DRAFT

# San Francisco – Oakland Bay Bridge, East Span
# Pier E4-E18 Demolition

## Sampling and Analysis Plan
## Water Quality Monitoring
## Implosion of Pier E4 and Pier E5

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**California Department of Transportation, District 4**
**Division of Environmental Planning and Engineering**
**Construction Environmental Engineering Support**
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# San Francisco – Oakland Bay Bridge, East Span
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## Sampling and Analysis Plan
## Water Quality Monitoring
## Implosion of Pier E4 and Pier E5


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# List of Abbreviations

| | |
|---|---|
| ADCP | Acoustic Doppler current profiler |
| Ag | silver |
| Cd | cadmium |
| CEDEN | California Environmental Data Exchange Network |
| Cr | chromium |
| Cu | copper |
| DO | dissolved oxygen |
| EDD | electronic data deliverable |
| EPA | Environmental Protection Agency |
| ESA | Environmentally sensitive area |
| GPS | global positioning system |
| mg/L | milligrams per liter |
| Ni | nickel |
| NIST | National Institute of Standards and Technology |
| NTU | nephelometric turbidity units |
| Pb | lead |
| PVC | polyvinyl chloride |
| QA/QC | quality assurance/quality control |
| RMP | Regional Monitoring Program |
| SAP | sampling and analysis plan |
| SAS | self-anchored suspension |
| SFOBB | San Francisco-Oakland Bay Bridge |
| SM | Standard method |
| SSC | suspended solids concentration |
| SWAMP | Surface Water Ambient Monitoring Program |
| SWIC | Surface-water interface core |
| WQO | water quality objective |
| Zn | Zinc |

## Section 1

# Scope of Monitoring Activities

This Sampling and Analysis Plan (SAP) has been prepared on behalf of the California Department of Transportation (Caltrans) to describe the monitoring approach to monitor the controlled implosion of two marine foundations (Pier E4 and Pier E5) supporting the Old East Span of the San Francisco–Oakland Bay Bridge (SFOBB).

Modeling and assessment of a prior pier implosion, Pier E3, was documented in a Water Quality Study ("Study"; Caltrans 2015a). This modeling and assessment suggested that impacts to water quality associated with the controlled implosion of Pier E3 would be temporary and minimal. A water quality sampling program was set up to monitor the controlled implosion of Pier E3 (Caltrans, 2015b). Results of that sampling program determined that the Pier E3 implosion did not have "significant impacts on water and sediment quality" (Caltrans, 2016).

As with the implosion of Pier E3, the implosion of Pier E4 and Pier E5 is expected to have insignificant impacts on water and sediment quality. To document any impacts resulting from the implosion of Pier E4 and Pier E5, this SAP was developed based on the Self-Monitoring Plan contained within the SFOBB East Span Seismic Safety Project's ("SFOBB Project") Waste Discharge Requirements, Order No. R2-2002-0011 (2002). This SAP, which was developed specifically for the Pier E4 and Pier E5 implosion, meets, and possibly exceeds, the specifications provided in the Self-Monitoring Plan.

## 1.1 Monitoring Goal

The goal of monitoring as described in this SAP is to quantify the following:

- pH is the most significant potential water quality impact expected from the controlled implosion. pH would be increased as a result of explosive by-products and the release of fine-grained Portland Cement Concrete residue from the imploded structure. From models and the real-world example of the Pier E3 implosion, the area of high pH excursion is expected to be limited to a 100-foot radius around each pier after implosion. pH is not expected to exceed ten standard units within the impacted area, and the effects would diminish within approximately four hours of implosion as a result of mixing from tidal currents.
- Turbidity is the next most significant potential water quality impact. Figure 1-1 shows that the modeled turbidity is expected to drop below 50 nephelometric turbidity units (NTU) within an hour, and diminishes to pre-implosion baseline conditions within five hours. Turbidity monitoring during Pier E3 implosion resulted in turbidity readings that were all well below 50 NTU.
- Impacts of settled fine concrete residue on benthic habitat quality are also expected to be *de minimis*.

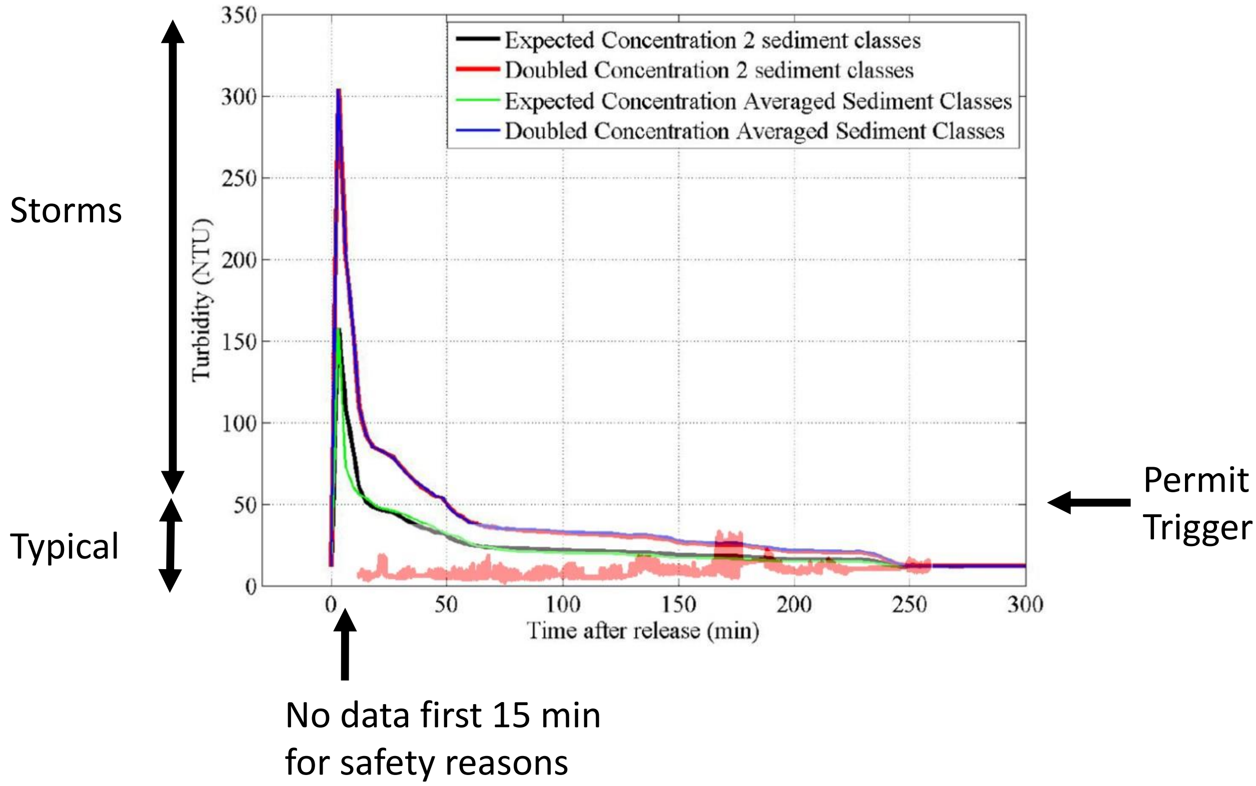


**Figure 1-1. Comparison of Model Prediction of Turbidity vs. Time Following Pier E3 Implosion (black, red, green and blue lines) with Actual Measurements (reddish pink line).**

*Plume mapping near the pier delayed for 15 minutes while air compressors turned off*

## 1.2 Sampling Approach

The SAP proposes three approaches to accomplish the monitoring goal:

1. **Plume mapping** using dynamic and static water column profiling techniques to define the three-dimensional extent of the plume generated, and to track its dissipation until water quality parameters return to background conditions. This is expected to last for approximately four hours after the implosion. Dynamic plume profiling uses a continuously-recording monitoring device, which is towed across the plume and is raised and lowered in the water column, to define the three-dimensional shape of the plume. Static profiling is done from a stationary vessel, raising and lowering a monitoring device. Plume mapping would be performed by a specially equipped survey vessel designed, owned, and operated by Brown and Caldwell that has been used previously for the Pier E3 monitoring.
2. **Environmentally Sensitive Area (ESA) monitoring** to confirm that the plume does not impact water quality in the vicinity of eelgrass beds. This would be performed using buoys equipped with continuous monitoring sensors and data loggers for measuring turbidity and pH at mid-depth near the ESAs. This monitoring is only necessary for the Pier E4 implosion

3. **Sediment quality assessment** before and after the implosion to measure potential benthic effects and attenuation rates. This would be performed using sediment quality methods developed and implemented by the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP) over the past 20 years. A random stratified sampling design will be implemented to test the spatial variability of sediment chemistry (metals and pH) and toxicity at the sediment water interface before the controlled implosion.

Each approach is discussed in more detail below.

# Section 2
# Monitoring Preparation

This section identifies the lead personnel responsible for each task described above. The primary instrumentation and equipment to be used to map and sample the implosion plume water column are illustrated. The analytical laboratories for testing the water grab samples are also introduced.

## 2.1 Qualified Sampling Personnel

The leads for each task are identified below, along with a brief description of their qualifications.

### 2.1.1 Plume mapping

Mr. Rhys McDonald of Brown and Caldwell will lead the plume mapping task. He is a Managing Scientist with 38 years of experience. Mr. McDonald has a BS degree in oceanography from the University of Washington. He has spent a significant portion of his professional career developing and implementing systems to monitor plumes in open waters in a wide variety of settings. His Caltrans experience includes the plume mapping effort during the Pier E3 implosion, development and implementation of improvement of monitoring data acquisition systems for the Caltrans Headquarters Coastal Monitoring contract at the San Francisco–Oakland Bay Bridge Bioretention Basins Pilot Project, and other compliance monitoring locations. In Caltrans District 1, Mr. McDonald has been the lead scientist in the development of real-time compliance monitoring and data acquisition systems supporting the Willits Bypass construction project. He will captain the dynamic plume mapping vessel and be assisted by an experienced crew consisting of two Brown and Caldwell personnel.

A second plume mapping boat will also be staffed by two personnel. The purpose of this boat is to conduct static plume profiling, place and tend the drogues used to delineate the extent of the plume, and act as a redundant sampling boat in the event of technical issues on the primary dynamic plume mapping boat.

### 2.1.2 ESA monitoring

Mr. Rhys McDonald of Brown and Caldwell will also lead the configuration, deployment, and data analysis for the ESA monitoring using continuous monitoring sensors.

### 2.1.3 Sediment quality assessment

Mr. Chris Stransky of Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) will lead the sediment quality assessment task. Mr. Stransky is an Associate Scientist with 23 years of experience, currently managing the Aquatic Sciences Group in San Diego. He has an M.S. in Aquatic Ecology/Toxicology from San Diego State University and a B.A. in Aquatic Science from the University of California, Santa Barbara. His expertise centers on toxicology with specialized emphasis on assessment of impacts to beneficial uses associated with both sediments and receiving waters. Central to many of the programs he currently manages is the use of multiple lines of evidence (i.e., chemistry, toxicity, and benthic community analysis), including State of California sediment quality objectives, field sampling design and oversight, the design and interpretation of biological effects tests, in situ monitoring, toxicity identification and toxicity reduction evaluations and development of site-specific water and sediment quality criteria. Chris oversees diverse and innovative projects that have resulted in the publication of several peer-reviewed papers, pushing for better science in both regulatory and non-regulatory monitoring programs.

Dr. Khalil Phelan Abusaba of Amec Foster Wheeler will lead the data analysis and reporting task. Dr. Abusaba is a Senior Associate Scientist with 30 years of experience. He has a PhD in Chemistry and an M.S. in Marine Sciences from the University of California, Santa Cruz. He was one of the pioneers of the RMP. He participated in 13 of the initial water quality surveys conducted by the RMP from 1990 to 1998 by designing and implementing protocols to sample and analyze trace metals in waters of San Francisco Bay. He has published the results from the RMP in peer-reviewed journals and presented them in numerous conferences and seminars. For the past eight years, he has assisted Caltrans with direction and oversight of water quality compliance monitoring programs at the Devils Slide Tunnel Project, the Caldecott Fourth Bore Tunnel Project, the Presidio Parkway Project, and the San Francisco–Oakland Bay Bridge Bioretention Basins Pilot Project.

## 2.2 Monitoring Supplies and Field Instruments

The monitoring supplies and field instruments to be used for each task are described below.

### 2.2.1 Plume mapping

The monitoring team will perform implosion plume mapping from aboard a specially outfitted research vessel using an integrated dynamic water property profiling system developed specifically for three-dimensional subsurface plume tracking and mapping. Dynamic profiling entails repeatedly lowering and raising profiling instrumentation through the water column while the vessel travels across the plume. In contrast, conventional static profiling entails lowering instruments and holding them at discrete depths to record sensor measurements while the survey vessel holds a fixed position. Dynamic profiling can collect high-resolution vertical profiles efficiently over large areas so that the areal extent of a subsurface plume can be defined.

The integrated plume mapping system consists of the following components:

- Research-grade multi-parameter sonde with fast-responding sensors.
- Custom wing to “fly” the sonde up and down through the water column by changing boat speed.
- Bottom depth sounder.
- Surface water property sensors.
- Acoustic Doppler current profiler (ADCP) for measuring water column currents.
- Sub-foot accurate GPS.
- Data acquisition system.
- Multiple computers.
- Multiple daylight readable computer monitors placed strategically aboard the research vessel.

Figure 2-1 shows a photograph of the research vessel with instrumentation call-outs.

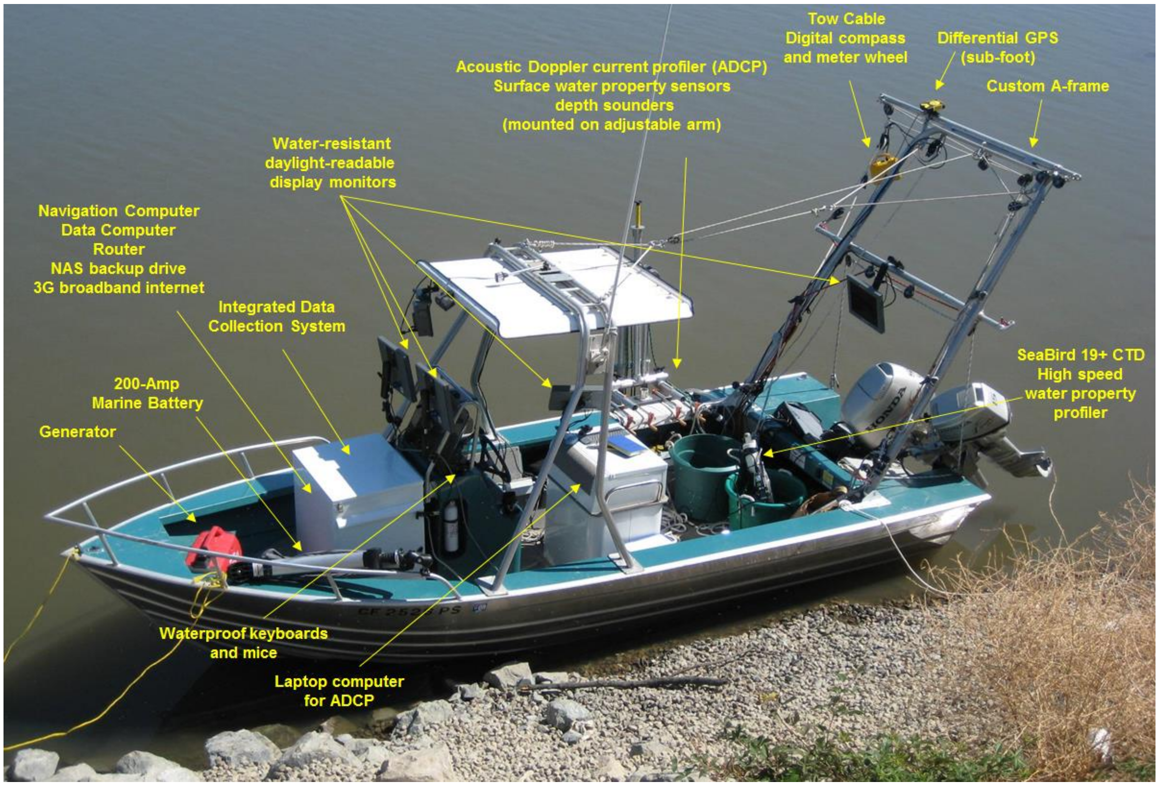


Figure 2-1. Plume mapping survey boat outfitted for dynamic profiling

The multiparameter sonde used by the dynamic plume mapping system will be a Sea-Bird SBE 19 plus Profiler CTD equipped with sensors for depth, temperature, pH, turbidity, DO, and conductivity. During transect profiling, the tow cable length and tow angle are recorded for the purpose of calculating the position coordinates of the sonde in relation to the GPS coordinates of the boat. Profiled parameters are recorded two times a second and displayed aboard the survey vessel on the daylight-readable computer monitors in real time. Strategically placed monitors display real-time navigation information and location data (Figure 2-2d). A remote is used to control data logging at the beginning and end of each transect and profile. The static plume mapping boat will use a similar multiparameter sonde.

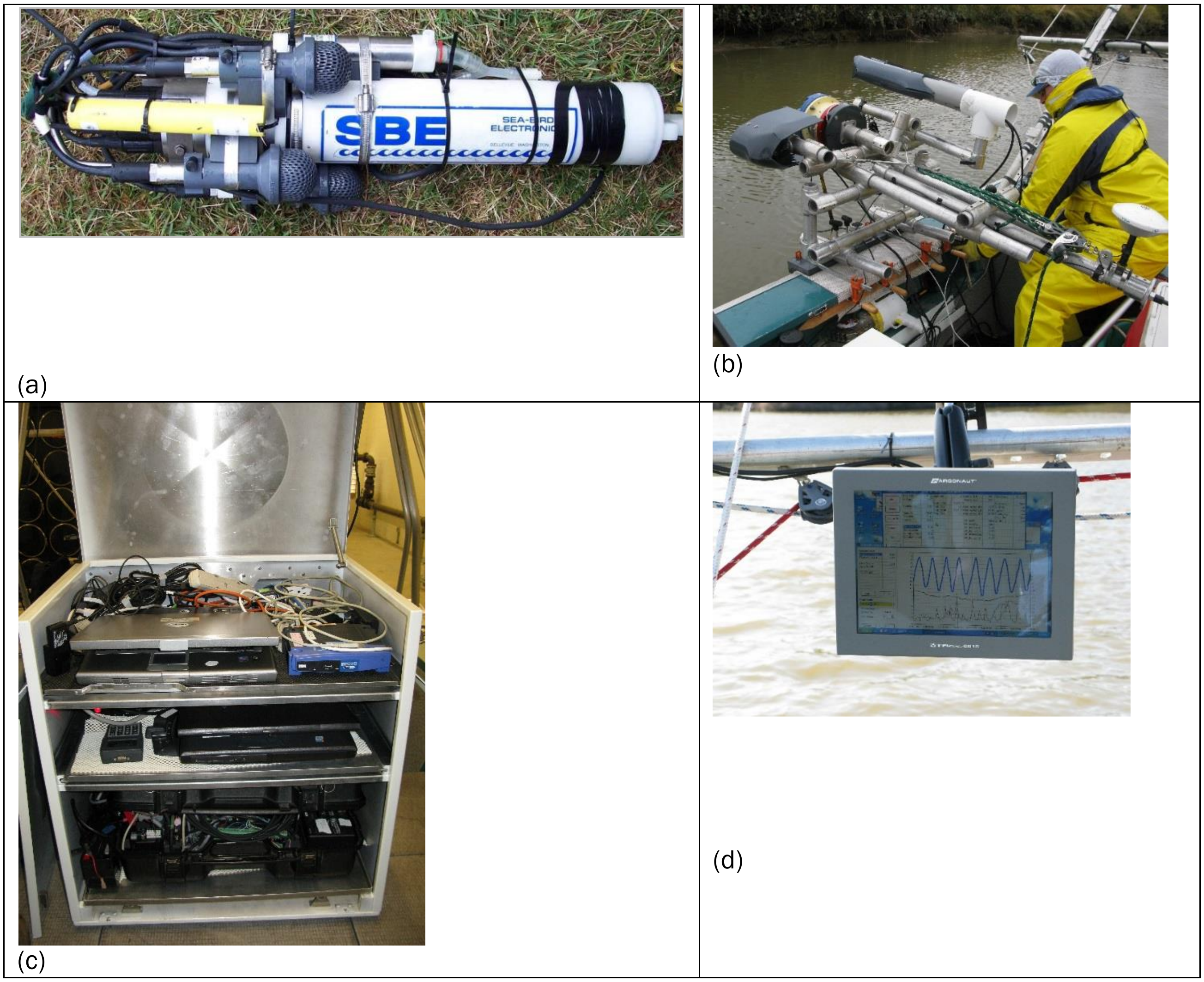


**Figure 2-2. Examples of (a) towed multiparameter sonde; (b) side-mounted sensor array; (c) shipboard integrated data acquisition system; and (d) daylight-readable computer monitor (showing sonde track in water column).**

The monitoring team will use current drogues to help track the movement of the plume and guide the profiling effort. The “window-shade” current drogues, as shown in the photograph on Figure 2-3, consist of a nominal 2 × 2 m flexible plastic sheet attached between a rigid buoyant top PVC pipe and a weighted bottom PVC pipe. The drogues are suspended from a surface float at a target depth determined by the length of the suspension line, and they hang vertically in the water column perpendicular to the direction of the current flow.

Mast-mounted marker flags on the surface float will provide visual identification. Attached buoys with GPS sensors and radio transmitters will send drogue position coordinates to the plume mapping vessel. Drogues will be deployed in pairs—one to track surface currents and one attached to a longer line to track currents at depth (e.g., 6 m).

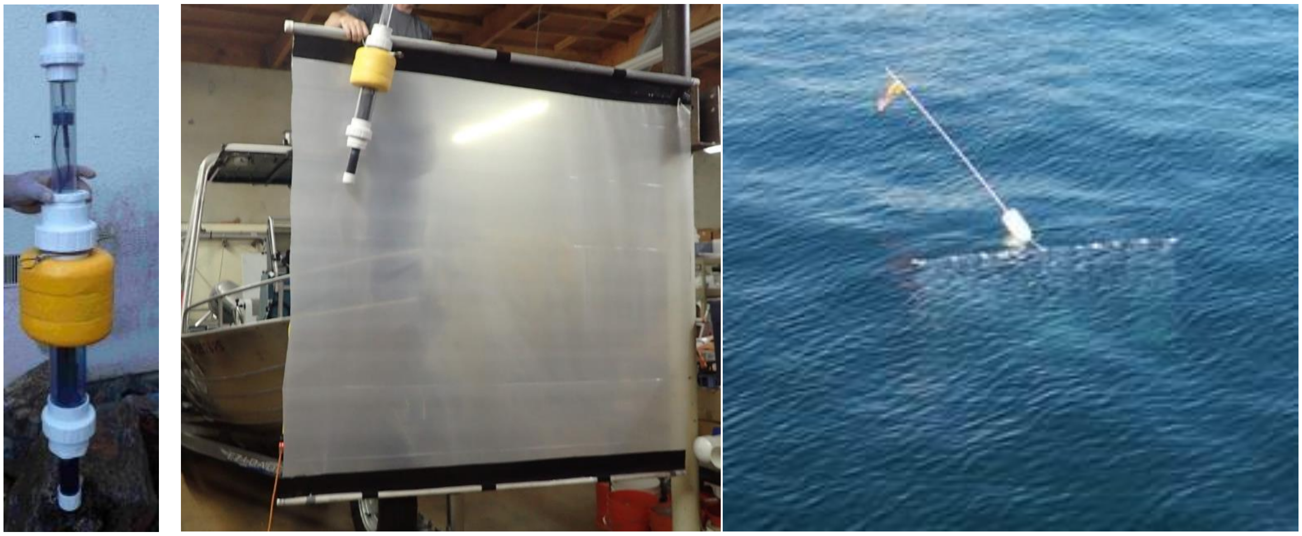

Figure 2-3. Example of current-tracking drogue and GPS buoy

### 2.2.2 ESA monitoring

Buoys will be deployed at five locations adjacent to ESA areas as indicated in Section 3.2 (Sampling Locations) below. Each buoy will be fitted with a sonde and data logger for monitoring and recording pH, temperature, conductivity and turbidity.

### 2.2.3 Sediment quality assessment

Sediment chemistry (trace metals, pH) and toxicity will be analyzed using methods comparable to the RMP (SFEI, 2012). Surface-water interface core (SWIC) samples will be collected and delivered intact to evaluate developmental toxicity to mussel larvae *Mytilus galloprovincialis*. Collection of intact SWIC samples is key to characterizing potential effects from settling of concrete residue at the sediment water interface, because it avoids “diluting” the effects of settled material on the surface with deeper sediments. In addition to toxicity, one core from each site will be used to evaluate metals concentration and pH in a thin upper layer (approximately 1 cm) of sediment in the intact core.

## 2.3 Testing Laboratories

Sediment trace metals will be analyzed by Brooks Applied Laboratories. Sediment toxicity and pH at the sediment water interface will be analyzed by Pacific EcoRisk.

## Section 3

# Monitoring Strategy

This section describes the sampling and analysis strategy and schedule for monitoring levels in an impaired water body or in the stormwater discharges from the project site. Analytical constituents are listed in Section 3.1, followed by sampling locations in Section 3.2. The sampling schedule is presented in Section 3.3.

## 3.1 Analytical Constituents

Water column properties will be measured in the field using in situ instrumentation aboard the survey vessels and post-survey in the laboratory from discrete grab samples collected during the field monitoring effort. Monitored constituents are listed in Table 3-1.

**Table 3-1. Proposed Analytical Constituents Measured During Pier Implosion**

| Parameters | Field or Lab | Approximate No of Lab Samples |
|---|---|---|
| Turbidity | Field | Continuous (tens of thousands of data records) |
| DO | Field | |
| Temperature | Field | |
| pH | Field | |
| Conductivity | Field | |
| Salinity | Field | |
| Chronic toxicity (sediments) mussel larvae | Lab | 3 Pre-implosion, 3 post-implosion at each pier (12 total) |
| Sediment chemistry (pH, metals) | Lab | |

## 3.2 Sampling Locations

Figure 3-1 illustrates the general area where samples will be collected for plume mapping and water quality assessment, where ESA monitoring will occur, and where the sediment quality assessment will occur.

High-resolution water property profiles will be used to characterize the trajectory, dispersion, and a real extent of the implosion plume for a period of approximately four hours after the implosion. Vertical profiles will be measured from fixed positions in the immediate vicinity of the pier soon after the implosion, and dynamically along transects over larger areas as the plume moves and spreads with the tidal current. The measurement objective is to obtain comprehensive near-synoptic data sets of high-resolution vertical profiles that have been collected through the longitudinal and transverse axes of the plume, in order to produce “snapshots” of the plume extent and dispersion at different times after implosion. Figure 3-2 shows an example subsurface effluent plume mapped using dynamic vertical profiling techniques. Figure 3-3 provides a pH graph created from such a vertical profiling - the profiling effort conducted for Pier E3.

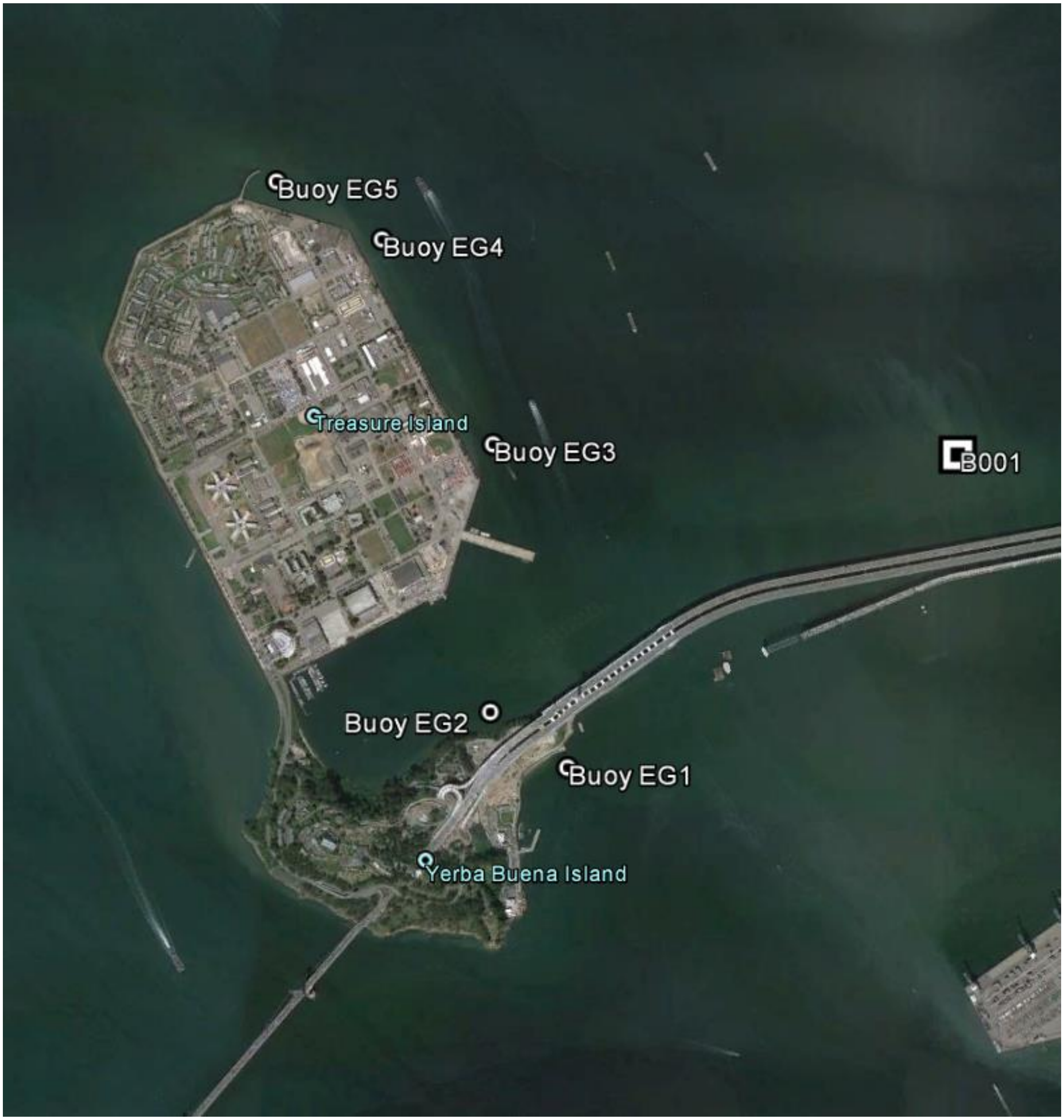


Figure 3-1. Sampling area for plume mapping and water quality assessment, and for ESA monitoring

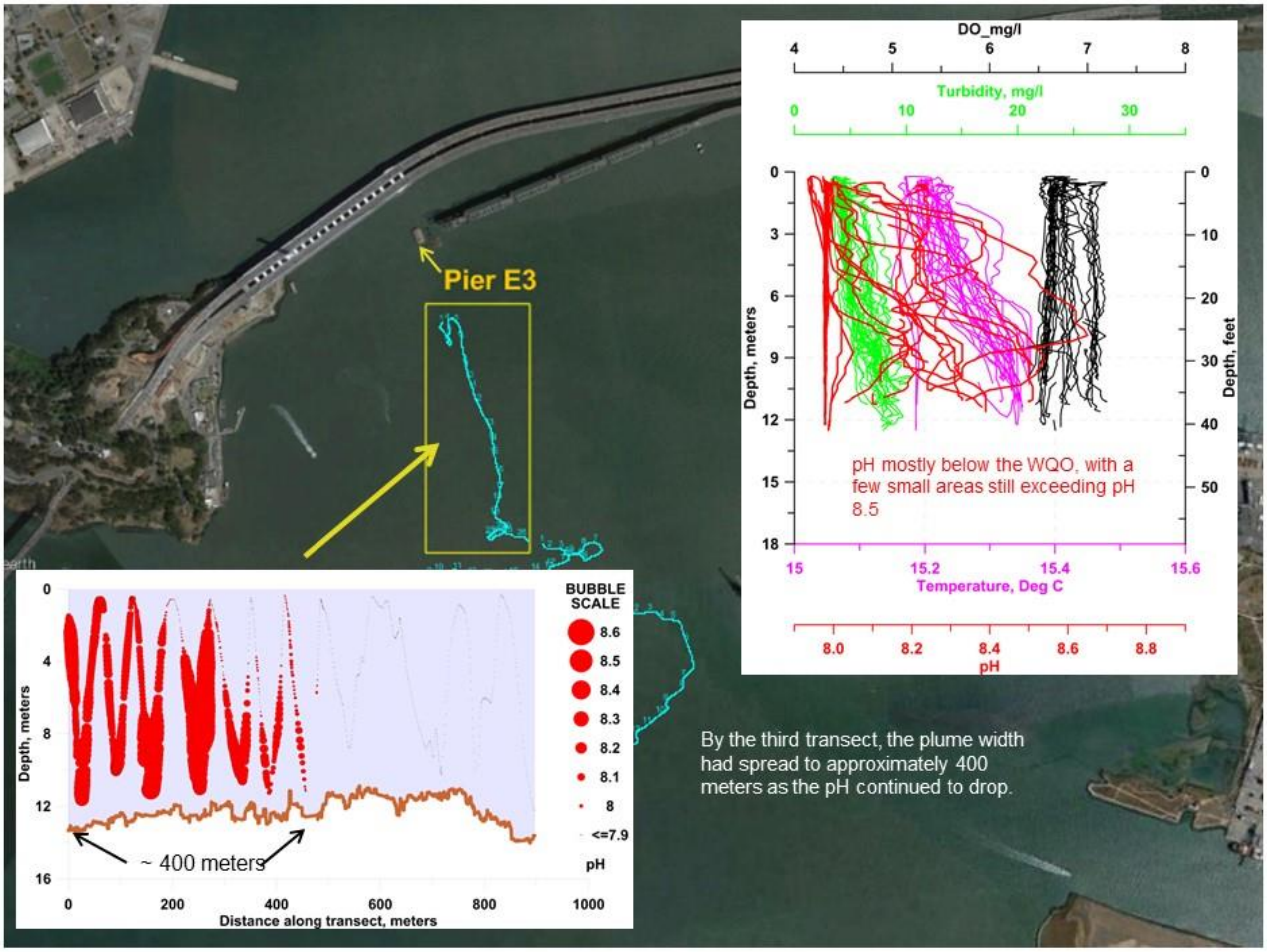


Figure 3-2. Example plume cross section measured using dynamic profiling

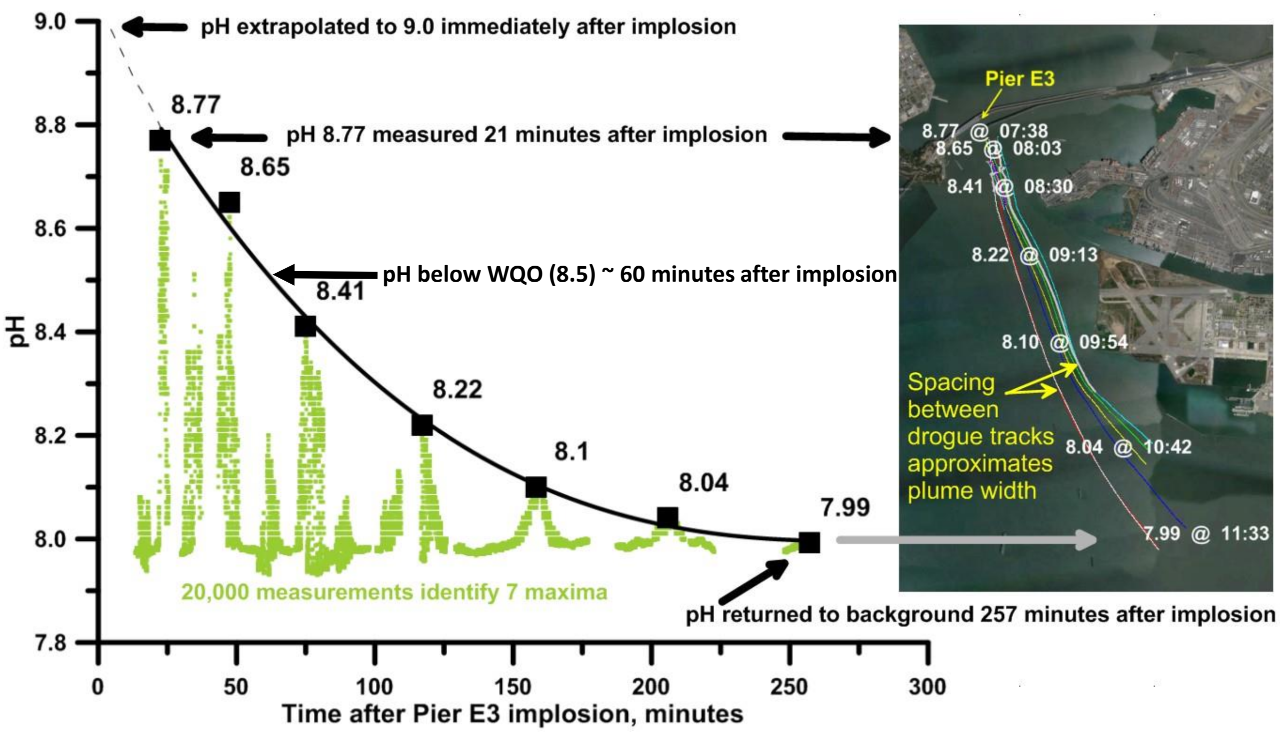


Figure 3-3. Pier E3 Post-Implosion Dynamic Plume Mapping Results for pH

Sets of current drogues released in the vicinity of each pier immediately before and after the implosion will serve to guide and focus the profiling effort. The expectation is that the pre-implosion drogues nominally mark the head of the plume, and the post-implosion drogues mark the tail end. The drogues will be released at up to three locations near the pier at two depths, for a total of 12 drogues (six pre- and six post-implosion).

ESA monitoring will occur at the indicated buoys adjacent to eelgrass habitat.

Three locations around each pier will be selected for sediment quality assessment using a random stratified sampling design. At these random locations sediments samples will be analyzed for sediment chemistry and sediment-water-interface toxicity.

## 3.3 Preparation, Sampling and Reporting Schedule

The proposed schedule for carrying out the SAP, including preparation, sampling, and reporting, is shown in Table 3-2 below.

Table 3-2. Proposed 2016–2017 Schedule for Preparation, Sampling and Reporting

| Time Frame | Activity |
|---|---|
| July to September 2016 | Equipment procurement and preparation, crew training |
| September 15 to October 15, 2016 | Trial run of water property profiling, ESA monitoring, and sediment quality assessment |
| October 15 to November 1, 2016 | Equipment maintenance, review background data collected |
| November 2016 | Buoy deployment adjacent to ESA |
| First Implosion, November 2016 | Planned implosion—water property profiling of plume, ESA monitoring, water quality sampling |
| 10–20 minutes pre-implosion | Down current drogues deployed to south of blast attenuation system |

| Table 3-2. Proposed 2016–2017 Schedule for Preparation, Sampling and Reporting | |
|---|---|
| **Time Frame** | **Activity** |
| 5–15 minutes post-implosion | Up current drogues deployed to north of blast attenuation system |
| 5–10 minutes post-implosion | Initial water quality samples collected; plume mapping commences |
| 1–8 hours post-implosion | Water quality sampling and plume mapping continues |
| 24 hours post-implosion | ESA drogues retrieved |
| Second Implosion, November 2016 | Alternate implosion date |
| 10–20 minutes pre-implosion | Down current drogues deployed to south of blast attenuation system |
| 5–15 minutes post-implosion | Up current drogues deployed to north of blast attenuation system |
| 5–10 minutes post-implosion | Initial water quality samples collected; plume mapping commences |
| 1–8 hours post-implosion | Water quality sampling and plume mapping continues |
| 24 hours post-implosion | ESA drogues retrieved |
| November to December 2016 | Sediment quality assessment one week following cessation of clamshelling |
| January 2017 | Draft report on implosion monitoring |
| March 2017 | Final report on implosion monitoring |

Preparation will occur in the July to September 2016 time frame. Between mid-September and mid-October 2016, a trial run of all sampling approaches will be conducted in the Bay. The purpose of the trial run is to collect background pre-implosion data, test the equipment and methods, and make sure the sampling crews are experienced with the job site and working conditions and are working together as a team. After the trial run, equipment will be maintained and serviced as necessary to prepare for implosion monitoring.

The implosion is planned for October, November, or December. For the Pier E4 implosion, buoys will be deployed for ESA monitoring on the day prior to implosion. On the day of each pier implosion, sampling vessels will mobilize at least three hours prior to be in position well in advance of the scheduled implosion.

Drogue deployment will occur immediately before and immediately after implosion. Plume mapping will occur for approximately four hours after implosion. Vessel operations during sampling are described in Section 4 (Sample Collection and Handling) below.

Buoys for ESA monitoring will be retrieved 24 hours after implosion. During the follow-up period when the construction contractor is clamshelling to remove debris, vessel-based monitoring of turbidity, pH, and DO will continue. One week after clamshelling is completed, a sediment quality assessment will be conducted according to the random stratified sampling design described above in Section 3.2.

A draft monitoring report will be prepared by January 2017. A final report is expected by March 2017.

Section 4

# Sample Collection and Handling

This section describes the procedures that will be followed for sample collection, sample handling, and sample documentation.

## 4.1 Sample Collection Procedure

Vessel operation and sample collection procedure during implosion are described below.

### 4.1.1 Vessel operation during implosion sampling

Approximately 10 to 20 minutes before the implosion, the plume mapping vessels will approach the southern edge of the blast attenuation system to deploy the current-tracking drogues. Approximately 5 to 15 minutes after the implosion, vessels will approach the northern edge of the plume and deploy three more pairs of current-tracking drogues.

Concurrently with the start of water quality sampling, the dynamic plume mapping vessel will proceed along the longitudinal axis of the plume as indicated by the current drogues, raising and lowering the Sea-Bird to map the plume in three dimensions. Following a longitudinal pass, the plume mapping vessel will perform a series of transects across the plume, again guided by the drogues and real-time acquisition of turbidity and pH data. Concurrently with the dynamic plume mapping, the static plume mapping vessel will continuously sample near the centroid of the plume by raising and lowering the sonde while maintaining position between current tracking drogues.

### 4.1.2 Sediment sampling procedures

SWIC samples will be collected for toxicity testing using estuarine species. Up to six replicate cores will be collected at each site. Whole core samples will be transported intact to a toxicity testing laboratory for analysis of toxicity to *Mytilus galloprovincialis*. A composite sediment sample will be used to measure sediment pH and chemistry. One core will be retained as an archive. The remaining five cores will be used to measure *in-situ* toxicity to *Mytilus galloprovincialis* using methods consistent with SWIC toxicity assessments in the RMP (SFEI 2012).

## 4.2 Sample Handling Procedures

Sample preservation and container requirements for water quality samples that are not continuously monitored are summarized in Table 4-1 below. Sediment samples will be delivered as whole cores to the analytical laboratory.

**Table 4-1. Sample Containers and Preservation**

| Parameters | Container | Preservation |
|---|---|---|
| Sediment Metals | 250 mL glass | Ice |
| SWIC Toxicity—Mytilus galloprovincialis | Intact cores | Ice |

## 4.3 Sample Documentation Procedures

Continuous monitoring data acquired by the Sea-Bird SBE19 plus sensors will be integrated with date, time, and GPS coordinates with on-board data acquisition systems. Data logging will be confirmed every hour and backed up to an external device to minimize the risk of losing data.

Sediment samples will be labeled and recorded on a chain-of-custody form. Labels will be written using a waterproof pen.

## Section 5

# Sample Analysis

Analytical methods for plume mapping and water quality constituents are summarized in Table 5-1 below.

| Table 5-1. Methods for Test Parameters Described in this SAP | |
|---|---|
| Parameters | Test Method |
| Water—Turbidity | Sea-Bird SBE19 plus |
| Water—DO | |
| Water—Temperature | |
| Water—pH | Sea-Bird SBE19 plus |
| Water—Conductivity | Sea-Bird SBE19 plus |
| Sediment—Trace Metals (Pb, Cu, Ni, Zn, Ag, Cd) | EPA Method 6020B |
| SWIC toxicity—*Mytilus galloprovincialis* | EPA Method 600/R-95-136M |

## Section 6

# Quality Assurance/Quality Control

As part of quality assurance and quality control (QA/QC) for this project, the Sea-Bird SBE19 plus and buoy sensors will be calibrated to National Institute of Standards and Technology (NIST) standards before deployment. Sediment analyses for trace metals will include digestion blanks, laboratory duplicates and matrix spikes. QA/QC procedures for sediment toxicity test include multiple replicates and comparison to controls.

## Section 7

# Data Management and Reporting

All field data and required metadata will be recorded on standardized data sheets. After field work has been completed, field data will be transcribed onto a spreadsheet using the field data electronic data deliverable (EDD) template, and the data will be validated and verified.

Field data are initially validated through the recognition of outlier values; questionable data will be reviewed and corrected. The Lead Field Technician will save a digital copy of all field notes and documentation and file a hard copy with the project files. The Field QA/QC Supervisor or Field Technician will review the spreadsheet for transcription errors. Errors requiring review will be noted, and will be revised by the Lead Field Technician as necessary. No data validation software will be used; calibration documentation of field equipment will be retained in project files.

The laboratory data template is designed to include all project background information, metadata, QA/QC data, and analytical results required for submitting data to the database. The spreadsheet template and valid values list, which contain standard names and codes for describing data, will be provided to the laboratory's Information Technology department before sample collection so that the laboratory's equipment can be programmed to transmit data directly into the template. This will increase data comparability, streamline data management, and reduce the potential for transcription errors.

Laboratory documentation will be reviewed for outlier values by the Field QA/QC Supervisor or Lead Field Technician, and any questionable results will be investigated through discussion with the laboratory QA/QC Manager. The Lead Field Technician will review field notes in an attempt to resolve discrepancies. When the reported laboratory documentation is satisfactory to the Field QA/QC Supervisor and Project Manager, the Lead Field Technician will save the digital formats of the laboratory documentation and file a hard copy in project files. Laboratory data verification and validation processes will be performed in accordance with their standard operating procedures. Documentation of these procedures is kept on file in the laboratory and is available for review upon request.

After the controlled implosion has been completed for both Pier E4 and Pier E5, Caltrans will file a comprehensive report with all stakeholder agencies. The report will contain the following information, at a minimum:

- Compliance evaluation summary, including descriptions of exceedances of receiving water limitations or WQOs, duration of the exceedances, and corresponding observations and data.
- Monitoring methods, equipment, data, photographs, and videos, including DVDs with all water quality logging data.
- Contingency reporting, as described in the Self-Monitoring Plan.
- Estimate of the total amount of sediment that was suspended and subsequently deposited.
- Summary of standard observations, as defined in the Waste Discharge Requirements issued to the SFOBB Project.
- Discussion regarding the effectiveness of monitoring methods.
- Assessment of impacts to special aquatic sites.

Data to be used for calibration and refinement of three-dimensional hydrodynamic and sediment transport model for subsequent demolition activities.

## Section 8

# Data Evaluation

Data will be evaluated with the objective of verifying, refuting, or nuancing the following predictions of the Study:

- pH is not expected to exceed ten within the impacted area, and the effects would diminish within hours of implosion as a result of mixing from tidal currents. This will be evaluated by the time series of the plume map that is generated.
- Turbidity will diminish to pre-implosion baseline conditions within five hours. This will be evaluated by the time series of the plume map that is generated.
- Disruption to benthic habitat and sediment toxicity following the implosion are expected to be minimal. This will be evaluated by comparing sediment toxicity in the Project area before and after the controlled implosion and testing for statistically significant differences as measured by SWIC toxicity assessment of mussel larvae.

Sediment metal concentration at the sediment water interface will be assessed as an ancillary indicator of benthic impacts. As with toxicity, an evaluation of statistically significant changes in sediment chemistry will be made before and after the implosion.

## Section 9

# Change of Condition

Any changes to this SAP will be documented in writing and communicated to the San Francisco Bay Regional Water Quality Control Board in a timely manner.

## Section 10

# References


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