

West Point Treatment Plant

Ongoing Marine Water Quality Monitoring

Water Quality Report –Update March 31, 2017

OVERVIEW

As part of a long-term monitoring program, King County monitors water quality at 12 offshore and 20 beach locations (see Figure 1) to provide an understanding of water quality within the Puget Sound Central Basin, including stations at all treatment plant outfalls. The West Point Treatment Plant main outfall is the site labeled KSSK02 on the map, located 3,600 ft. offshore at approximately 230-ft deep. The county maintains a long-term dataset, over 50 years at some locations, which provides insight into natural variation. This monitoring program and dataset form the basis from which water quality conditions can be assessed that may be affected by the West Point wastewater discharge during its period of reduced treatment.

At the offshore sampling stations, dissolved oxygen, temperature, salinity, density (calculated), chlorophyll, and light intensity and transmission are measured throughout the entire water column from surface to bottom every two weeks. Additionally, nutrients, fecal indicator bacteria (FIB), suspended solids, and chlorophyll are measured at specific depths at each site, and phytoplankton composition and abundance are assessed at a subset of sites. Beach locations are monitored monthly for nutrients, FIB, temperature, and salinity.

Additional Monitoring: During reduced treatment at the West Point plant, the sampling frequency at a subset of four offshore monitoring stations will be increased to a weekly basis. In addition, a new site will be added at the emergency bypass outfall and also sampled weekly. This frequency and variety of biological, chemical, and physical conditions can capture some impacts on ecosystem functions. The County’s monitoring is sufficient to evaluate the most relevant water quality conditions that have the potential to result in any acute adverse effects to Puget Sound aquatic life. The most recent data results available, from March 6th/7th and March 15th sampling events, are summarized for three key water quality indicators below. More data results are available in the

appendix. *Note:* Beach data were not collected during this time period and will be included in the next report.

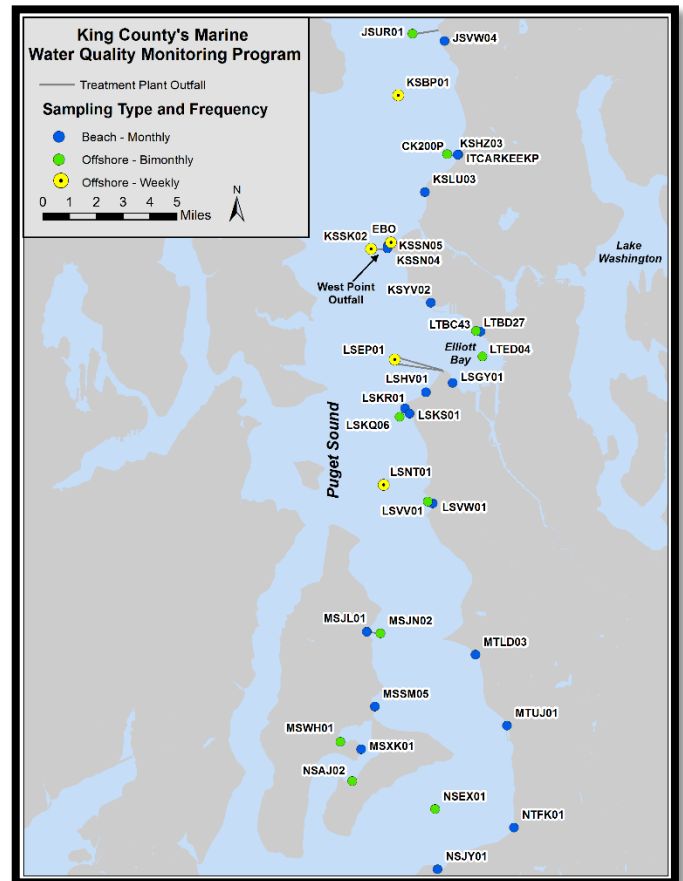


Figure 1. Map of King County’s marine water quality monitoring stations.

BACTERIA

Fecal coliforms, along with *Enterococcus*, are a type of indicator bacteria that King County routinely monitors at freshwater and marine beaches, as well as offshore waters. These bacteria are found in the intestinal tracts and feces of humans and other warm-blooded animals, and can make their way into our waterways through various pathways. Although these bacteria are typically not pathogenic, they are important to monitor as they can be an indicator that pathogens that make people sick may be present.

The State of Washington has a two part standard to protect human primary contact recreation and shellfish

consumption in marine waters. The standard includes a 14 colony forming unit/100 mL geometric mean average and a 43 CFU/100 mL peak concentration (the peak concentration is not to be exceeded in greater than 10% of samples). These standards are used for comparing data from multiple samples at a station rather than a single sample.

Comparing individual samples to the bacteria standards for reference indicates that concentrations of fecal coliforms from surface waters at all offshore stations, including KSSK02 off of West Point, were below both geometric mean and peak standards during both sampling events in early March (Figure 2). Although fecal coliforms near the West Point Outfall were elevated above seasonal norms in surface waters on March 15th, the concentrations remained below state water quality standards. Fecal coliform concentrations in the West Point treated discharge were periodically elevated compared to normal levels during the period prior to March 15th, indicating that this may be the source of the elevated concentration at the KSSK02 location. Sub-surface bacteria concentrations were all below state water quality criteria as well. For data on subsurface and *Enterococcus* bacteria concentrations, see Appendix Table A-2.

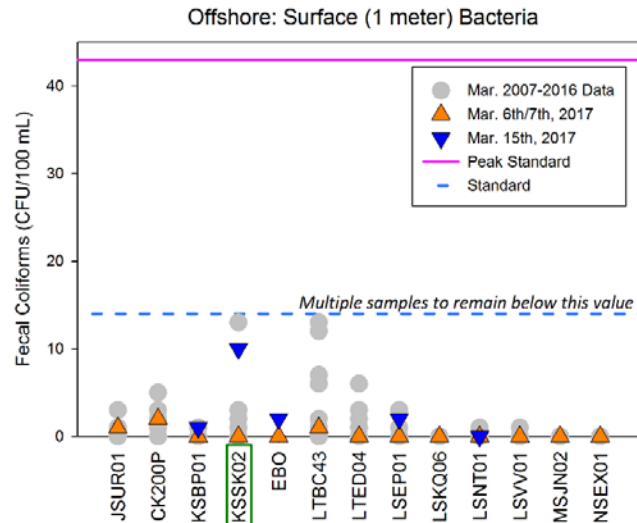


Figure 2. Bacteria concentrations of single samples collected near surface (1 meter) at a subset of offshore stations in Central Puget Sound during the early March 2017 sampling events are illustrated with historical bacteria concentrations. Note: station KSSK02, West Point outfall, highlighted.

NUTRIENTS

Nutrients, such as nitrogen compounds (ammonia and nitrate) and orthophosphate, are essential elements for aquatic plants. Silica is a micronutrient needed by some microscopic plants (phytoplankton) and other organisms for skeletal growth. However, excess nutrients can cause

a sudden increase in aquatic plants that can lead to unfavorable conditions. High ammonia concentrations can be toxic to aquatic organisms, including fish.

Nutrients in offshore station waters on March 6/7th and March 15th were within normal values based upon past March values. The emergency bypass station (EBO) had not routinely been sampled prior to the March sampling event; therefore, comparisons with previous data cannot be made. All ammonia values were low (Figure 3) and well below the lowest (chronic) water quality criterion, which is based upon temperature, salinity, and pH factors (anticipated to be about 1.6 mg/L for March conditions). Although low, values at the West Point outfall and emergency bypass stations were above the detection limit and higher than other sites sampled on March 15th. However, these values are within historical ranges. Ammonia in the West Point treated discharge since the damage to the treatment processes has been similar to normal levels.

Nitrate, orthophosphate, and silica were also within normal ranges for all sites.

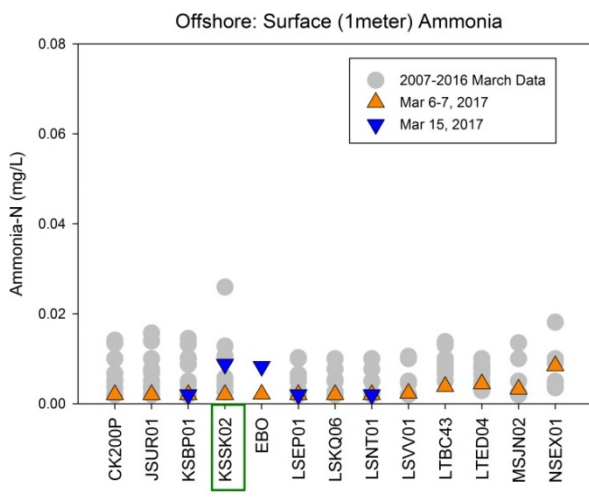


Figure 3. Ammonia levels in surface (1m) waters for offshore stations in Central Puget Sound during the early and mid-March 2017 sampling event are shown with historical concentrations. Note: most values in March were below detectable levels, therefore, the method detection limit value was used. Detection limits have changed from 0.01 to the current 0.005 mg/L with laboratory advancements. Note: station KSSK02, West Point outfall, highlighted.

DISSOLVED OXYGEN

Dissolved oxygen is important for marine life, and can control the presence or absence of species. Aquatic plants and animals require a certain amount of oxygen dissolved in the water to live, and different species have different

tolerances. Waters with high concentrations of dissolved oxygen are considered healthy for sustaining many species.

In deep waters in particular, it can be too dark for aquatic plants to live and is separated from surface mixing with the air, so processes like decomposition by bacteria can result in low dissolved oxygen. Human inputs of organic materials and decay of aquatic plants at depth may decrease oxygen levels. In addition, deep waters from the Pacific Ocean enter Puget Sound at depth and can result in naturally occurring low dissolved oxygen levels.

The State of Washington dissolved oxygen standard to protect aquatic life depends on the designated waterbody use. For Central Puget Sound, the one-day minimum dissolved oxygen standard is 7 mg/L for waters of extraordinary quality. At the dissolved oxygen level of 5 mg/L, biological stress can be induced on marine life. If dissolved oxygen levels fall below 3 mg/L, then this can displace or potentially result in death of some marine species.

The most recent offshore sample data from March 6th and 7th show typical conditions for March across King County's monitoring stations in Central Puget Sound, and all sites show deep oxygen levels above the state water quality standard (Figure 4). On March 15th, for the subset of stations that are sampled weekly, deep oxygen also showed typical levels.

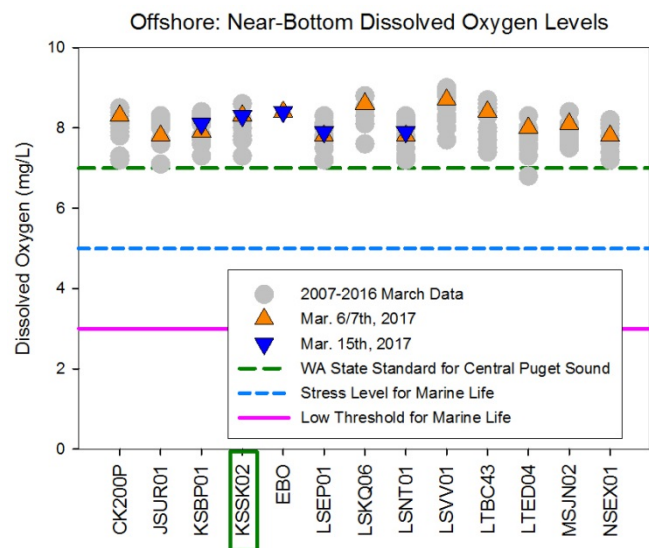


Figure 4. In Puget Sound, the lowest dissolved oxygen levels are typically found near the seafloor, so near bottom dissolved oxygen levels are shown by sampling site on top of historical oxygen conditions for March. Note: station KSSK02, West Point outfall, highlighted in green. The EBO site, Emergency Bypass Outfall, was added recently, so no historical data are available here.

SUMMARY

Water sample results collected between March 6th and March 15th, 2017 are summarized below. Additional results are provided in the Appendix.

- Concentrations of fecal coliforms at all offshore stations were below reference water quality standards for March.
- Bacteria concentrations at most offshore stations were similar to expected values during the month of March with one exception: March 15th had elevated values at the West Point outfall station, although concentrations were still below reference water quality standards.
- Fecal coliform levels on March 15th may have been affected by West Point effluent that had slightly higher levels at the time.
- Ammonia results were higher at the West Point outfall and emergency bypass stations on March 15th but still low throughout the water column.
- All nutrient results were within expected values.
- Near-bottom dissolved oxygen values were at healthy levels and all above the state water quality standard.
- Dissolved oxygen levels were high throughout the top and bottom of the water column, and reflect typical conditions for March.
- March conditions continued to be wet, and by March 17th, total precipitation over the last 5 months exceeded the typical annual water-year amount, as measured by the National Weather Service at Sea-Tac airport. Run-off and increased river flows contributed to the high surface silica concentrations in March (see Appendix figures).

FOR MORE INFORMATION

- **King County Marine & Sediment Assessment Group:**
<http://green2.kingcounty.gov/marine>
- **Download Water Column Data:**
<http://green2.kingcounty.gov/marine/Download>
- **West Point Marine Monitoring:**
<http://www.kingcounty.gov/depts/dnrm/wtd/system/west/west-point-restoration/marine-monitoring.aspx>
- **Wastewater Incidence Response:**
<http://kingcounty.gov/depts/dnrm/wtd/response/incident-response.aspx>

Appendix: March, Part 1, Marine Water Quality Data

The following graphs and tables display data from the March 6th/7th and March 15th marine monitoring events. General water quality data are shown by site. For the offshore sites, parameters shown include water temperature, salinity, dissolved oxygen, relative chlorophyll fluorescence, total suspended solids, percent light transmission, nutrient concentrations, and fecal indicator bacteria. Nutrients include nitrate and nitrite, ammonia, orthophosphate, and silica. For the beach sites, parameters shown include fecal indicator bacteria, nitrate and nitrite, and ammonia. For more explanation of parameters and sampling methods, see the marine monitoring program website:

<http://green2.kingcounty.gov/marine/>

Description of station locators from the map on the first page (Figure 1) are given in the table below. Data from a subset of stations from the routine monitoring program are displayed to provide context for data collected near the West Point Treatment Plant and Treatment Plant Outfall. For more details on all monitoring stations, see the [marine monitoring plan](#).

NOTE: Beach monitoring data were not collected during this time frame. Beach monitoring data collected the week of March 27th and will appear in the next monitoring report.

Table A-1. Location of sampling stations that include data in this summary report. The following data graphs and tables in the Appendix are from the stations highlighted in blue.

Offshore Stations

Locator	Description
JSUR01	Brightwater Treatment Plant Outfall
KSBP01	Point Jefferson
CK200P	Carkeek CSO Treatment Plant Outfall
KSSK02	West Point Treatment Plant Outfall
EBO	Emergency Bypass Outfall for West Point
LTBC43	Elliott West CSO Treatment Plant Outfall
LTED04	Central Elliott Bay
LTXQ01	Henderson/MLK CSO Treatment Plant Outfall
LSEP01	South Treatment Plant Outfall
LSKQ06	Alki CSO Treatment Plant Outfall
LSNT01	Fauntleroy/Vashon
LSVV01	Barton CSO Outfall
MSJN02	Vashon Treatment Plant Outfall
NSEX01	East Passage

Offshore Water Quality: KSSK02 – West Point Outfall

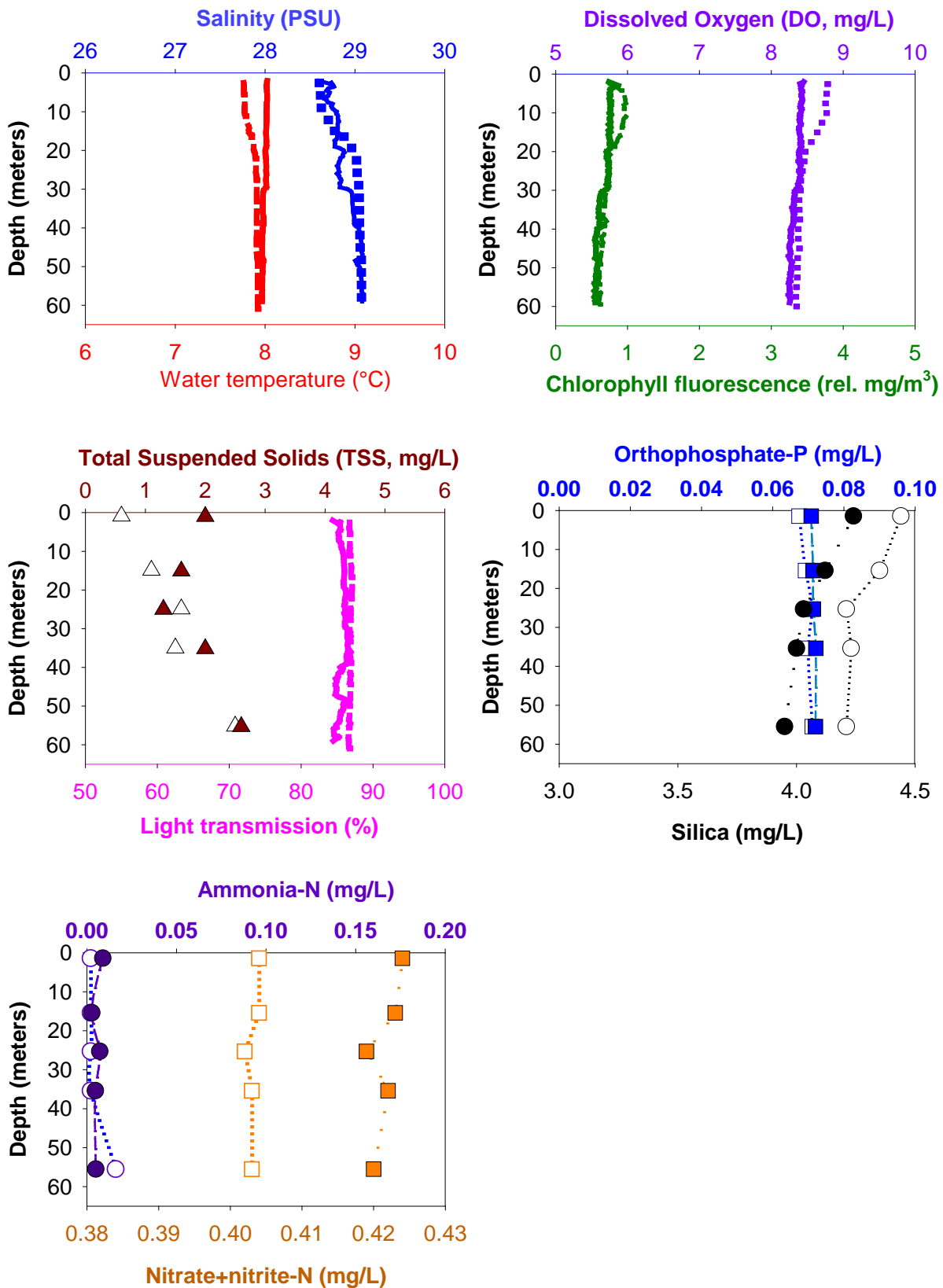


Figure A-1. Offshore water column profile (lines) and discrete water quality results (points) from the first two weeks of March 2017 at the West Point Outfall. Dashed lines and open symbols represent the March 6th/7th sampling event and solid lines and solid symbols represent the March 15th sampling event.

Offshore Water Quality: KSBP01 – Point Jefferson

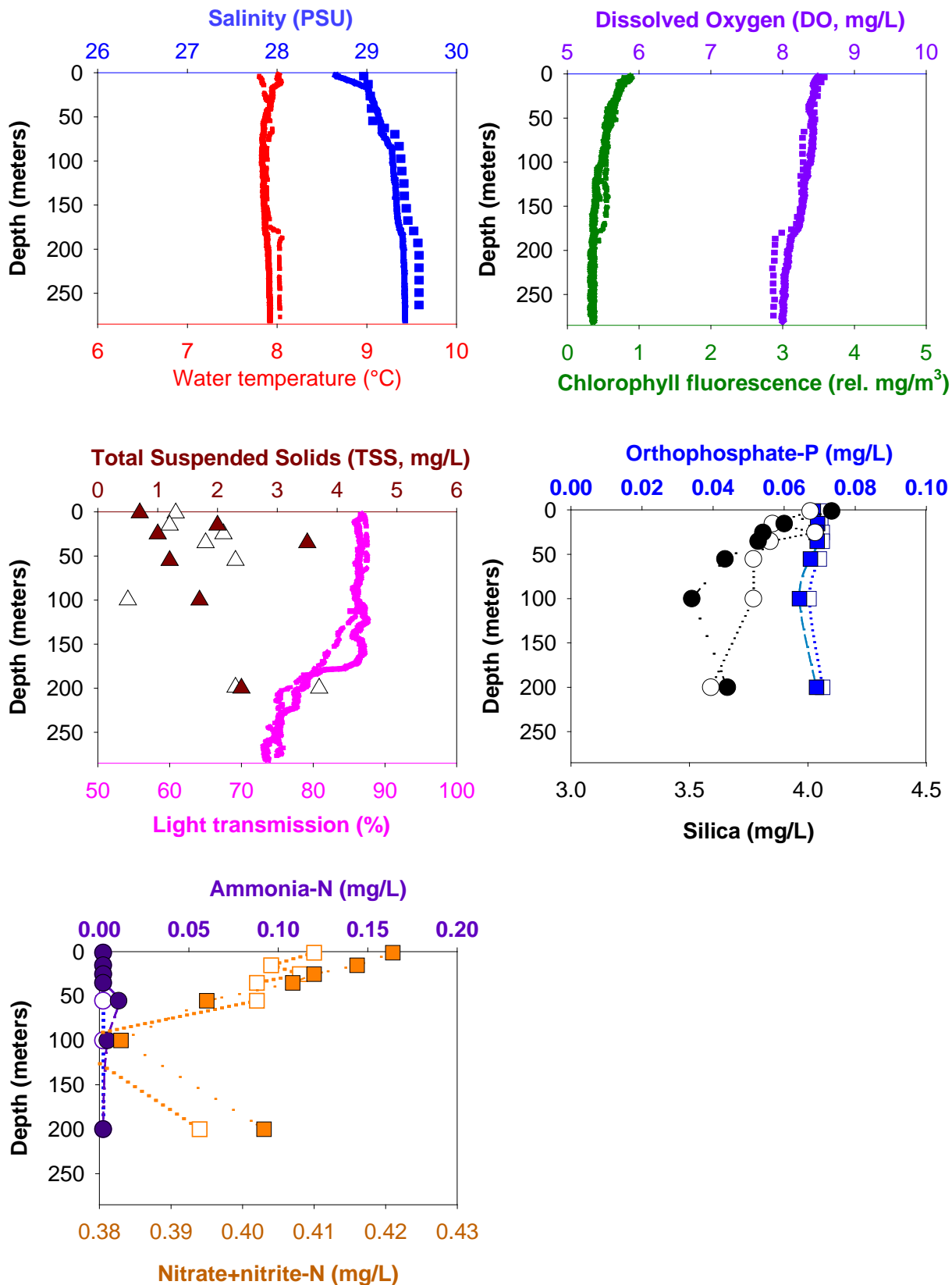


Figure A-2. Offshore water column profile (lines) and discrete water quality results (points) from the first two weeks of March 2017 at Point Jefferson. Dashed lines and open symbols represent the March 6th/7th sampling event and solid lines and solid symbols represent the March 15th sampling event.

Offshore Water Quality: EBO – Emergency Bypass Outfall

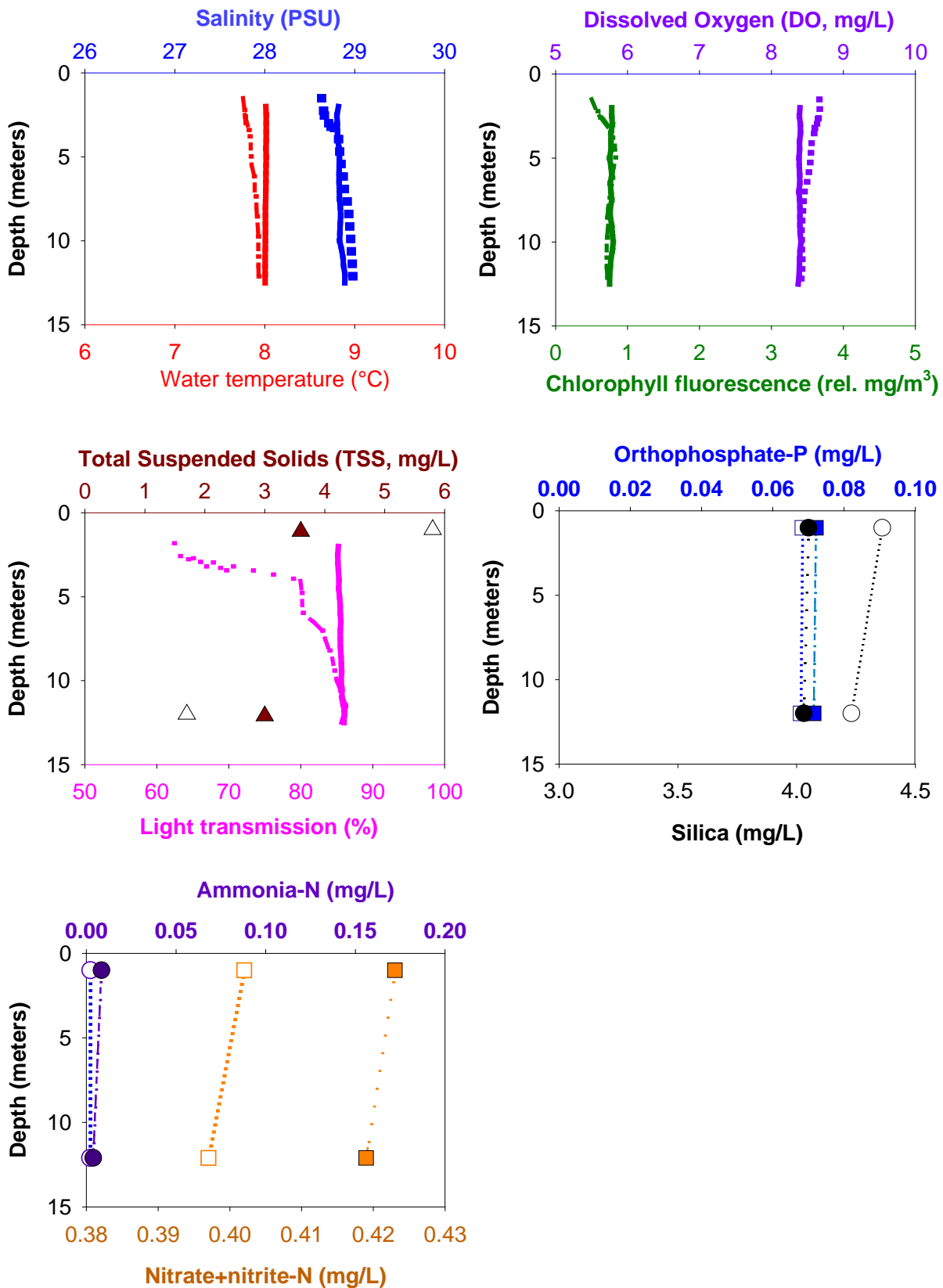


Figure A-3. Offshore water column profile (lines) and discrete water quality results (points) from the first two weeks of March 2017 at West Point’s emergency bypass outfall. Dashed lines and open symbols represent the March 6th/7th sampling event and solid lines and solid symbols represent the March 15th sampling event.

Offshore Water Quality: LSEP01 – South Plant Outfall

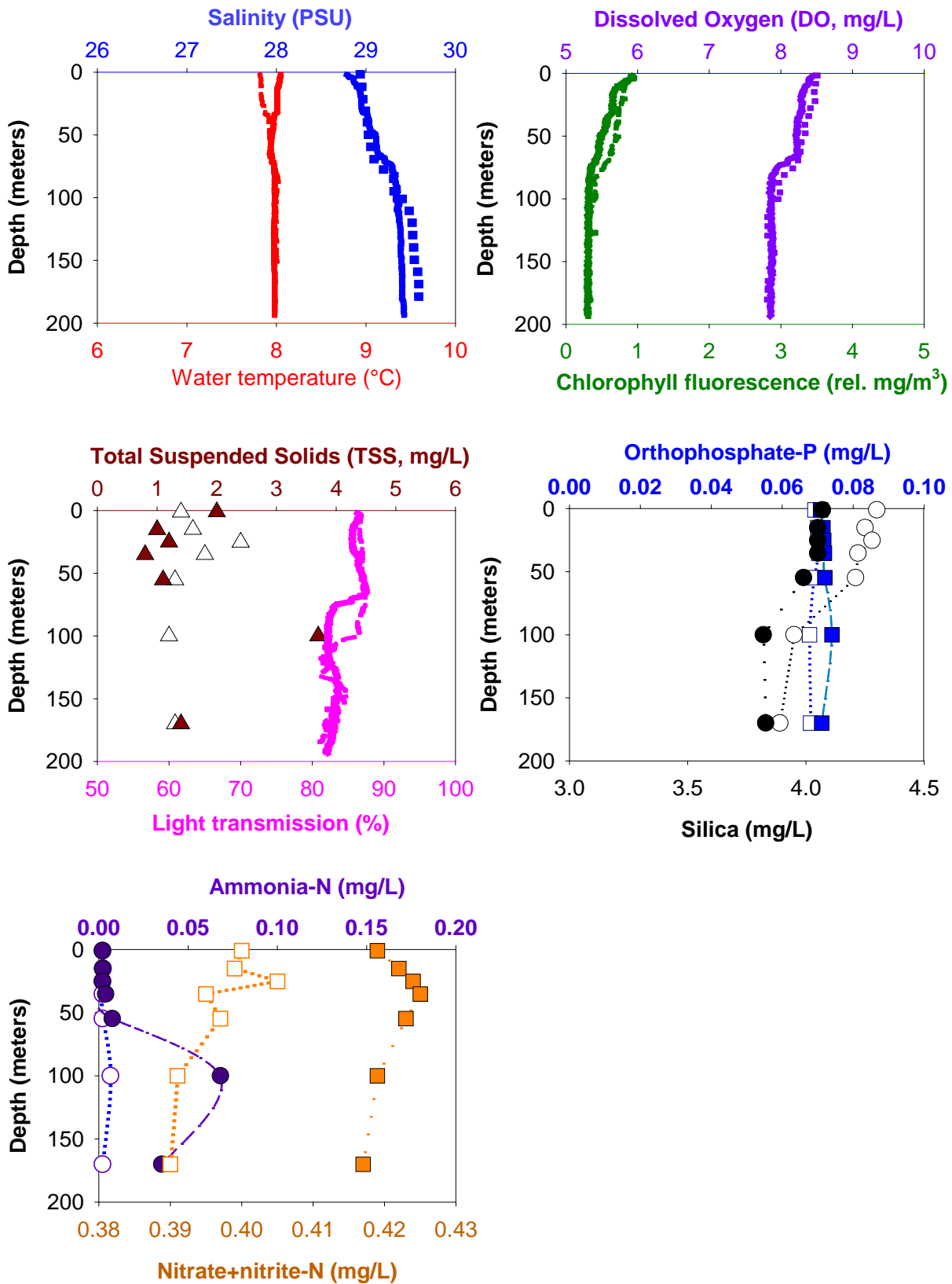


Figure A-4. Offshore water column profile (lines) and discrete water quality results (points) from the first two weeks of March 2017 at the South Plant Outfall. Dashed lines and open symbols represent the March 6th/7th sampling event and solid lines and solid symbols represent the March 15th sampling event.

Offshore Water Quality: LSNT01 – Point Williams

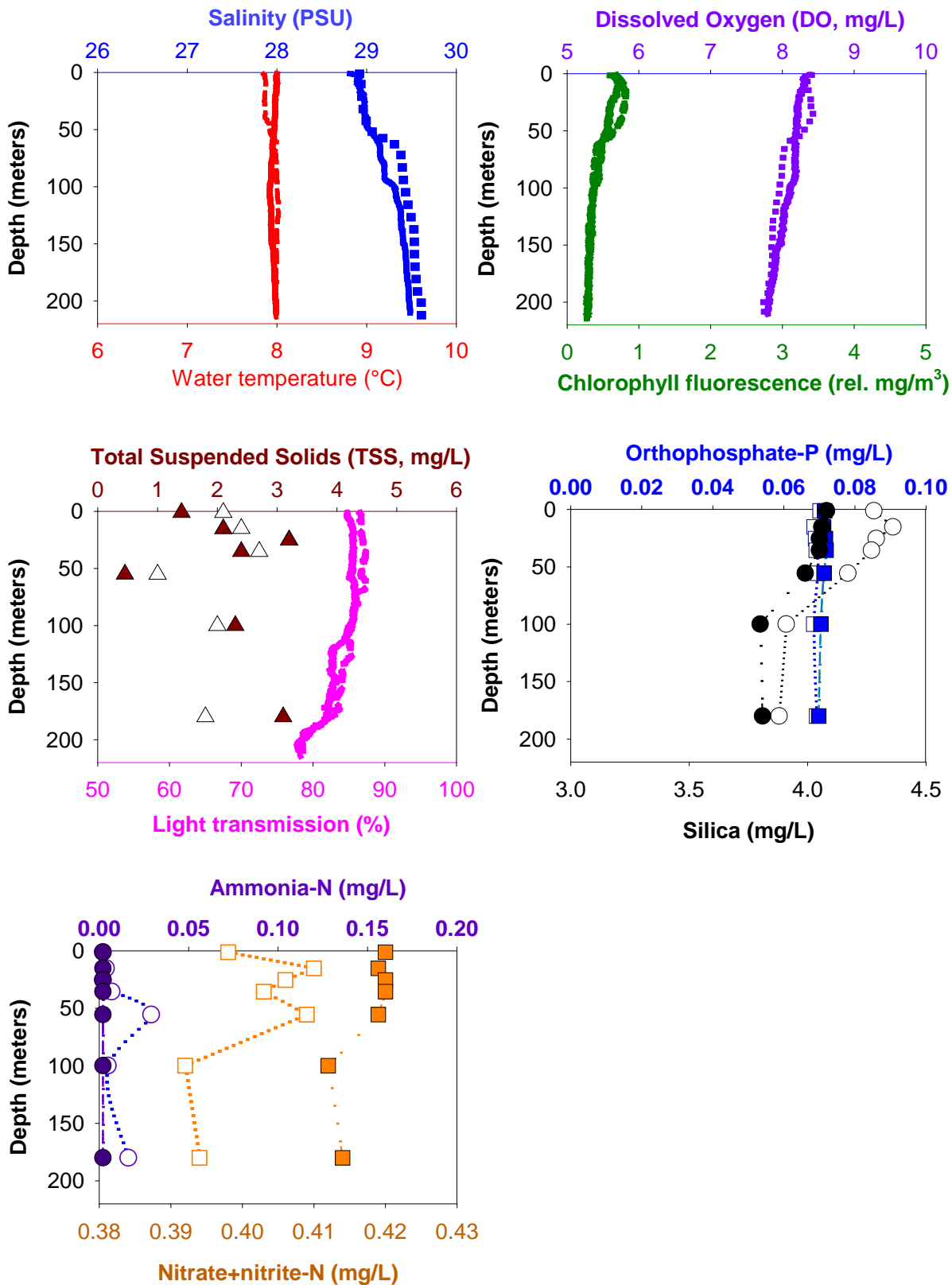


Figure A-5. Offshore water column profile (lines) and discrete water quality results (points) from the first two weeks of March 2017 at Point Williams. Dashed lines and open symbols represent the March 6th/7th sampling event and solid lines and solid symbols represent the March 15th sampling event.

Fecal Indicator Bacteria: Offshore

Table A-2. Offshore fecal indicator bacteria concentrations at select monitoring sites during the first two weeks of March, 2017. Stations near West Point Treatment Plant Outfall are highlighted.

	Station	Date	Depth (m)	Fecal Coliform (CFU/100 mL)	<i>Enterococcus</i> (CFU/100 mL)
Offshore	KSBP01	3/6/2017	1.3	0	1
	KSSK02	3/6/2017	0.9	0	1
	KSSK02	3/6/2017	24.9	0	0
	KSSK02	3/6/2017	55.2	0	2
	EBO	3/6/2017	1	0	1
	EBO	3/6/2017	12	0	3
	LSEP01	3/7/2017	1.2	0	1
	LSEP01	3/7/2017	99.9	0	2
	LSEP01	3/7/2017	170	0	0
	LSNT01	3/7/2017	1	0	0
	KSBP01	3/15/2017	1.1	1	3
	KSSK02	3/15/2017	1	10	13
	KSSK02	3/15/2017	25	0	5
	KSSK02	3/15/2017	55.3	0	6
	EBO	3/15/2017	1.1	2	6
	EBO	3/15/2017	12.1	0	11
	LSEP01	3/15/2017	1	2	1
	LSEP01	3/15/2017	100	1	0
	LSEP01	3/15/2017	170	1	0
	LSNT01	3/15/2017	1	0	0