:29	
TS-3-T12-REP	Client	8A05040-46	Water	01/04/18 17:45	

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WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Amec Foster Wheeler - San Diego 2
9210 Sky Park Court, Suite 200
San Diego, CA 92123

Project Number: SIYB Times Series Study

Project Manager: Barry Snyder

Reported:
01/19/2018 10:47

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
TS-3-ER	Client	8A05040-47	Water	01/03/18 16:00	
TS-3-FB	Client	8A05040-48	Water	01/04/18 18:00	

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9210 Sky Park Court, Suite 200
San Diego, CA 92123

Project Number: SIYB Times Series Study

Project Manager: Barry Snyder

Reported: 01/19/2018 10:47

Sample Results

Sample: TS-1-T0 — Sampled: 01/03/18 16:42 by Client

8A05040-01 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0398	**Prepared:** 01/09/18 11:00				**Analyst:** gza
Copper, Dissolved	**9.5**	0.010	ug/l	1	01/10/18 23:42	

Sample: TS-1-T1 — Sampled: 01/03/18 18:50 by Client

8A05040-02 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0398	**Prepared:** 01/09/18 11:00				**Analyst:** gza
Copper, Dissolved	**9.5**	0.010	ug/l	1	01/10/18 23:56	

Sample: TS-1-T2 — Sampled: 01/03/18 21:00 by Client

8A05040-03 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0398	**Prepared:** 01/09/18 11:00				**Analyst:** gza
Copper, Dissolved	**9.1**	0.010	ug/l	1	01/11/18 00:10	

Sample: TS-1-T3 — Sampled: 01/03/18 23:11 by Client

8A05040-04 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0398	**Prepared:** 01/09/18 11:00				**Analyst:** gza
Copper, Dissolved	**9.4**	0.010	ug/l	1	01/11/18 00:23	

Sample: TS-1-T4 — Sampled: 01/04/18 1:00 by Client

8A05040-05 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0398	**Prepared:** 01/09/18 11:00				**Analyst:** gza
Copper, Dissolved	**9.6**	0.010	ug/l	1	01/11/18 00:37	

Sample: TS-1-T5 — Sampled: 01/04/18 3:00 by Client

8A05040-06 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0398	**Prepared:** 01/09/18 11:00				**Analyst:** gza
Copper, Dissolved	**9.3**	0.010	ug/l	1	01/11/18 00:51	

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Project Number: SIYB Times Series Study

Project Manager: Barry Snyder

Reported: 01/19/2018 10:47

Sample Results

(Continued)

Sample: TS-1-T6 — Sampled: 01/04/18 4:15 by Client

8A05040-07 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0398	**Prepared:** 01/09/18 11:00				**Analyst:** gza
Copper, Dissolved	**9.5**	0.010	ug/l	1	01/11/18 01:05	

Sample: TS-1-T7 — Sampled: 01/04/18 6:20 by Client

8A05040-08 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0398	**Prepared:** 01/09/18 11:00				**Analyst:** gza
Copper, Dissolved	**9.0**	0.010	ug/l	1	01/11/18 02:00	

Sample: TS-1-T8 — Sampled: 01/04/18 8:20 by Client

8A05040-09 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0398	**Prepared:** 01/09/18 11:00				**Analyst:** gza
Copper, Dissolved	**8.9**	0.010	ug/l	1	01/11/18 02:13	

Sample: TS-1-T9 — Sampled: 01/04/18 10:24 by Client

8A05040-10 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0398	**Prepared:** 01/09/18 11:00				**Analyst:** gza
Copper, Dissolved	**10**	0.010	ug/l	1	01/11/18 02:27	

Sample: TS-1-T10 — Sampled: 01/04/18 13:00 by Client

8A05040-11 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0398	**Prepared:** 01/09/18 11:00				**Analyst:** gza
Copper, Dissolved	**9.8**	0.010	ug/l	1	01/11/18 02:41	

Sample: TS-1-T11 — Sampled: 01/04/18 15:15 by Client

8A05040-12 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0398	**Prepared:** 01/09/18 11:00				**Analyst:** gza
Copper, Dissolved	**9.9**	0.010	ug/l	1	01/11/18 02:55	

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San Diego, CA 92123

Project Number: SIYB Times Series Study

Project Manager: Barry Snyder

Reported: 01/19/2018 10:47

Sample Results

(Continued)

Sample: TS-1-T12 — Sampled: 01/04/18 17:29 by Client

8A05040-13 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0398	**Prepared:** 01/09/18 11:00				**Analyst:** gza
Copper, Dissolved	**9.9**	0.010	ug/l	1	01/11/18 03:09	

Sample: TS-1-T12-REP — Sampled: 01/04/18 17:39 by Client

8A05040-14 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0398	**Prepared:** 01/09/18 11:00				**Analyst:** gza
Copper, Dissolved	**10**	0.010	ug/l	1	01/11/18 03:22	

Sample: TS-1-ER — Sampled: 01/03/18 16:05 by Client

8A05040-15 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0398	**Prepared:** 01/09/18 11:00				**Analyst:** gza
Copper, Dissolved	**0.059**	0.010	ug/l	1	01/11/18 03:36	

Sample: TS-1-FB — Sampled: 01/04/18 17:45 by Client

8A05040-16 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0398	**Prepared:** 01/09/18 11:00				**Analyst:** gza
Copper, Dissolved	ND	0.010	ug/l	1	01/11/18 03:50	

Sample: TS-2-T0 — Sampled: 01/03/18 16:42 by Client

8A05040-17 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0398	**Prepared:** 01/09/18 11:00				**Analyst:** gza
Copper, Dissolved	**5.5**	0.010	ug/l	1	01/11/18 04:04	

Sample: TS-2-T1 — Sampled: 01/03/18 18:50 by Client

8A05040-18 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0399	**Prepared:** 01/09/18 11:03				**Analyst:** gza
Copper, Dissolved	**6.4**	0.010	ug/l	1	01/11/18 20:35	

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San Diego, CA 92123

Project Number: SIYB Times Series Study

Project Manager: Barry Snyder

Reported: 01/19/2018 10:47

Sample Results

(Continued)

Sample: TS-2-T2 — Sampled: 01/03/18 21:00 by Client

8A05040-19 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640 **Batch ID:** W8A0399 **Prepared:** 01/09/18 11:03 **Analyst:** gza						
Copper, Dissolved	**4.1**	0.010	ug/l	1	01/11/18 20:49	

Sample: TS-2-T3 — Sampled: 01/03/18 23:11 by Client

8A05040-20 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640 **Batch ID:** W8A0399 **Prepared:** 01/09/18 11:03 **Analyst:** gza						
Copper, Dissolved	**5.0**	0.010	ug/l	1	01/11/18 21:03	

Sample: TS-2-T4 — Sampled: 01/04/18 1:00 by Client

8A05040-21 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640 **Batch ID:** W8A0399 **Prepared:** 01/09/18 11:03 **Analyst:** gza						
Copper, Dissolved	**5.7**	0.010	ug/l	1	01/11/18 21:16	

Sample: TS-2-T5 — Sampled: 01/04/18 3:00 by Client

8A05040-22 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640 **Batch ID:** W8A0399 **Prepared:** 01/09/18 11:03 **Analyst:** gza						
Copper, Dissolved	**5.3**	0.010	ug/l	1	01/11/18 21:30	

Sample: TS-2-T6 — Sampled: 01/04/18 4:15 by Client

8A05040-23 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640 **Batch ID:** W8A0399 **Prepared:** 01/09/18 11:03 **Analyst:** gza						
Copper, Dissolved	**5.4**	0.010	ug/l	1	01/11/18 21:44	

Sample: TS-2-T7 — Sampled: 01/04/18 6:20 by Client

8A05040-24 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640 **Batch ID:** W8A0399 **Prepared:** 01/09/18 11:03 **Analyst:** gza						
Copper, Dissolved	**5.5**	0.010	ug/l	1	01/11/18 21:58	

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San Diego, CA 92123

Project Number: SIYB Times Series Study

Project Manager: Barry Snyder

Reported: 01/19/2018 10:47

Sample Results

(Continued)

Sample: TS-2-T8 — Sampled: 01/04/18 8:20 by Client

8A05040-25 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640 **Batch ID:** W8A0399		**Prepared:** 01/09/18 11:03				**Analyst:** gza
Copper, Dissolved	**6.4**	0.010	ug/l	1	01/11/18 22:12	

Sample: TS-2-T9 — Sampled: 01/04/18 10:24 by Client

8A05040-26 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640 **Batch ID:** W8A0399		**Prepared:** 01/09/18 11:03				**Analyst:** gza
Copper, Dissolved	**2.0**	0.010	ug/l	1	01/11/18 22:25	

Sample: TS-2-T10 — Sampled: 01/04/18 13:00 by Client

8A05040-27 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640 **Batch ID:** W8A0399		**Prepared:** 01/09/18 11:03				**Analyst:** gza
Copper, Dissolved	**6.2**	0.010	ug/l	1	01/11/18 22:39	

Sample: TS-2-T11 — Sampled: 01/04/18 15:15 by Client

8A05040-28 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640 **Batch ID:** W8A0399		**Prepared:** 01/09/18 11:03				**Analyst:** gza
Copper, Dissolved	**6.6**	0.010	ug/l	1	01/11/18 23:34	

Sample: TS-2-T12 — Sampled: 01/04/18 17:29 by Client

8A05040-29 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640 **Batch ID:** W8A0399		**Prepared:** 01/09/18 11:03				**Analyst:** gza
Copper, Dissolved	**7.1**	0.010	ug/l	1	01/11/18 23:48	

Sample: TS-2-T12-REP — Sampled: 01/04/18 17:39 by Client

8A05040-30 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640 **Batch ID:** W8A0399		**Prepared:** 01/09/18 11:03				**Analyst:** gza
Copper, Dissolved	**7.0**	0.010	ug/l	1	01/12/18 00:02	

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San Diego, CA 92123

Project Number: SIYB Times Series Study

Project Manager: Barry Snyder

Reported:
01/19/2018 10:47

Sample Results

(Continued)

Sample: TS-2-ER — Sampled: 01/03/18 15:30 by Client

8A05040-31 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0399	**Prepared:** 01/09/18 11:03				**Analyst:** gza
Copper, Dissolved	**0.025**	0.010	ug/l	1	01/12/18 00:15	

Sample: TS-2-FB — Sampled: 01/04/18 17:50 by Client

8A05040-32 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0399	**Prepared:** 01/09/18 11:03				**Analyst:** gza
Copper, Dissolved	**0.023**	0.010	ug/l	1	01/12/18 00:29	

Sample: TS-3-T0 — Sampled: 01/03/18 16:42 by Client

8A05040-33 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0399	**Prepared:** 01/09/18 11:03				**Analyst:** gza
Copper, Dissolved	**2.7**	0.010	ug/l	1	01/12/18 00:43	

Sample: TS-3-T1 — Sampled: 01/03/18 18:50 by Client

8A05040-34 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0399	**Prepared:** 01/09/18 11:03				**Analyst:** gza
Copper, Dissolved	**3.2**	0.010	ug/l	1	01/12/18 00:57	

Sample: TS-3-T2 — Sampled: 01/03/18 21:00 by Client

8A05040-35 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0399	**Prepared:** 01/09/18 11:03				**Analyst:** gza
Copper, Dissolved	**4.1**	0.010	ug/l	1	01/12/18 01:10	

Sample: TS-3-T3 — Sampled: 01/03/18 23:11 by Client

8A05040-36 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0399	**Prepared:** 01/09/18 11:03				**Analyst:** gza
Copper, Dissolved	**4.8**	0.010	ug/l	1	01/12/18 01:24	

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Project Number: SIYB Times Series Study

Project Manager: Barry Snyder

Reported: 01/19/2018 10:47

Sample Results

(Continued)

Sample: TS-3-T4 — Sampled: 01/04/18 1:00 by Client

8A05040-37 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0399	**Prepared:** 01/09/18 11:03				**Analyst:** gza
Copper, Dissolved	**3.5**	0.010	ug/l	1	01/12/18 01:38	

Sample: TS-3-T5 — Sampled: 01/04/18 3:00 by Client

8A05040-38 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0400	**Prepared:** 01/09/18 11:04				**Analyst:** gza
Copper, Dissolved	**4.1**	0.010	ug/l	1	01/11/18 06:21	

Sample: TS-3-T6 — Sampled: 01/04/18 4:15 by Client

8A05040-39 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0400	**Prepared:** 01/09/18 11:04				**Analyst:** gza
Copper, Dissolved	**3.9**	0.010	ug/l	1	01/11/18 06:35	

Sample: TS-3-T7 — Sampled: 01/04/18 6:20 by Client

8A05040-40 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0400	**Prepared:** 01/09/18 11:04				**Analyst:** gza
Copper, Dissolved	**2.1**	0.010	ug/l	1	01/11/18 06:49	

Sample: TS-3-T8 — Sampled: 01/04/18 8:20 by Client

8A05040-41 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0400	**Prepared:** 01/09/18 11:04				**Analyst:** gza
Copper, Dissolved	**1.2**	0.010	ug/l	1	01/11/18 07:03	

Sample: TS-3-T9 — Sampled: 01/04/18 10:24 by Client

8A05040-42 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640	**Batch ID:** W8A0400	**Prepared:** 01/09/18 11:04				**Analyst:** gza
Copper, Dissolved	**1.0**	0.010	ug/l	1	01/11/18 07:58	

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Project Manager: Barry Snyder

Reported: 01/19/2018 10:47

Sample Results

(Continued)

Sample: TS-3-T10 — Sampled: 01/04/18 13:00 by Client

8A05040-43 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640 **Batch ID:** W8A0400 **Prepared:** 01/09/18 11:04 **Analyst:** gza						
Copper, Dissolved	**1.4**	0.010	ug/l	1	01/11/18 08:12	

Sample: TS-3-T11 — Sampled: 01/04/18 15:15 by Client

8A05040-44 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640 **Batch ID:** W8A0400 **Prepared:** 01/09/18 11:04 **Analyst:** gza						
Copper, Dissolved	**3.0**	0.010	ug/l	1	01/11/18 08:25	

Sample: TS-3-T12 — Sampled: 01/04/18 17:29 by Client

8A05040-45 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640 **Batch ID:** W8A0400 **Prepared:** 01/09/18 11:04 **Analyst:** gza						
Copper, Dissolved	**3.9**	0.010	ug/l	1	01/11/18 08:39	

Sample: TS-3-T12-REP — Sampled: 01/04/18 17:45 by Client

8A05040-46 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640 **Batch ID:** W8A0400 **Prepared:** 01/09/18 11:04 **Analyst:** gza						
Copper, Dissolved	**3.9**	0.010	ug/l	1	01/11/18 08:53	

Sample: TS-3-ER — Sampled: 01/03/18 16:00 by Client

8A05040-47 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640 **Batch ID:** W8A0400 **Prepared:** 01/09/18 11:04 **Analyst:** gza						
Copper, Dissolved	**0.044**	0.010	ug/l	1	01/11/18 09:07	

Sample: TS-3-FB — Sampled: 01/04/18 18:00 by Client

8A05040-48 (Water)

Analyte	Result	MRL	Units	Dil	Analyzed	Qualifier
Metals - Low Level by 1600 Series Methods						
Method: EPA 1640 **Batch ID:** W8A0400 **Prepared:** 01/09/18 11:04 **Analyst:** gza						
Copper, Dissolved	**0.028**	0.010	ug/l	1	01/11/18 09:20	

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Project Number: SIYB Times Series Study

Project Manager: Barry Snyder

Reported: 01/19/2018 10:47

Quality Control Results

Metals - Low Level by 1600 Series Methods

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W8A0398 - EPA 1640										
Blank (W8A0398-BLK1)				**Prepared: 01/09/18**	**Analyzed: 01/10/18**					
Copper, Dissolved	ND	0.010	ug/l							
LCS (W8A0398-BS1)				**Prepared: 01/09/18**	**Analyzed: 01/10/18**					
Copper, Dissolved	10.1	0.010	ug/l	10.0		101	70-130			
Matrix Spike (W8A0398-MS1)	**Source: 8A05040-01**			**Prepared: 01/09/18**	**Analyzed: 01/10/18**					
Copper, Dissolved	19.5	0.010	ug/l	10.0	9.52	100	70-130			
Matrix Spike (W8A0398-MS2)	**Source: 8A05040-02**			**Prepared: 01/09/18**	**Analyzed: 01/10/18**					
Copper, Dissolved	18.9	0.010	ug/l	10.0	9.45	95	70-130			
Matrix Spike Dup (W8A0398-MSD1)	**Source: 8A05040-01**			**Prepared: 01/09/18**	**Analyzed: 01/10/18**					
Copper, Dissolved	19.7	0.010	ug/l	10.0	9.52	102	70-130	1	30	
Matrix Spike Dup (W8A0398-MSD2)	**Source: 8A05040-02**			**Prepared: 01/09/18**	**Analyzed: 01/10/18**					
Copper, Dissolved	19.0	0.010	ug/l	10.0	9.45	95	70-130	0.3	30	
Batch: W8A0399 - EPA 1640										
Blank (W8A0399-BLK1)				**Prepared: 01/09/18**	**Analyzed: 01/11/18**					
Copper, Dissolved	ND	0.010	ug/l							
LCS (W8A0399-BS1)				**Prepared: 01/09/18**	**Analyzed: 01/11/18**					
Copper, Dissolved	9.89	0.010	ug/l	10.0		99	70-130			
Matrix Spike (W8A0399-MS1)	**Source: 8A05040-18**			**Prepared: 01/09/18**	**Analyzed: 01/11/18**					
Copper, Dissolved	15.6	0.010	ug/l	10.0	6.37	92	70-130			
Matrix Spike (W8A0399-MS2)	**Source: 8A05040-19**			**Prepared: 01/09/18**	**Analyzed: 01/11/18**					
Copper, Dissolved	13.8	0.010	ug/l	10.0	4.11	97	70-130			
Matrix Spike Dup (W8A0399-MSD1)	**Source: 8A05040-18**			**Prepared: 01/09/18**	**Analyzed: 01/11/18**					
Copper, Dissolved	16.1	0.010	ug/l	10.0	6.37	98	70-130	4	30	
Matrix Spike Dup (W8A0399-MSD2)	**Source: 8A05040-19**			**Prepared: 01/09/18**	**Analyzed: 01/11/18**					
Copper, Dissolved	14.1	0.010	ug/l	10.0	4.11	100	70-130	2	30	
Batch: W8A0400 - EPA 1640										
Blank (W8A0400-BLK1)				**Prepared: 01/09/18**	**Analyzed: 01/11/18**					
Copper, Dissolved	ND	0.010	ug/l							
LCS (W8A0400-BS1)				**Prepared: 01/09/18**	**Analyzed: 01/11/18**					
Copper, Dissolved	10.9	0.010	ug/l	10.0		109	70-130			
Matrix Spike (W8A0400-MS1)	**Source: 8A05040-38**			**Prepared: 01/09/18**	**Analyzed: 01/11/18**					
Copper, Dissolved	14.8	0.010	ug/l	10.0	4.14	107	70-130			
Matrix Spike (W8A0400-MS2)	**Source: 8A05040-39**			**Prepared: 01/09/18**	**Analyzed: 01/11/18**					
Copper, Dissolved	14.1	0.010	ug/l	10.0	3.92	102	70-130			
Matrix Spike Dup (W8A0400-MSD1)	**Source: 8A05040-38**			**Prepared: 01/09/18**	**Analyzed: 01/11/18**					
Copper, Dissolved	15.0	0.010	ug/l	10.0	4.14	108	70-130	1	30	
Matrix Spike Dup (W8A0400-MSD2)	**Source: 8A05040-39**			**Prepared: 01/09/18**	**Analyzed: 01/11/18**					

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Project Number: SIYB Times Series Study

Project Manager: Barry Snyder

Reported:
01/19/2018 10:47

Quality Control Results

(Continued)

Metals - Low Level by 1600 Series Methods (Continued)

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W8A0400 - EPA 1640 (Continued)										
Matrix Spike Dup (W8A0400-MSD2)	**Source: 8A05040-39**			**Prepared: 01/09/18**	**Analyzed: 01/11/18**					
Copper, Dissolved	14.8	0.010	ug/l	10.0	3.92	109	70-130	5	30	

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Reported:
01/19/2018 10:47

Notes and Definitions

Item	Definition
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
Dil	Dilution
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
% Rec	Percent Recovery
Source	Sample that was matrix spiked or duplicated.
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ) and Detection Limit for Reporting (DLR)
MDA	Minimum Detectable Activity
NR	Not Reportable
TIC	Tentatively Identified Compound (TIC) using mass spectrometry. The reported concentration is relative concentration based on the nearest internal standard. If the library search produces no matches at, or above 85%, the compound is reported as unknown.

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.
An Absence of Total Coliform meets the drinking water standards as established by the California State Water Resources Control Board (SWRCB)
All results are expressed on wet weight basis unless otherwise specified.
All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS 002.

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APPENDIX E
FIELD DATA FORMS

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PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-1-ER

Date: (mm/dd/yyyy) 01/03/2018

Time Started: (hh:mm) ~~15:45~~ 1605 Ended: (hh:mm) 16:20

GPS: (WGS84) Lat. NA Long. NA

Tide (ft): -1.4ft

Weather conditions: Overcast, cool

Wind (none, light, moderate, heavy): Light

Sea State Conditions (calm, ripples, small waves) Calm

Physical Water Quality Measurements

Time of collection: 16:05	pH	Salinity (ppt)	Temperature (°C)
Measurement:	NA	NA	NA

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-1-T0

Date: (mm/dd/yyyy) 01/03/2018

Time Started: (hh:mm) 16:40 Ended: (hh:mm) 17:05

GPS: (WGS84) Lat. 32.71866 Long. -117.226077

Tide (ft): -1.9 ft

Weather conditions: overcast, cool

Wind (none, light, moderate, heavy): none

Sea State Conditions (calm, ripples, small waves) calm

Physical Water Quality Measurements

Time of collection: 16:42	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.05	~~34.93~~ 33.27	16.32

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

CONDUCTIVITY ~~5274~~ 49447 mg/l ~~cm~~ 49447 uS/cm Specific

Notes:

Vessel ~60ft away turned on engine, bilge, drained water. Fumes

Vessel ~20ft away

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-1-T1

Date: (mm/dd/yyyy) 01/03/2018

Time Started: (hh:mm) 18:47 Ended: (hh:mm) 19:13

GPS: (WGS84) Lat. 32.718666 Long. -117.226079

Tide (ft): -0.1

Weather conditions: overcast, cool

Wind (none, light, moderate, heavy): none

Sea State Conditions (calm, ripples, small waves) Calm

Physical Water Quality Measurements

Time of collection: 18:50	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.26	~~34.95~~ 33.69	16.2

COND mg/cm ~~44033~~

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

Vessel ~20ft away w/ bilge

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-1-T2

Date: (mm/dd/yyyy) 01/03/2018

Time Started: (hh:mm) 20:58 Ended: (hh:mm) 21:22

GPS: (WGS84) Lat. 32.71866 Long. -117.226077

Tide (ft): 3.0 ft ↑

Weather conditions: overcast, cool

Wind (none, light, moderate, heavy): none

Sea State Conditions (calm, ripples, small waves) calm

Physical Water Quality Measurements

Time of collection: 21:00	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.26	35.02	16.13

COND 49965 33.69

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

Vessel ~20ft away

* "scummy" water on sampling area, slight film w/ floating trash scattered ~30ft radius around area

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-1-T3

Date: (mm/dd/yyyy) 01/03/2018

Time Started: (hh:mm) 23:09 Ended: (hh:mm) 23:32

GPS: (WGS84) Lat. 32.718666 Long. -117.226077

Tide (ft): 4.7 ft

Weather conditions: partially overcast, cool

Wind (none, light, moderate, heavy): none

Sea State Conditions (calm, ripples, small waves) calm

Physical Water Quality Measurements

Time of collection: 23:11	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.29	35.02	16.07

COND
43997
33.61

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

water clear again, no noticable films, etc on surface.

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: T5 - 1 - T4

Date: (mm/dd/yyyy) 01/04/2018

Time Started: (hh:mm) 00:58 Ended: (hh:mm) 01:26

GPS: (WGS84) Lat. 32.71026 Long. -117.23499

Tide (ft): +3.6 ↓

Weather conditions: clear, cool

Wind (none, light, moderate, heavy): none

Sea State Conditions (calm, ripples, small waves) calm

Physical Water Quality Measurements

Time of collection: 01:00	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.34	~~34.99~~ 33.65	16.03

COND 47392

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

Water calm. no particulates seen on top of water. small film/sheen on surface @ sample site.

boat ~20ft bilge started during sampling event

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS - 1 - TS

Date: (mm/dd/yyyy) 01/04/2018

Time Started: (hh:mm) 02:58 Ended: (hh:mm) 03:18

GPS: (WGS84) Lat. 32.71026 Long. -117.23499

Tide (ft): 1.9 ft ↓

Weather conditions: clear, cool

Wind (none, light, moderate, heavy): none

Sea State Conditions (calm, ripples, small waves) calm

Physical Water Quality Measurements

Time of collection: 0301	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.35	~~35.01~~ 33.63	16.00

COND ~~43919~~

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

Some particulates (foam & vegetative debris) on surface.

Vessel bilge running ~20ft away.

observed little condensation in filter bottle when opened & no liquid on bottom

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-1-T6

Date: (mm/dd/yyyy) 1/4/2018

Time Started: (hh:mm) 04:13 Ended: (hh:mm) 04:40

GPS: (WGS84) Lat. 32.718666 Long. -117.226077

Tide (ft): 1.6 ft

Weather conditions: clear, cool

Wind (none, light, moderate, heavy): none

Sea State Conditions (calm, ripples, small waves) calm

Physical Water Quality Measurements

Time of collection: 0415	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.34	35.00	15.99

COND
~~43.902~~ 33.67

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

Few particles (trash & vegetative debris) on surface.

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-1-T7

Date: (mm/dd/yyyy) 1/4/2018

Time Started: (hh:mm) 06:20 Ended: (hh:mm) 6:30

GPS: (WGS84) Lat. 32.718666 Long. -117.226077

Tide (ft): +2.7

Weather conditions: slightly hazy, clear overhead

Wind (none, light, moderate, heavy): none

Sea State Conditions (calm, ripples, small waves) calm

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.4	~~35~~ 33.72	15.91

~~COND~~ 4 ~~38~~ 15

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

Few particles (trash + vegetative debris) on surface.
Sail boat moored near site on south side of dock

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-1-T8

Date: (mm/dd/yyyy) 01/04/2018

Time Started: (hh:mm) 0820 Ended: (hh:mm) 0829

GPS: (WGS84) Lat. 32.71866 Long. -117.226073

Tide (ft): 5.2 ft

Weather conditions: Sunny, slightly hazy, calm

Wind (none, light, moderate, heavy): none

Sea State Conditions (calm, ripples, small waves) Calm

Physical Water Quality Measurements

Time of collection: 0820	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.49	~~35~~ 33.64	15.92

COND ~~45,787~~

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

Some paint specks in water near meter.

50-ft yacht came in for fuel ~ 0830, after samples + pH were pulled.

minimal debris in filter.

Same boats moored overnight on South side of dock

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-1-T9

Date: (mm/dd/yyyy) 01/04/2018

Time Started: (hh:mm) 1024 Ended: (hh:mm) 1036

GPS: (WGS84) Lat. 32.71866 Long. -117.226077

Tide (ft): 6.4 ft

Weather conditions: sunny, slightly hazy

Wind (none, light, moderate, heavy): none

Sea State Conditions (calm, ripples, small waves) calm

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.17	~~35~~ 33.69	16.018

COND ~~44155~~

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

Boat leaving dock @ 1020
Same boats moored overnight on south side of dock
Minor vegetative debris on water surface

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-1-T11

Date: (mm/dd/yyyy) 01/04/18

Time Started: (hh:mm) 1515 Ended: (hh:mm) 1525

GPS: (WGS84) Lat. 32.71866 Long. -117.226077

Tide (ft): -0.5 ft. ↓

Weather conditions: sunny, mostly clear

Wind (none, light, moderate, heavy): moderate wind

Sea State Conditions (calm, ripples, small waves) ripples

Physical Water Quality Measurements

Time of collection: 1525	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.45	~~35~~ 33.71	16.39

COND ~~44,419~~

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

Same boats moored on south side.
one small boat leaving dock@1310
one boat came in for fuel @ 1315

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-1-T12

Date: (mm/dd/yyyy) 01/04/2018

Time Started: (hh:mm) 1729 Ended: (hh:mm) 1735

GPS: (WGS84) Lat. 32.718606 Long. -117.226077

Tide (ft): -1.3 ft

Weather conditions: clear, dark

Wind (none, light, moderate, heavy): light

Sea State Conditions (calm, ripples, small waves) calm

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.52	~~34.53~~ 33.57	16.34

COND ~~47.310~~

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

same boat moored @ south side
@ large boat on N. side of Right finger fueling

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-1-T12-REP

Date: (mm/dd/yyyy) 01/04/2018

Time Started: (hh:mm) 1739 Ended: (hh:mm)

GPS: (WGS84) Lat. 32.71866 Long. -117.226079

Tide (ft): -1.3 ft

Weather conditions: clear, dark

Wind (none, light, moderate, heavy): light

Sea State Conditions (calm, ripples, small waves) calm

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.47	~~35.08~~ 33.63	16.31

COND ~~44,296~~

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

Same boat Moored @ south side
large boat on N. side of right finger for fueling

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-1-FB

Date: (mm/dd/yyyy) 01/04/2018

Time Started: (hh:mm) ~~1729~~ 1745 Ended: (hh:mm)

GPS: (WGS84) Lat. NA Long. NA

Tide (ft): +1.3 ft

Weather conditions: clear, dark

Wind (none, light, moderate, heavy): light

Sea State Conditions (calm, ripples, small waves) calm

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	NA	NA	NA

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-1-T10

Date: (mm/dd/yyyy) 01/04/18

Time Started: (hh:mm) 1300 Ended: (hh:mm) 1310

GPS: (WGS84) Lat. 32.71866 Long. -117.226077

Tide (ft): 5 ft. ↓

Weather conditions: Sunny, mostly clear

Wind (none, light, moderate, heavy): light breeze

Sea State Conditions (calm, ripples, small waves) ripples

Physical Water Quality Measurements

Time of collection: 1310	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.28	35	16.24

COND
~~47,248~~ 33.70

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

Same boats moored on south side
hull cleaning approx. 50 yds west.
oil slicks seen in water ~ 1200
large yacht in for fueling ~ 1305

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-2-ER

Date: (mm/dd/yyyy) 1/31/2018.

Time Started: (hh:mm) 1530 Ended: (hh:mm) 1610

GPS: (WGS84) Lat. 32.71575 Long. -117.22977

Tide (ft):

Weather conditions: overcast, fog rolling in

Wind (none, light, moderate, heavy): moderate to light

Sea State Conditions (calm, ripples, small waves) small ripples

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	NA	NA	NA

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

Heavy fog layer rolling in. Tied off at Buoy "A" at La Playa anchorage.

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-2-T0

Date: (mm/dd/yyyy) 1/3/18

Time Started: (hh:mm) 1642 Ended: (hh:mm) 1651

GPS: (WGS84) Lat. 32.71575 Long. -117.22977

Tide (ft):

Weather conditions: overcast foggy rolling in

Wind (none, light, moderate, heavy): light

Sea State Conditions (calm, ripples, small waves) calm

conductivity 46.08 MS/cm

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.02	33.9	16.07

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes: 33.67

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-2-T1

Date: (mm/dd/yyyy) 1/3/18

Time Started: (hh:mm) 1850 Ended: (hh:mm) 1900

GPS: (WGS84) Lat. 32.71575 Long. -117.2297

Tide (ft):

Weather conditions: clouds, light breeze

Wind (none, light, moderate, heavy): light

Sea State Conditions (calm, ripples, small waves) calm

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.21	~~36.95~~ 33.57	15.93

COND ~~46009~~

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-2-T2

Date: (mm/dd/yyyy) 1/3/18

Time Started: (hh:mm) 2100 Ended: (hh:mm) 2111

GPS: (WGS84) Lat. 32.71573 Long. -117.22977

Tide (ft):

Weather conditions: Overcast, cold

Wind (none, light, moderate, heavy): none

Sea State Conditions (calm, ripples, small waves) calm

conductivity 45825

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.12	~~30.89~~ 33.63	15.82

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-2-T3

Date: (mm/dd/yyyy) 1/3/18

Time Started: (hh:mm) 2311 Ended: (hh:mm) 2320

GPS: (WGS84) Lat. 32.71575 Long. -117.22972

Tide (ft):

Weather conditions: Overcast, cold

Wind (none, light, moderate, heavy): none

Sea State Conditions (calm, ripples, small waves) calm

~~Conductivity~~ 45889

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.27	~~37.02~~	15.74

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes: 33.65

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-2-4

Date: (mm/dd/yyyy) 1/4/18

Time Started: (hh:mm) 100 Ended: (hh:mm) 1:09

GPS: (WGS84) Lat. 32.71595 Long. 117.22977

Tide (ft):

Weather conditions: clear, cold

Wind (none, light, moderate, heavy): light

Sea State Conditions (calm, ripples, small waves) calm

Conductivity 45943

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.28	~~37.09~~ 33.66	15.72

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-2-S

Date: (mm/dd/yyyy) 1/4/18

Time Started: (hh:mm) 300 Ended: (hh:mm) 309

GPS: (WGS84) Lat. 32.7157 S Long. 117.22977

Tide (ft):

Weather conditions: clear, cold

Wind (none, light, moderate, heavy): none

Sea State Conditions (calm, ripples, small waves) calm

(~~Conductivity~~ 45910)

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.25	~~37.06~~ 33.70	15.69

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-2-6

Date: (mm/dd/yyyy) 1/4/18

Time Started: (hh:mm) 0415 Ended: (hh:mm) 425

GPS: (WGS84) Lat. 32.71575 Long. -117.2297

Tide (ft):

Weather conditions: cold, clear

Wind (none, light, moderate, heavy): light

Sea State Conditions (calm, ripples, small waves) calm

Conductivity
45866

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.30	~~37.04~~ 33.69	15.67

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-2-T7

Date: (mm/dd/yyyy) 1/4/18

Time Started: (hh:mm) 0620 Ended: (hh:mm) 0624

GPS: (WGS84) Lat. 32.71575 Long. -117.22977

Tide (ft): well fill this in later :)

Weather conditions: calm, clear

Wind (none, light, moderate, heavy): none

Sea State Conditions (calm, ripples, small waves) calm

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.26	~~37.05~~ 33.75	15.63

conduct- ~~44.884~~

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-2-T8

Date: (mm/dd/yyyy) 1/4/18

Time Started: (hh:mm) 0820 Ended: (hh:mm) 8:33

GPS: (WGS84) Lat. 32.715~~78~~ Long. -117.229~~70~~

Tide (ft): + 5.2 ft

Weather conditions: sunny, clear

Wind (none, light, moderate, heavy): none

Sea State Conditions (calm, ripples, small waves) Calm

Physical Water Quality Measurements

Time of collection: 0820	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.36	~~36.92~~ 33.85	15.74

Conduct 45783

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-2-T9

Date: (mm/dd/yyyy) 1/4/18

Time Started: (hh:mm) 10:27 Ended: (hh:mm) 10:36

GPS: (WGS84) Lat. 32.715350 Long. -117.224770

Tide (ft): + 6.4

Weather conditions: Sunny, clear

Wind (none, light, moderate, heavy): none

Sea State Conditions (calm, ripples, small waves) calm

Physical Water Quality Measurements

Time of collection: 1038	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.32	~~36.90~~ 33.41	16.14

conduct ~~46204~~

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

30min prior to sampling - slick from topside boat wash came thru, no obvious slick during sampling

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-2-T10

Date: (mm/dd/yyyy) 1/4/18

Time Started: (hh:mm) 1300 Ended: (hh:mm) 1312

GPS: (WGS84) Lat. 32.715778 Long. -117.229770

Tide (ft): 5.0

Weather conditions: Sunny clear

Wind (none, light, moderate, heavy): moderate N wind

Sea State Conditions (calm, ripples, small waves) small ripples

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.17	~~56.92~~ 33.78	16.15

conduct ~~46200~~

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-2-T11

Date: (mm/dd/yyyy) 1/4/18

Time Started: (hh:mm) 15:15 Ended: (hh:mm) 1523

GPS: (WGS84) Lat. 32.715745 Long. -117.229770

Tide (ft): -0.5 ↓

Weather conditions: sunny clear

Wind (none, light, moderate, heavy): light/mod N wind

Sea State Conditions (calm, ripples, small waves) small ripples

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.15	~~36.91~~	16.07

Conduct ~~46187~~ 3354

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-2-T12

Date: (mm/dd/yyyy) 1/4/18

Time Started: (hh:mm) 1729 Ended: (hh:mm) 1738

GPS: (WGS84) Lat. 32.71575 Long. -117225~~3~~0

Tide (ft): -1.4 ft

Weather conditions: twilight.

Wind (none, light, moderate, heavy): none

Sea State Conditions (calm, ripples, small waves) calm

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:			

conduct

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-2-T12-REP

Date: (mm/dd/yyyy) 1/4/18

Time Started: (hh:mm) 1739 Ended: (hh:mm) 1749

GPS: (WGS84) Lat. 32.71525 Long. -117.229770

Tide (ft): -1.3 ft

Weather conditions: Twilight

Wind (none, light, moderate, heavy): none

Sea State Conditions (calm, ripples, small waves) Calm

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)	~~Conduct~~ 46041
Measurement:	8.10	~~36.88~~ 33.43	15.99	

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-2-FB

Date: (mm/dd/yyyy) 1/4/18

Time Started: (hh:mm) 1750 Ended: (hh:mm) 1755

GPS: (WGS84) Lat. NA Long. NA

Tide (ft): :

Weather conditions:

Wind (none, light, moderate, heavy):

Sea State Conditions (calm, ripples, small waves)

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	NA	NA	NA

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-3-ER

Date: (mm/dd/yyyy) 01/03/2018

Time Started: (hh:mm) 1600 Ended: (hh:mm) 1618

GPS: (WGS84) Lat. NA Long. NA

Tide (ft): -1.69' Falling

Weather conditions: Overcast ~~Wind >5mph~~

Wind (none, light, moderate, heavy): moderate to light

Sea State Conditions (calm, ripples, small waves) Ripples (wind)

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	NA	NA	NA

CONDUCTIVITY (mg)(m)

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-3-TD

Date: (mm/dd/yyyy) 01/03/18

Time Started: (hh:mm) 1642 Ended: (hh:mm) 1708

GPS: (WGS84) Lat. 32.74026 Long. -117.23449

Tide (ft): -1.9 feet Low tide

Weather conditions: overcast

Wind (none, light, moderate, heavy): None

Sea State Conditions (calm, ripples, small waves) calm

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.08	~~33.29~~ 33.54	15.99

Std. CONDUCT. ~~49,152~~ mS/cm Std.

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes: pilot Boat left slip PB2 ~ 1635
engine smell dissipating / No influence at time of sampling

minimal localized foam bubbles, pressure washing of boat on Dock 1, 7B spot in (2 spots per finger - ~~per side~~)
~ 1710 - 1730.
1730 Pilot Boat leaves

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-3-T1

Date: (mm/dd/yyyy) 1/3/18

Time Started: (hh:mm) 1850 Ended: (hh:mm) 1905

GPS: (WGS84) Lat. 32.71026 Long. -117.23449

Tide (ft): +0.03 Rising

Weather conditions: overcast/cloudy

Wind (none, light, moderate, heavy): None

Sea State Conditions (calm, ripples, small waves) Calm

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.12	~~35.28~~ 33.62	15.93

CONDUCT. 44150

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-3-T2

Date: (mm/dd/yyyy) 1/3/18

Time Started: (hh:mm) 2100 Ended: (hh:mm) 2115

GPS: (WGS84) Lat. 32.71026 Long. -117 23.449

Tide (ft): +3.1 Rising

Weather conditions: clear / semi Overcast

Wind (none, light, moderate, heavy): None

Sea State Conditions (calm, ripples, small waves) Calm

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.10	~~35~~ 29	15.92

57.2 CONDUCT ~~44,744~~ /cm

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes: No nearby activity. 33.67

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-3-T3

Date: (mm/dd/yyyy) 1/3/18

Time Started: (hh:mm) 2311 Ended: (hh:mm) 2325

GPS: (WGS84) Lat. 32.71026 Long. -117.23449

Tide (ft): +4.7 MSL tide

Weather conditions: Clear / some overcast

Wind (none, light, moderate, heavy): None

Sea State Conditions (calm, ripples, small waves) Calm

Physical Water Quality Measurements

33.70

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.11	~~35.28~~	15.92

CONDUCT ~~44.137~~

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes: No nearby activity.

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-3-T4

Date: (mm/dd/yyyy) 01/04/18

Time Started: (hh:mm) 0100 Ended: (hh:mm) 0111

GPS: (WGS84) Lat. 32.71026 Long. -117.23949

Tide (ft): +3.54 Falling

Weather conditions: Clear

Wind (none, light, moderate, heavy): None

Sea State Conditions (calm, ripples, small waves) Calm

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.12	~~35.29~~ 33.68	15.88

CONDUCT ~~44,107~~

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes: No Nearby Activity

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-3 -T5

Date: (mm/dd/yyyy) 01/04/18

Time Started: (hh:mm) 0300 Ended: (hh:mm) 0310

GPS: (WGS84) Lat. 32. 71020 Long. -117 23449

Tide (ft): +1.96 Falling

Weather conditions: Clear

Wind (none, light, moderate, heavy): None

Sea State Conditions (calm, ripples, small waves) Calm

Physical Water Quality Measurements 33.68

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.13	~~35.30~~	15.85

CONDUCT ~~44.083~~

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes: No activity Nearby

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-3-T6

Date: (mm/dd/yyyy) 01/04/18

Time Started: (hh:mm) 0415 Ended: (hh:mm) 0430

GPS: (WGS84) Lat. 32.71026 Long. -117.23499

Tide (ft): +1.6' Low tide

Weather conditions: clear

Wind (none, light, moderate, heavy): None

Sea State Conditions (calm, ripples, small waves) calm

Physical Water Quality Measurements 33.67

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.13	~~35.28~~	15.84

CONDUCT ~~777, 0~~

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes: No Nearby activity

Some scum/sheen (organic?) drifting by / at sample.

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-3-T7

Date: (mm/dd/yyyy) 1/4/18

Time Started: (hh:mm) 0620 Ended: (hh:mm) 0640

GPS: (WGS84) Lat. 32.71026 Long. -117.23469

Tide (ft): +2.7

Weather conditions: Clear,

Wind (none, light, moderate, heavy): Light

Sea State Conditions (calm, ripples, small waves) Calm

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.15	~~35.23~~ 33.57	15.83

CONDUCT ~~49963~~

*Water quality measured at the same depth as sample collection (I.e. within 1 meter from the surface).

Notes:

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-3-T8

Date: (mm/dd/yyyy) 1/4/18

Time Started: (hh:mm) 0820 Ended: (hh:mm) 0835

GPS: (WGS84) Lat. 32.71026 Long. -117.23449

Tide (ft): +5.2

Weather conditions: Clear

Wind (none, light, moderate, heavy): Light

Sea State Conditions (calm, ripples, small waves) Calm

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.16	~~35.21~~ 33.59	15.81 ~~15.95~~ CONDUCT

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-3-T9

Date: (mm/dd/yyyy) 1/4/18

Time Started: (hh:mm) 1024 Ended: (hh:mm) 1036

GPS: (WGS84) Lat. 32. 71026 Long. -117 23449

Tide (ft): +6.4

Weather conditions: Clear

Wind (none, light, moderate, heavy): None

Sea State Conditions (calm, ripples, small waves) Calm

Physical Water Quality Measurements 33.56

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.04	~~33.80~~	15.89

CONDUCT 47067

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-3-T10

Date: (mm/dd/yyyy) 01/04/2018

Time Started: (hh:mm) 12:55 Ended: (hh:mm) 13:11

GPS: (WGS84) Lat. 32 71026 Long. -117 23449

Tide (ft): +5.0 ↓

Weather conditions: Clear

Wind (none, light, moderate, heavy): Moderate North West

Sea State Conditions (calm, ripples, small waves) Ripples

Physical Water Quality Measurements

Time of collection: 1310	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.10	~~35.19~~ 33.58	16.12

CONDUCT ~~49236~~

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-3-T11

Date: (mm/dd/yyyy) 01/04/2018

Time Started: (hh:mm) 15:13 Ended: (hh:mm) 15:24

GPS: (WGS84) Lat. 32.71026 Long. -117 23449

Tide (ft): -0.5 ft

Weather conditions: Clear

Wind (none, light, moderate, heavy): Moderate NW

Sea State Conditions (calm, ripples, small waves) Ripples

Physical Water Quality Measurements

Time of collection: 1524	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.16	~~35.22~~ 33.69	16.16

CONDUCT 44307

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-3-T12

Date: (mm/dd/yyyy) 01/04/2018

Time Started: (hh:mm) 1725 Ended: (hh:mm) 1740

GPS: (WGS84) Lat. 32.710126 Long. -117.23449

Tide (ft): -1.4

Weather conditions: Clear

Wind (none, light, moderate, heavy): light

Sea State Conditions (calm, ripples, small waves) Calm

Physical Water Quality Measurements

Time of collection: 1726	pH	Salinity (ppt)	Temperature (°C)
Measurement*	8.10	~~35.23~~ 39.63	~~16.18~~ 44328

CONDnet

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

PORT OF SAN DIEGO
SIYB 24-Hour Water Quality Time Series Study
January 2018

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-3-T12-REP

Date: (mm/dd/yyyy) 1/4/18

Time Started: (hh:mm) 1745 Ended: (hh:mm) 1755

GPS: (WGS84) Lat. 32.710126 Long. -117.23449

Tide (ft): -1.3 ↑

Weather conditions: Clear

Wind (none, light, moderate, heavy): None

Sea State Conditions (calm, ripples, small waves) Calm

Physical Water Quality Measurements

33.67

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	8.14	~~35.22~~	16.14

CONDUCT 44282

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes:

FIELD WATER QUALITY DATA SHEET

Station Identification: TS-3-FB

Date: (mm/dd/yyyy) 1/4/18

Time Started: (hh:mm) 1800 Ended: (hh:mm) 1810

GPS: (WGS84) Lat. NA Long. NA

Tide (ft): NA

Weather conditions: Clear

Wind (none, light, moderate, heavy): None

Sea State Conditions (calm, ripples, small waves) Calm

Physical Water Quality Measurements

Time of collection:	pH	Salinity (ppt)	Temperature (°C)
Measurement:	NA	NA	NA

CONDUCT

NA

*Water quality measured at the same depth as sample collection (i.e. within 1 meter from the surface).

Notes: