Plume Tracking Monitoring Plan for the Point Loma and South Bay Ocean Outfall Regions, San Diego, California

Progress Report
March 2020

Report Period: January – December 2019

City of San Diego Point Loma Wastewater Treatment Plant
(NPDES CA0107409; Order No. R9-2017-0007)

City of San Diego South Bay Water Reclamation Plant
(NPDES CA0109045; Order No. R9-2013-0006
as amended by Order Nos. R9-2014-0071 and R9-2017-0023)

U.S. IBWC South Bay International Wastewater Treatment Plant
(NPDES CA0108928; Order No. R9-2014-0009
as amended by Order Nos. R9-2014-0094, R9-2017-0024, and R9-2019-0012)

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Continual Improvement, Prevention of Pollution, Regulatory Compliance
ISO 14001

The Plume Tracking Monitoring Plan (PTMP) was designed to develop new and effective procedures for enhanced water quality monitoring and adaptive plume tracking in the San Diego region. These procedures included: (a) the deployment of a real-time oceanographic mooring systems (RTOMS) located near the terminal diffuser wye structures of the Point Loma Ocean Outfall (PLOO) and the South Bay Ocean Outfall (SBOO); (b) deployment of static ADCP and thermistor moorings; and (c) deployment and testing of a remotely operated towed vehicle (ROTV; i.e., ScanFish III). Although the requirement to develop the PTMP did not go into effect until October 1, 2017 for the PLOO region, and December 13, 2017 for the SBOO region, work began about two years earlier with the Scripps Institution of Oceanography (Scripps), to design, build, and initiate field testing of the PLOO and SBOO real-time mooring systems.

Detailed here are significant activities that have been completed to date to achieve the objectives outlined in the PTMP (see Table 1for updated PTMP timeline). As shown below, the deployment of both the SBOO and PLOO moorings are on schedule, with the PLOO RTOM currently in its second deployment, and the SBOO RTOM now in its third deployment.

Timeline of Activities Completed

2015	
November	Initial acquisition, training, and testing of the ROTV (ScanFish III)
2016	
May	ScanFish software/hardware training and field testing
December	First deployment of SBOO RTOM
2017	
May	ScanFish software/hardware training and field testing
November	ScanFish software/hardware training and field testing
December	First retrieval of SBOO RTOM
2018	
March	First deployment of PLOO RTOM
June	ScanFish software/hardware training and field testing
August	Second deployment of SBOO RTOM (e.g., see Figure 1A)
2019	
March	First retrieval of PLOO RTOM
May	ScanFish software/hardware training and field testing
May	Consultation with Scripps staff to strategize locations of the City's static moorings
June	2018 Plume Tracking Progress Report submitted
September	Second retrieval of SBOO RTOM
October	Further consultation with Scripps to develop a plan to transfer data storage and processing responsibilities of RTOM data to the City of San Diego by the end of the current SIO contract in 2022
October	Second deployment of PLOO RTOM (e.g., see Figure 2)
December	Work plan for ROTV/CTD quarterly surveys completed (see Adaptive Plume Tracking Pilot Study, attached)
December	Third deployment of SBOO RTOM (e.g., see Figure 1B)

Changes to Project Plan

For the most part, we have stayed very close to the original timeline of activities outlined in the PTMP (see Table 1). However, due to unforeseen circumstances, retrieval and redeployment of the RTOMS have, on occasion, taken significantly more time than originally anticipated, which resulted in longer periods out of the water. Specifically, the second deployment of the PLOO RTOM took approximately seven months after retrieval due to several sensor related issues. Sea-Bird Electronics manufacture many of the sensors used on both the SBOO and PLOO moorings, and due to delays in their ability to service these sensors in a timely manner, we were forced to delay the redeployment of both RTOMS. For example, the SeapHOx sensor, which measures pH, had significant manufacturing problems in 2018 and 2019, as components of the sensor were manufactured out of specification, which in turn resulted in sensors not meeting calibration standards. Consequently, due to this manufacturing fault, Sea-Bird servicing time for this sensor alone increased four to six months. Sensors that were expected to be ready in February were not ready until May. Furthermore, two SeapHOx sensorsthat had previously been factory calibrated failed our in-house pool calibration test. Thus, these two sensors were returned once again to Sea-Bird for further modifications and calibrations. After an additional three months at Sea-Bird, we finally received the newly calibrated sensors in mid-September 2019, and proceeded to redeploy the PLOO mooring in October 2019.

To help ensure that delays, such as those described above, cause minimal impact in the future, we are working to streamline the redeployment process by obtaining more back-up sensors, and planning for longer equipment service times with manufacturers. The results of these improvements are already evident by the reduction in time for the retrieval and redeployment of the SBOO mooring, which only took three months. The City of San Diego is seeking an additional $130K in funding for FY21 to spend on sensors, which should facilitate a further reduction in the time RTOMS spend out of water. As we learn more about the servicing requirements and sensor replacement needs of these moorings, we expect to continue to improve efficiency and reduce down-time.

Notable Equipment Issues

PLOO-01

- Sea-Bird SeapHOx pH sensor @ 94 m (bottom): batteries died a few days into deployment, due to incorrect configuration during pool calibration testing.
- Turner Cyclops C7 Chlorophyll a and CDOM sensor @ 94 m (bottom): failed entire deployment.
- Chelsea UviLux BOD sensor @ 94 m (bottom): reset to factory default then failed one week after deployment.
- Satlantic SUNA nitrate V1/V2 sensor @ 94 m (bottom): fouled or otherwise failed ~five months after deployment, recorded large negative values.
- Satlantic SUNA nitrate V1/V2 sensor @ 1 m (surface): recorded negative values, possibly due to incorrect zero calibration and may be corrected post-processing.
- RDI ADCP batteries died shortly after 11 months deployed: was only predicted to last eight to nine months based on RDI software.
- AIS stopped working after deployment. New unit purchased.

PLOO-02

- Pro-Oceanus pCO2 sensor @ 1 m (surface): reading low values prior to deployment. Internal pump was replaced, which remedied the problem.
- Satlantic SUNA nitrate V1/V2 sensor @ 1 m (surface): recorded negative values, possibly due to incorrect

zero calibration and may be possible to corrected during post-processing.
- Cell phone communication lost on PLOO RTOM on February 14, 2020. Remote attempts to swap cell service were attempted without success. Cell phone modem on mooring will be replaced on March 4, 2020.

SBOO-02
- Sea-Bird SeapHOx pH sensor @ 24 m (bottom): Failed after five months deployed.
- RDI ADCP batteries died shortly after 12 months deployed: was only predicted to last eight to nine months based on RDI software.
- Bottom controller @ 24 m: batteries died, as expected, after 12 months deployed, thus no bottom Satlantic SUNA nitrate, Wetlabs Eco-Triplet (CDOM, Chl-a, Backscatter), Chelsea UviLux (BOD), or Sea-Bird SeapHOx (pH) data after batteries died (Aug-Sept 2019).

Planned Activities (CY 2020-2021)

2020

January -May	Acquisition and analysis of data from PLOO and SBOO RTOMS for the period 2018-2019 inclusion in the City of San Diego's Biennial Receiving Waters Monitoring and Assessment Report
January	Retrieval and redeployment of static ADCP and thermistor moorings in PLOO and SBOO regions
February	Adaptive Plume Tracking Pilot Study – PLOO Region Q1
May	Adaptive Plume Tracking Pilot Study – PLOO and SBOO Regions Q2
May	Retrieval and redeployment of static ADCP and thermistor moorings in PLOO and SBOO regions
June	Second retrieval of PLOO RTOM
August	Adaptive Plume Tracking Pilot Study – PLOO and SBOO Regions Q3
August	Third deployment of PLOO RTOM
September	Retrieval and redeployment of static ADCP and thermistor moorings in PLOO and SBOO regions
November	Adaptive Plume Tracking Pilot Study – PLOO and SBOO Regions Q4
December	Third retrieval of SBOO RTOM

2021

January	Forth deployment of SBOO RTOM
March	Submit 2020 Plume Tracking Progress Report

Table 1.

Updated Plume Tracking Monitoring Plan timeline/progress.

Year	Quarter	Real-time Ocean Mooring Systems					Static ADCP / Thermistor Moorings*	Adaptive Plume Tracking				Progress
		PLOO		SBOO		Data Management						
		Deploy (D) / Recover (R)	Acquire Data	Deploy (D) / Recover (R)	Acquire Data			ROTV Training & Testing	Develop Pilot Study	Conduct Pilot Study	Implement Adaptive Plume Tracking	
2016	Qtr 1						PL, SB					•
	Qtr 2						PL, SB	X				•
	Qtr 3						PL, SB					•
	Qtr 4			D1	X	X	PL, SB					•
2017	Qtr 1				X	X	PL, SB					•
	Qtr 2				X	X	PL, SB	X				•
	Qtr 3				X	X	PL, SB					•
	Qtr 4			R1	X	X	PL, SB	X				•
2018	Qtr 1	D1	X			X	PL, SB					•
	Qtr 2		X			X	PL, SB	X				•
	Qtr 3		X	D2	X	X	PL, SB		X			•
	Qtr 4		X		X	X	PL, SB		X			•
2019	Qtr 1	R1	X		X	X	PL, SB		X			•
	Qtr 2				X	X	PL, SB	X	X			•
	Qtr 3	D2	X	R2	X	X	PL, SB		X			•
	Qtr 4		X	D3	X	X	SB		X			•
2020	Qtr 1		X		X	X	PL, SB			X		
	Qtr 2	R2/D3	X		X	X	A/N			X		
	Qtr 3		X		X	X	A/N			X		
	Qtr 4		X	R3/D4	X	X	A/N			X		
2021	Qtr 1		X		X	X	A/N				X	
	Qtr 2	R3/D4	X		X	X	A/N				X	
	Qtr 3		X		X	X	A/N				X	
	Qtr 4		X	R4/D5	X	X	A/N				X	
2022	Qtr 1		X		X	X	A/N				X	
	Qtr 2	R4/D5	X		X	X	A/N				X	
	Qtr 3		X		X	X	A/N				X	
	Qtr 4		X	R5/D6	X	X	A/N				X	

* PL = PLOO, SB = SBOO, A/N = as needed

Figure 1A.

Preliminary data from the second deployment of the SBOO real-time oceanographic mooring system from 08/03/2018 – 09/18/2019. These are raw data have not yet been fully processed.

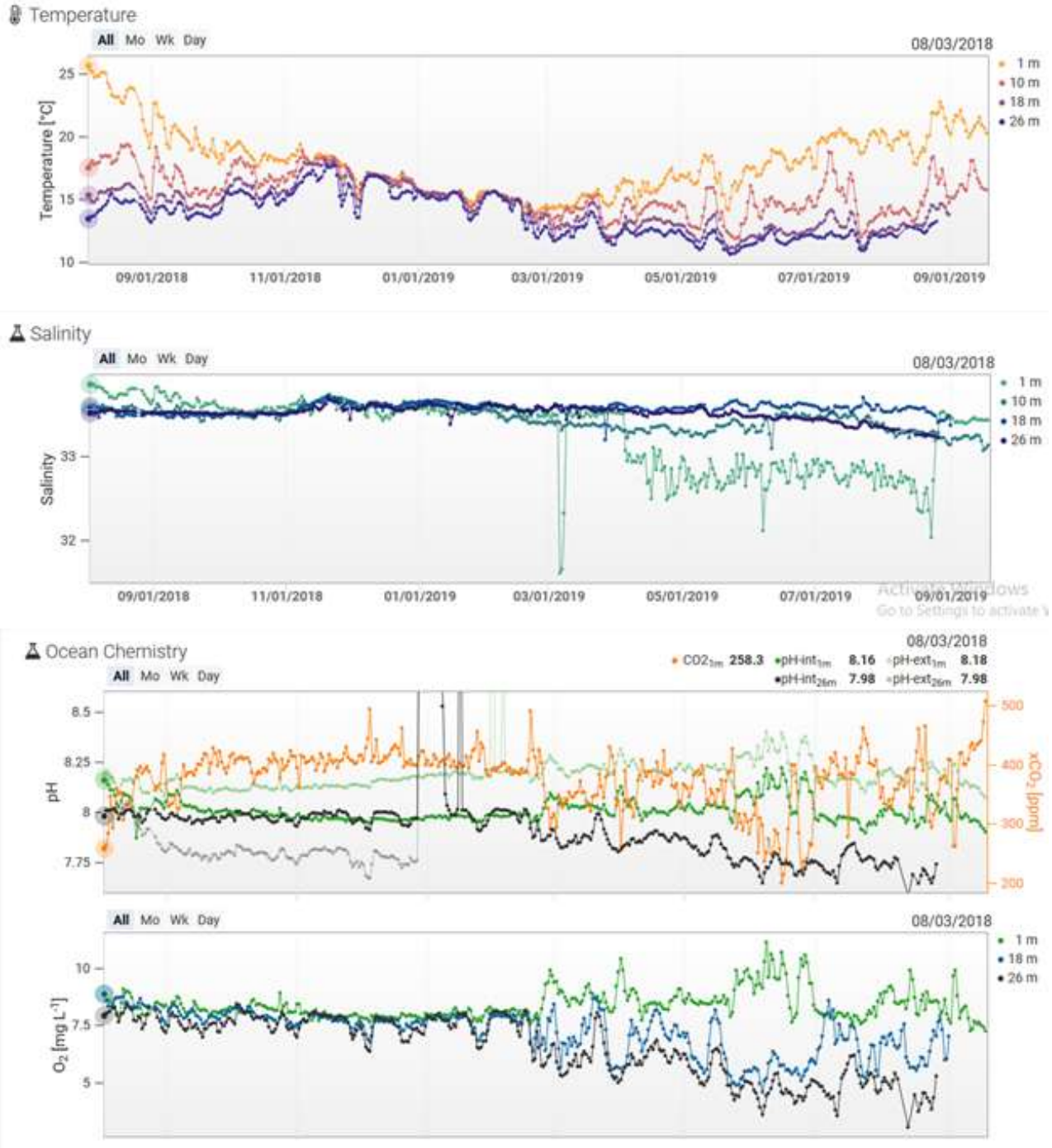

Figure 1A continued

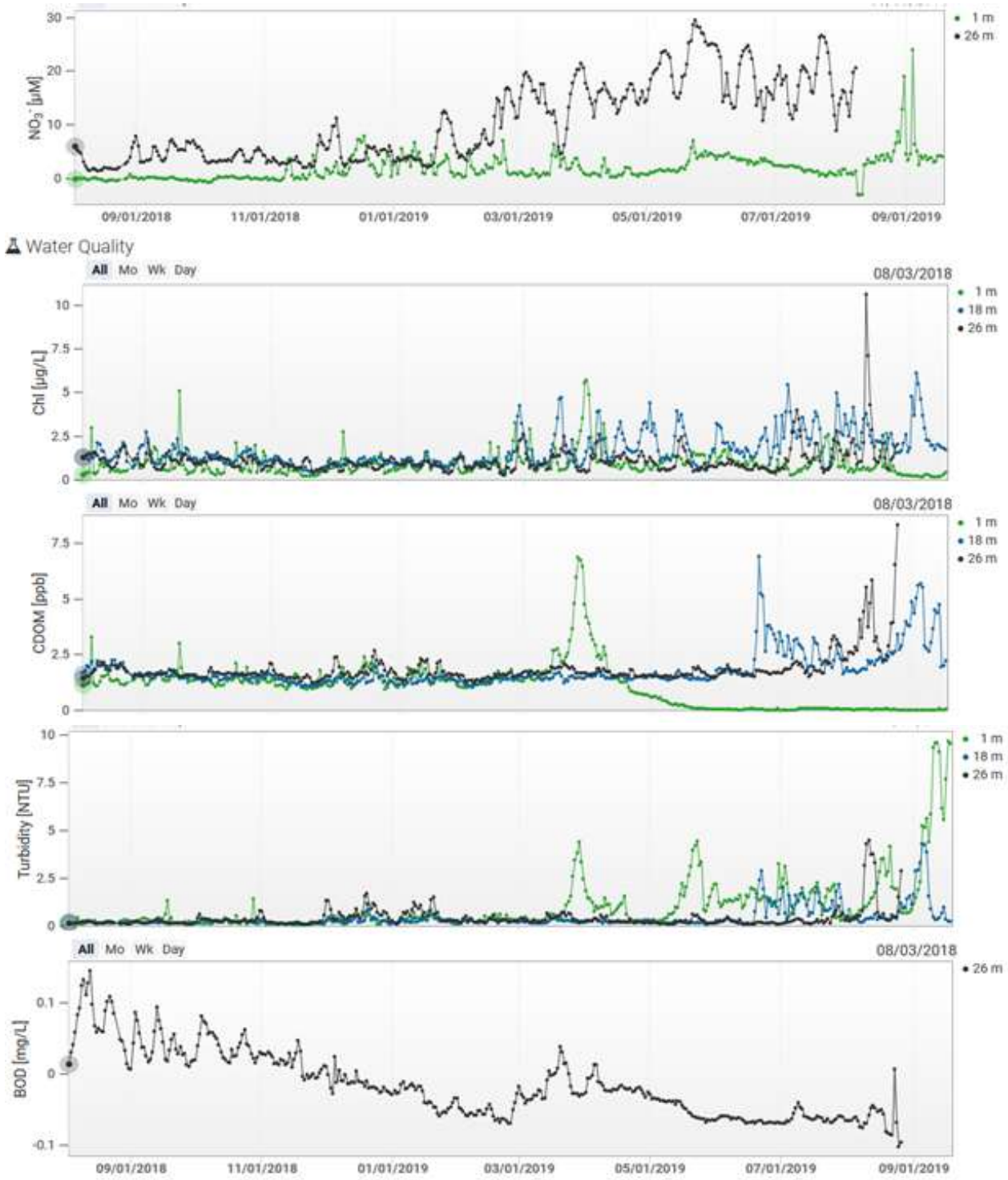

Figure 1B.

Preliminary data from the third deployment of the SBOO real-time oceanographic mooring system from 12/18/2019 – 02/26/2020. These are raw data have not yet been fully processed.

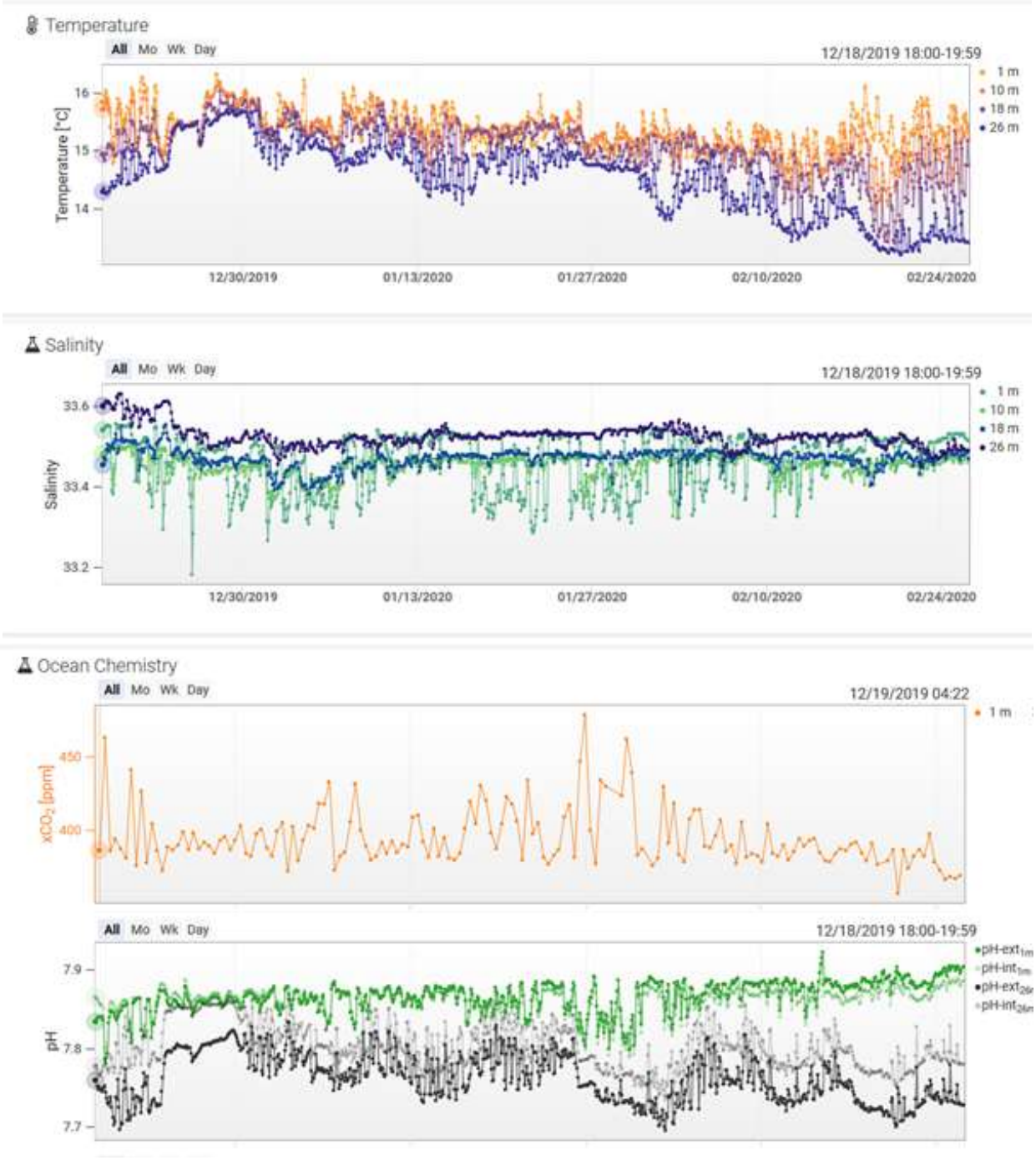

Figure 1B continued

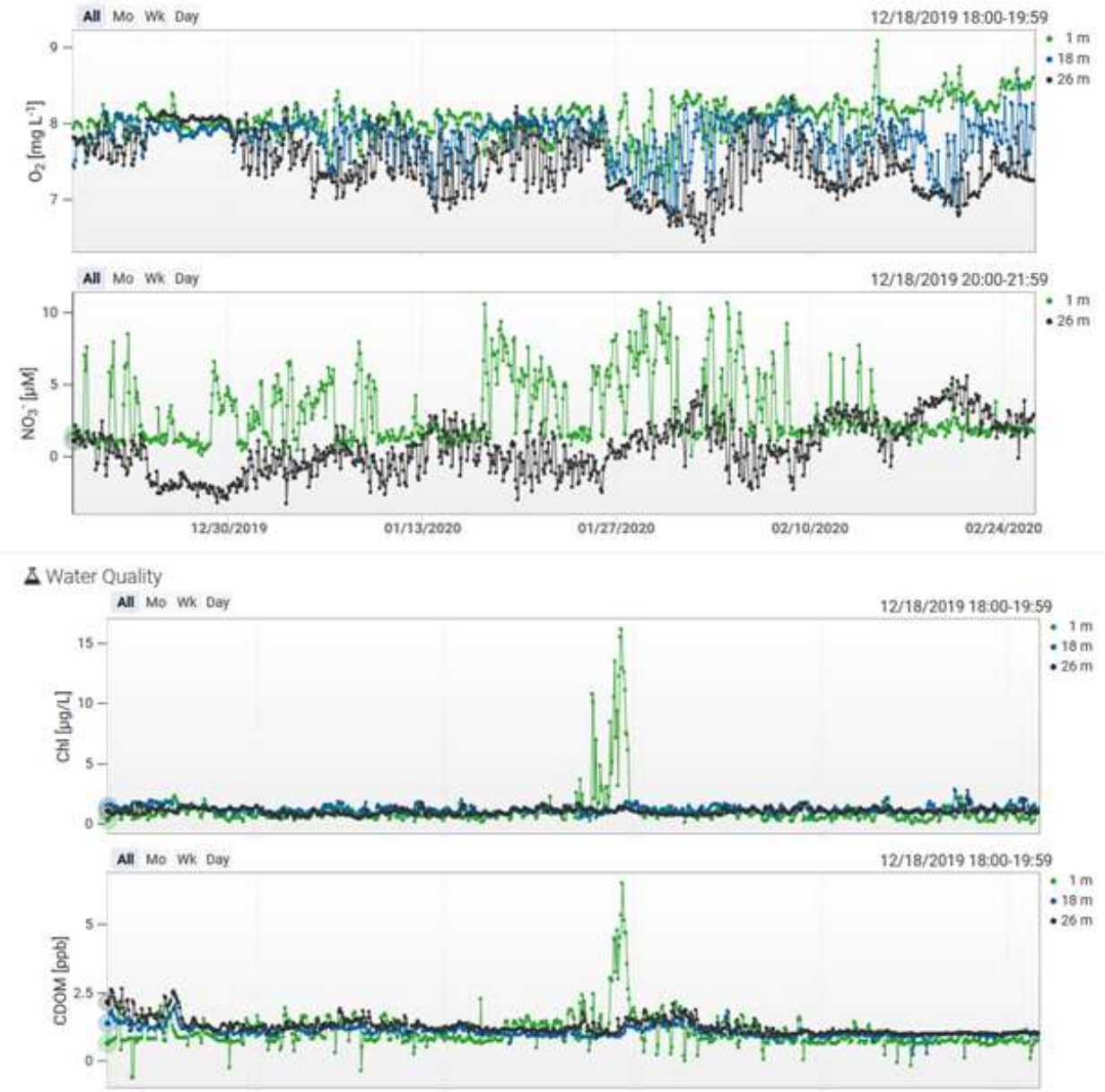

Figure 1B continued

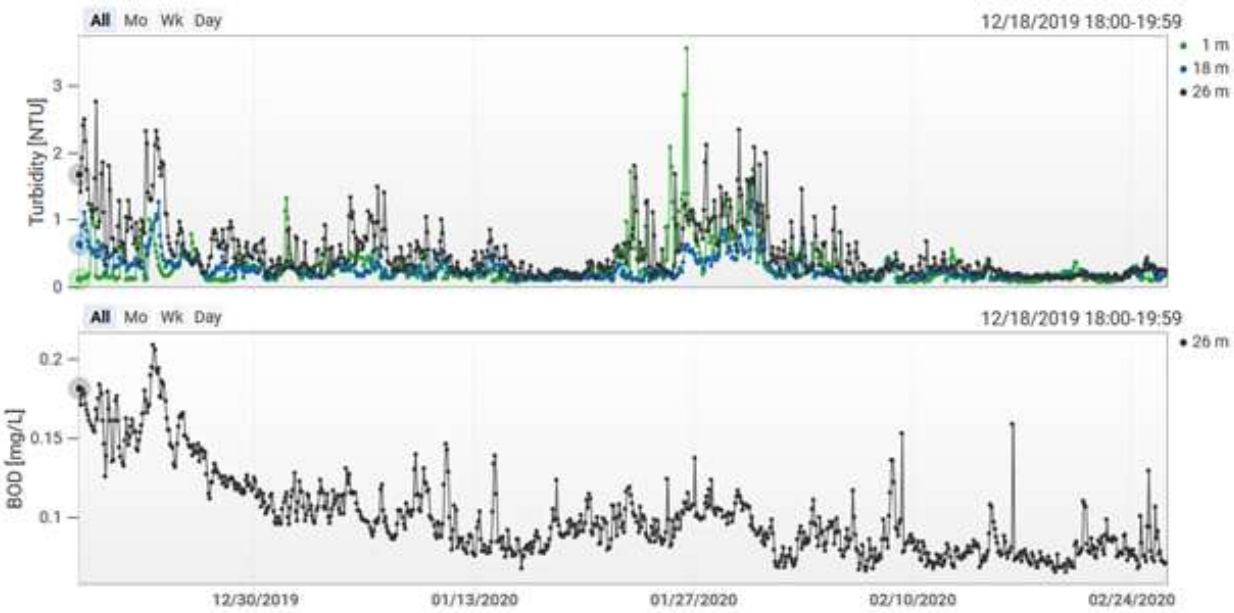

Figure 2.

Preliminary data from the second deployment of the PLOO real-time oceanographic mooring system from 10/07/2019 – 02/15/2020. These are raw data have not yet been fully processed.

Figure 2 continued

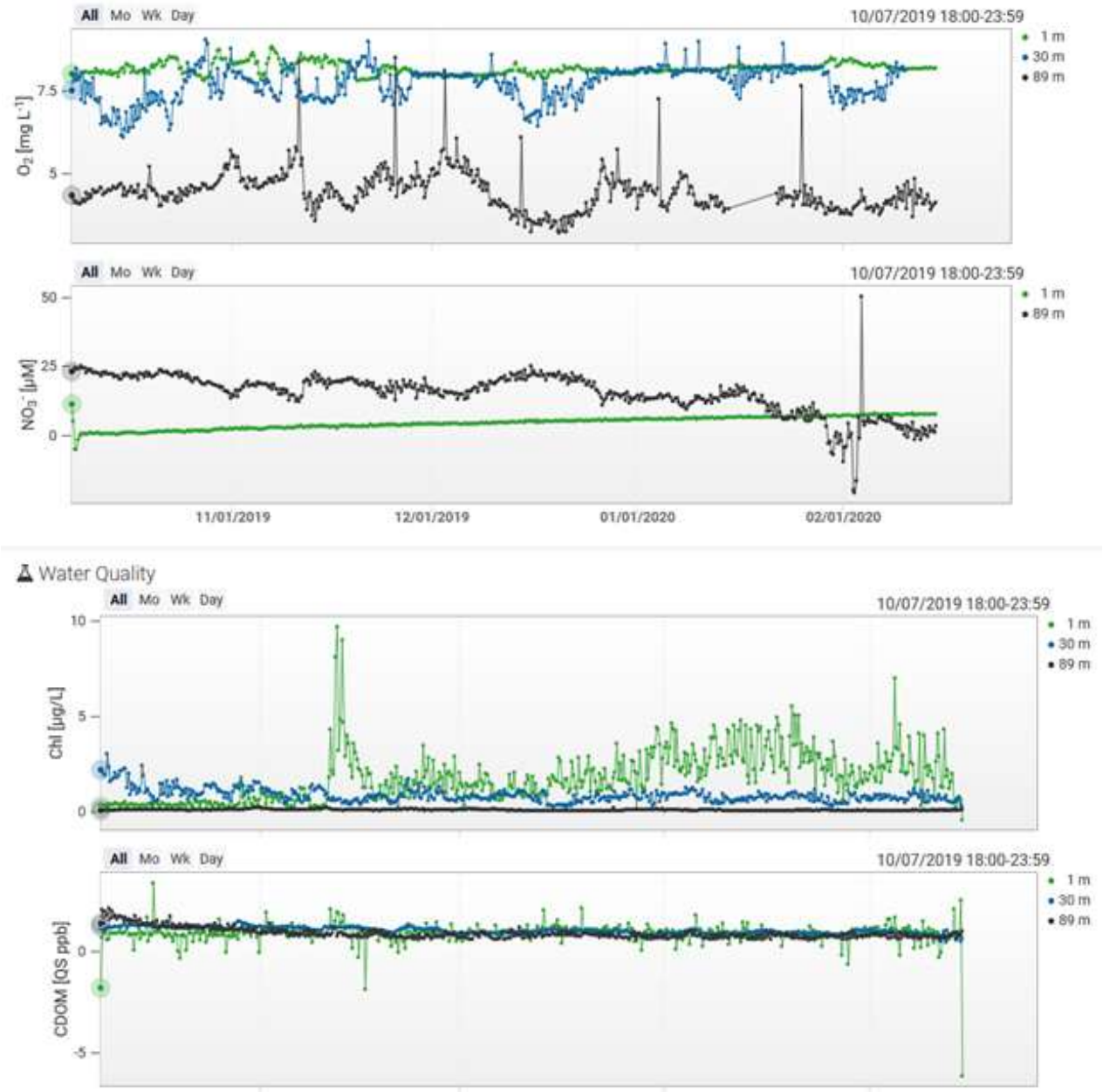

Figure 2 continued