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April 12, 2017

Geoff Merrell
State On-Scene Coordinator
Alaska Department of Environmental Conservation
555 Cordova Street
Anchorage, AK 99501

Re: Middle Ground Shoal Platform, Natural Gas Pipeline Release
Middle Ground Shoal Gas Leak Sampling and Monitoring Plan Summary Report
Sampling Period #4 ending 04/11/2017

Dear Mr. Merrell:

Hilcorp Alaska, LLC ("Hilcorp") submitted the Middle Ground Shoal Gas Leak Sampling and Monitoring Plan ("Plan") to the Department of Environmental Conservation ("Department") on March 8, 2017. Preliminary approval to implement the Plan was provided by the Department on March 10, 2017. As described in Section 3.2 of the Plan, Hilcorp is submitting this fourth weekly summary report to the Department.

In an effort to provide data to the Department as quickly as possible, a complete and thorough quality control evaluation has not been completed at this time. Please note that all data presented in this report is preliminary and should be considered as such until a quality control evaluation is completed. Hilcorp will continue to evaluate data quality and will notify the Department of any significant issues as soon as possible.

As indicated in daily situation reports submitted to the Department, pipeline repair efforts are currently underway. The temporary clamp is anticipated to be installed on the pipeline within the next 1-3 days.

Ice Monitoring:

Hilcorp continues to monitor ice conditions in the area of the gas leak using helicopter overflights and platform observations. Observations are compared to the National Oceanic and Atmospheric Administration (NOAA) ice forecasts. Ice conditions are monitored daily as conditions allow and updates are provided to the Department via Situation Reports. Hilcorp anticipates ice conditions to continue to improve with forecasted warmer weather conditions.

Fish and Wildlife Monitoring:

On April 5 and April 7, one CISPRI protected species observer and one wildlife observer professional from International Bird Rescue conducted an extended overflight of approximately 20 square miles surrounding the gas leak location (within a 5-mile diameter circle). The helicopter was able to fly at approximately 300 to 360 feet altitude. To avoid incidental harassment of marine mammals, altitude would have been increased to 1500 feet, but only in the case where marine mammals were spotted. Flight conditions and visibility were good during all flights. On April 7, one gull (possibly a Glaucous-winged Gull) was observed within the 20 square mile area. Prior to conducting the overflight on April 7, approximately 200 gulls, a few Herring Gulls, and three Bald Eagles were observed within the mouth of the Kenai River. The wildlife observer report is provided in Attachment A.

The next fish and wildlife monitoring events are planned for today (April 12) and Friday (April 14). Wildlife monitoring will continue for two weeks after completion of the pipeline repair.

Water Quality Sampling:

Sampling Period # 4 ending 4/11/2017
The water quality buoy was successfully deployed two times in the area of the gas leak on April 5, 2017, one day after a neap tide. The buoy was equipped with sensors to monitor temperature, pH, salinity, ORP, conductivity, relative conductivity, and concentrations of dissolved oxygen and methane. During Sampling Period #4, the buoy was tethered to the deck to allow for periodic adjustment of the buoy's travel path. This method of deployment reduced the depth of the instruments in the water column to 0.8, 5.8, and 11.3 meters below the water surface.

Drifts #1 and #2 during Sampling Period #4 passed 68 meters and 10 meters from the gas release, respectively. As noted in Attachment A, Drift #2 passed through the bubble plume which was surfacing approximately 10 meters from the leak site. Water quality sampling during Sampling Period #4 showed limited variability in dissolved oxygen, methane, and carbon dioxide concentrations. The lowest dissolved oxygen reading observed (11.5 mg/L) at 10.8 meters below the water surface was well above the water quality standard specified under 18 AAC 70 for marine waters. The highest methane concentration observed was 0.106 mg/L. No violations of state water quality standards were identified.

Vertical CTD Casts
Four CTD casts were performed to obtain vertical profiles of the water column at distances ranging between 91 and 645 meters from the gas leak location. Temperature, salinity, and dissolved oxygen was measured by lowering and raising the CTD to and from the seafloor. Limited variability with depth was identified for all three parameters indicating the water column was well mixed, and not stratified.

Laboratory Results
Laboratory results for water samples collected on March 29 were received during Sampling Period #4. Data indicate the highest methane concentration at 0.21 mg/L, located 1 meter below the water surface. Carbon dioxide concentrations in laboratory samples ranged between 1.5 to 1.8 mg/L. Aggregated laboratory and sensor data suggest methane is not significantly affecting carbon dioxide concentrations in the area of the gas leak.

A summary report and additional safety documentation for the water quality sampling efforts are provided in Attachment B. The next water quality sampling effort is planned to occur today (April 12), conditions permitting

Air/Water Interface Sampling:

The next air/water interface sampling effort is planned to occur today (April 12), conditions permitting.

Acoustic Monitoring:

Acoustic monitoring described in the Plan was conducted previously on Sunday March, 27, 2017. A second acoustic monitoring effort was initiated on April 7, 2017 to measure underwater sound pressure levels from the use of a CaviBlaster® during pipeline repair operations. Prior to beginning repair operations, Autonomous Multichannel Acoustic Recorders (AMARs) were placed on the seafloor at two fixed distances from the leak location. The AMARs have been continuously recording acoustic data in the Cook Inlet with ice coverage ranging between 0-1 tenth since deployment. To date, use of the CaviBlaster® has not been required for repair operations. Data obtained from the AMARs will be reported to the Department in support of acoustic monitoring efforts described in the Plan. The Operation Plan for this acoustic monitoring effort is provided in Attachment C.

If you have any questions or concerns regarding this letter, please feel free to contact either myself or the appropriate Hilcorp staff member as we continue to work with you on our ongoing response to this event.

Sincerely,

William G. Britt, Jr.
Environmental Manager

Attachments:
- Attachment A: Fish and Wildlife Monitoring Summary Report
- Attachment B: Water Quality Sampling Summary Report
- Attachment C: Acoustic Monitoring – Sound Source Characterization Operations Plan

ATTACHMENT A

FISH AND WILDLIFE MONITORING SUMMARY REPORT

April 5, 2017 Report
Hilcorp Cook Inlet Wildlife Surveys
By Wildlife Observer, Responder, IBR

I arrived at Ross Aviation at 6:30 am, and took Hilcorp charter from Anchorage to Kenai, landing in Kenai about 7:40 am. I picked up a Hilcorp pool car at the Kenai hangar. Weather was cloudy with a north wind.

I ate breakfast, checked for any recent relevant eBird sightings in the upper Cook Inlet area (none), and got gas for the car.

I visited the Kenai River mouth area about 10:40-10:50 am at incoming tide, and observed about 100 gulls on the grassy flats, with a few flying along the coast. At 11:20-11:30, no marine birds were seen around Nikiski dock area.

I arrived at OSK helipad about 11:45 am. I met the PSO from CISPRI who was the marine mammal observer on the same flight. We started the heli survey at 1:15 pm although slack tide was at 1:03 pm. We were delayed for takeoff because there was only one helicopter functioning and there was a crew change ahead of us.

We were able to fly at 300-400' ASL because the volume of methane leaking has diminished. The sky was completely overcast and the remaining ice (< 25% of the area) has mostly broken into smaller pieces floating on the water. I sat on the outside circling window as we made counter-clockwise circles around the leak (which was not visible). The outer ending GPS point was Latitude 60 N 44.409', and Longitude 151W 28.706 (taken by Brian Heath, CISPRI). No wildlife was observed.

I departed Kenai at 5:30 pm and arrived at Ross Aviation hangar in Anchorage about 6 pm.

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April 7, 2017 Report
Hilcorp Cook Inlet Wildlife Surveys
By Wildlife Observer, Responder, IBR

I arrived at Ross Aviation at 6:30 am, and took Hilcorp charter from Anchorage to Kenai, landing in Kenai about 7:00 am. I confirmed my return flight with Tim, and picked up a Hilcorp pool car at the Kenai hangar. Weather was partly cloudy with a north wind.

I ate breakfast, and checked for any recent relevant bird sightings in the upper Cook Inlet area from eBird.org and the AK Birding listserv (see below). Spring migration is beginning.

From eBird:

> ***Location: Kenai Flats Birding Platform, Kenai Peninsula County, Alaska, US (Map) – upstream from river mouth 60.541834, -151.218395***
>
> ***At Wed Apr 05, 2017 12:30 PM***
>
> *Observers:*
> *Kenneth Tarbox, Preston Bicknell*
> *Waterbird sightings*
> ***20 Mallard***
> ***4 Northern Pintail***
> ***2 Greater Scaup***
> ***14 Common Goldeneye***
> ***3 Bald Eagle***
> ***50 Mew Gull***
> ***4 Herring Gull***
> ***100 Glaucous-winged Gull***
> ***1500 gull sp.***

I visited the Kenai River mouth area from 11:45-12:10 pm during incoming tide, and observed about 200 gulls on the nearshore grassy flats, with a few Herring Gulls and three Bald Eagles flying along the coast.

At 1:45-2:00 pm, no marine birds were seen around Nikiski dock area. I arrived at OSK helipad about 2:05 pm. I met the PSO from CISPRI who was the marine mammal observer on the same flight. We started the heli survey at 3:05 pm and slack tide was at 3:15 pm. We were able to fly about 360' ASL because the volume of methane leaking has diminished. There was very little ice floating in the survey area, but more in the center of the inlet. I sat on the outside circling window as we made counter-clockwise circles around the leak (which was not visible). The outer ending GPS point was Latitude N 60 47.943, and Longitude W 151 31.893 (taken by PSO, CISPRI). Visibility was good and I saw one gull flying in the survey area (possibly Glaucous-winged Gull).

I departed Kenai at 5:00 pm and arrived at Ross Aviation hangar in Anchorage about 6:10 pm after a stop at the Drift River facility.

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	Date	Bird Obs	Start Time	End Time	Slack Tide Time	Tide Loc	Approx Survey Speed (kts)	Approx Survey Alt (ft)	Approx Area Obs (sq mi)	% Open Water	Beaufort Sea State	Swell	Nikiski Weather Time	Air Temp (deg F)	Wind Speed (kts)	Wind Dir	Visib (mi)	Cloud Cover (%)	Precip (in)	Pilot	Marine Mammal Obs	Comments
1	3/9/2017	*flight data sheet not completed for March 9, 2017*																				
2	3/17/2017	*WO*	1505	1550	1513	Nik	85	500	15	<25	0	0	1415	18.5	6.8	ENE	100+	0	0	TP	CISPRI PSO	No wildlife observed
3	3/20/2017	*WO*	1010	1120	1028	Nik	85	500	20	<25	0	0	1135	26.4	4.3	NNW	100+	5	0	unk	CISPRI PSO	No wildlife observed
4	3/22/2017	*WO*	1305	1400	1311	Nik	85	500	20	25-50	0	0	1413	31.3	2.5	ESE	100+	0	0	Joe	CISPRI PSO	No wildlife observed. Approx. 20% open water around leak site. Slight swell seen under ice near leak per WC.
5	3/31/2017	*WO*	1445	1538	1437	Nik	85	350	see GPS	25-50	2	<1	1430	31.3	15.2	ENE	50+	100	0	Joe	CISPRI PSO	1 gull and 1 raven seen by PSO and Pilot in survey area.
6	4/5/2017	*WO*	1315	1410	1303	Nik	60-70	300-400	see GPS	>75	2	1	1215	35.2	8.7	ENE	50+	100	0	TP	CISPRI PSO	No wildlife observed
7	4/7/2017	*WO*	1505	1605	1515	Nik	60	360	see GPS	99	2	1	1617	37.2	3.3	NNE	100+	50	0	TP	CISPRI PSO	One flying gull in survey area.

PSO - Protected Species Observer
WO - Wildlife Observer

Cook Inlet Operations - Protected Species Observer Effort Log

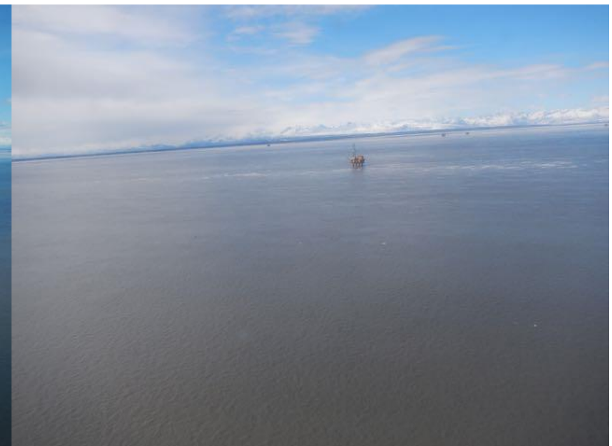
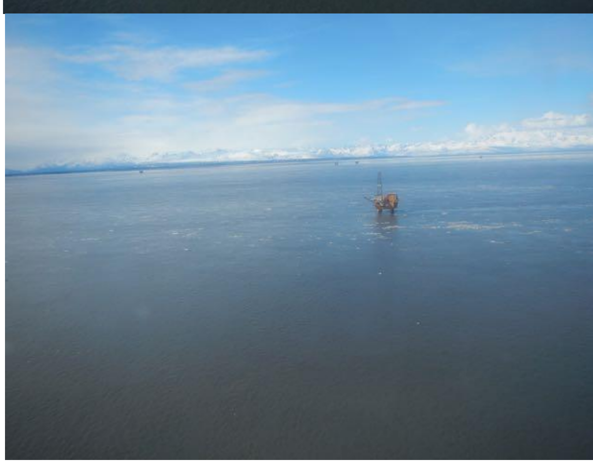
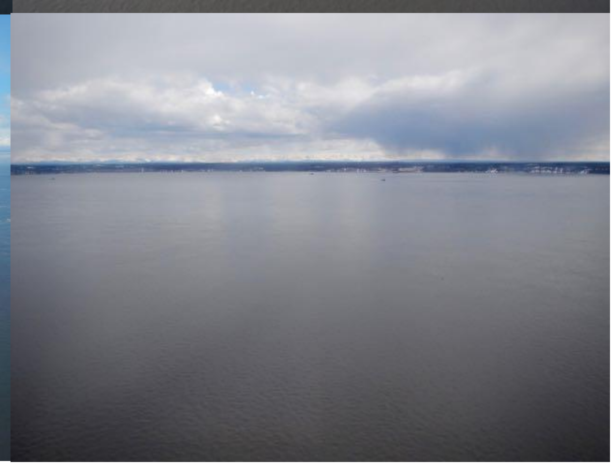
Project ID: PSO Hilcorp

Name: CISPRI Protected Species Observer **Initial:** PSO **Vessel Name:** Hilcorp Helo

Effort Log Page #: MMO-008

Date MM/DD/YYYY	Observers' Initials	Start of watch				End of watch				Wind direction	Beaufort sea state	Swell (m)	Visibility (km)	Glare severity
		Time	Latitude	Longitude	Depth (m)	Time	Latitude	Longitude	Depth (m)					
4/05/17	PSO	1300	N. 60° 44.409'	W 151° 18.546'	Altitude 300 to 400'	1400	N. 60° 48.545'	W. 151° 29.042'	Altitude 300' to 400'	8.7 Knots	Ø	Ø	unlimited	none
4/07/17	PSO	1500	004 N. 60° 44.330	W 151° 18.649	Alt 523'	1356	005 N. 60° 47.943	W. 151° 31.893	Alt 363'		Ø	Ø	unlimited	none

Photograph Log

Photos were taken the vicinity of the leak with a view of Platform A. Flight circles are approximately 0.5 miles apart. The still water has been conducive to detecting flight or dive movements of wildlife.

ATTACHMENT B

WATER QUALITY SAMPLING SUMMARY REPORT

Cook Inlet Methane Pipeline Leak Area

Water Quality and Air/Water Interface Monitoring

Weekly Report #4

Prepared by SLR International Corporation (SLR)

Report Date: 4-12-2017

1.0 OVERVIEW

The fourth water quality monitoring event was conducted from aboard the Offshore Service Vessel (OSV) Titan during this reporting period using the approaches and methods described in the ADEC-approved plan (SLR 2017a). There was no air/water interface sampling this reporting period.

Safety of the vessel and crew was top priority during the monitoring activities. The quantity and location of sampling events were determined by site and weather conditions. The data presented herein is preliminary, subject to further review and verification by SLR International Corporation (SLR).

The revised location of the methane leak provided by Hilcorp prior to the first monitoring event on March 18 was used for the purposes of monitoring and reporting. This revised location and corresponding water depth is:

- Latitude 151°26'01.84"W, Longitude 60°46'35.68"N
- Easting1384137.82, Northing: 2478537.39
- Water Depth (MLLW) = 21.18 meters (69.51 feet)

This location is referred to as the Methane Release Point (MRP). Initial estimates of the leak rate ranged from 203 to 300 thousand cubic feet per day (MCFD). On March 13, Hilcorp reduced the pressure in the line and reported the gas flow rate from the leak was 193 to 215 MCFD. On March 25, 2017, the leak rate was further reduced to 85 to 115 MCFD. On April 10, the flow rate was further reduced to a reported rate of 78 to 108 MCFD.

As discussed in Section 2.2 of this report, based on the preliminary data review completed to date, the dissolved oxygen (DO) concentrations measured during this event and the previous events did not violate the Alaska Water Quality Standards (AWQS) as established in Title 18 Alaska Administrative Code (AAC), Chapter 75 (18 AAC 70).

2.0 WATER QUALITY MONITORING

2.1 Activities Completed

Water quality monitoring and sampling was conducted on April 5, 2017, one day after a neap tide event on April 4. The monitoring period covered portions of a flood and ebb tide. The NOAA tide predictions at the nearby East Forelands area predicted a high tide at 13:14 with height of 5.49 meters above mean lower low water (MLLW) on April 5. At the MRP site the tide changes about 50 minutes after NOAA tidal predictions for the East Forelands area, and drifts were planned accordingly. The field team consisted of one SLR and one Kinnetic Laboratories, Inc. (KLI) scientists. The field team members (samplers) were Alaska Department of Environmental Conservation (ADEC) qualified samplers, per 18 Alaska Administrative Code 75.

The data collection activities followed the Water Quality Cook Inlet Alaska Methane Pipeline Leak Water Quality Sampling Plan (WQ Plan), (SLR 2017a). The primary data collection method utilized a drifting instrumented buoy to obtain water quality parameters in the area of interest. The drifting buoy had multiple instruments suspended along a line at three depth intervals (2, 7 and 12.5 meters) as depicted on Figure 1. The primary instruments are listed below:

- SeaBird Electronics, SBE 19 plus V2 SeaCAT- conductivity, depth, temperature (CTD), with dissolved oxygen (DO), pH, and turbidity.
- Pro-Oceanus Mini Methane
- Pro-Oceanus Mini Carbon Dioxide
- PME MiniDOT
- Garmin WAAS differential global positioning system (mounted on buoy and used to track the buoy's position during a monitoring transect)

Reported instrument depths below the water surface (bws) are based on length of line from the bottom of the buoy to the instrument(s). The buoy drifted with the current so the instrument string maintained a near vertical position during deployment. However, unlike the previous three weeks, during Week 4 the buoy was tethered to the deck of the boat, allowing for periodic adjustment of the buoy's travel path throughout the drift to better intercept the MRP. This method of deployment raised the buoy 1.2 meters above the water surface, and reduced the depth of the instruments in the water column by 1.2 meters. So, monitoring depths for this reporting period were approximately 0.8, 5.8, and 11.3 meters. This was verified by review of the depth reading obtained by the CTD, which was located at the end of the line. A summary of the parameters measured by each instrument and frequency is provided in Attachment A, Table A-1.

During event 4, the site conditions impacted the activities completed and collection of data, as noted below:

- Ice conditions during the fourth event varied from approximately 5-9 tenths ice cover, with greater variability across the entire inlet. Ice coverage was considerably less, approximately to 0-1 tenths during the flood tide (around 2-5 pm AKDT). Monitoring activities were responsive to these dynamic site conditions, and at one point were temporally suspended due to ice.

- Air temperatures varied between 2 and 7 ºC with water temperatures typically about -1.0 ºC, and icing of equipment was a concern.

- A new DO sensor was installed on the SeaBird CTD system, which operated satisfactorily.

- MiniCH4 and MiniCO2 sensors at the 11.3 meter depth were mounted with the membrane facing the water's surface as precautionary measure to prevent gas bubbles from the MRP becoming trapped within the enclosure surrounding the membrane. Prior to this week, these sensors had been mounted with the membrane facing toward the seafloor.

Two water quality buoy drifts (monitoring transects) were completed through the area surrounding the MRP on April 5 at differing tidal stages. The duration of each water quality buoy drift varied from approximately 20 to 57 minutes. Drift #1 occurred during the flood tide. The buoy was deployed approximately 170 meters up current of the MRP was allowed to drift down current approximately 500 meters, with periodic adjustment using the vessel to guide it in the direction of the observed "bubble" plume down current of the MRP. The buoy passed through the bubble plume about 8 minutes into 20 minute drift. Drift #2 was started near the end of the flood tide, and continued through the slack and into a portion on the ebb tide. The drift began approximately 200 meters up current of the MRP and drifted through the bubble plume on the flood tide. After passing the bubble plume, the buoy continued to drift down current until slack tide. Once the tide began to ebb, the buoy drifted back through the bubble plume and down current 500 meters (Attachment A, Figure A-2d). Table A-2 in Attachment A provides a summary of the buoy deployments. At the closest point, the buoy passed approximately 68 and 10 meters from the MRP during Drifts #1 and #2, respectively. As noted, during Drift #2 the buoy passed through the bubble plume which was surfacing approximately 10 meters from the MRP on the seafloor.

Four CTD casts were performed to obtain vertical profiles of the water column. The cast consisted of lowering the CTD to the seafloor and bringing it back up. The primary objective was to assess the heterogeneity of the water column, by measuring temperature, salinity, and dissolved oxygen at a variety of depths. Casts were performed with the boat in neutral, and drifting at the speed of the current to maintain a vertical deployment. Each cast was performed at a different starting distance from the MRP, ranging from 91 to 645 meters, as shown in Table A-3: Vertical Cast Summary, April 5, 2017. Each cast took approximately 5 minutes to complete with the vessel drifting approximately 150 to 200 meters during that period. Vertical Cast #4 was started immediately down current of the observed bubble plume.

No water samples for laboratory analysis were collected during week 4.

A photograph log documenting the data collection methods and site conditions during Week 4 is included in Attachment A.

2.2 Summary of Results

The travel path of the buoy during each drift and the location of the vertical CTD casts are illustrated on Figure A-2d.

2.2.1 Buoy Transects-Week 4

Data plots for the primary parameters of interest (DO, CH_4 and CO_2) for the water quality buoy drifts completed on April 5 are provided on Figures A-7.1 and A-7.2 in Attachment A.

- Dissolved Oxygen- The lowest DO value recorded after the sensor had time to stabilize and pass the MRP was 11.5 mg/L during Drift #1 and 11.4 mg/L during Drift #2. There was no significant drop in DO concentrations recorded by the sensors as they passed the MRP, or passed through the bubble plume (Attachment A, Figure A-7.1a and A-7.2a). However, a slight drop on the order of 0.1 mg/L appears evident on the plot of the miniDOT sensor at 10.8 meters, immediately after the buoy passed the bubble plume both times during Drift #2 (Figure A-7.2a). It is noted that during both drifts the miniDOT sensor deployed at the deeper depth (10.8 meters) had some potentially erratic readings during the initial one to three minutes of deployment, which may indicate a sensor stabilization period. This pattern was evident in the DO plots of the deeper MiniDot sensor in previous monitoring events (Weeks 2 and 3), and appears to be typical.

- Dissolved Methane The recorded CH_4 concentrations did not show a noticeable (sharp) increase as the sensors passed the MRP, or when they passed through the bubble plume (Attachment A, Figure A-7.1b and A-7.2b). The concentrations recorded during Drift #2 were slightly higher than during Drift #1 by about 0.015 mg/L. The maximum CH_4 concentration recorded for Drift #2 was 0.106 mg/L at the 5.8 meter depth. This value is much lower than the highest CH_4 concentration recorded during Week 2 on March 23 (28.4 mg/L during Drift #4 and 0.7 mg/L during Drift #2).

- Dissolved Carbon Dioxide - CO_2 concentrations recorded during Drifts #1 and 2 did not show any apparent fluctuation as the buoy passed the MRP or bubble plume (Figure A-7.1c and Figure A-7.2c in Attachment A). The recorded concentrations tended to be around 1.15 mg/L at depth of 11.3 meters and 0.85 mg/L at a depth of 5.8 meters.

In general, the DO and CO_2 concentrations recorded during these two drifts were similar to the reading the previous week (March 29). The CH_4 concentrations from the previous week were slightly lower (maximum recorded value of 0.087 and 0.08 mg/L). However, the two drifts on March 29 passed further from the MRP (143 and 146 meters), and were conducted when the water velocities were higher (Table A-2, 8 to 8.2 km/hr on March 29 versus 0.72 to 2.5 km/hr on April 4).

As during previous weeks, the lowest DO concentration measured during both drifts was well above the most stringent regulatory limit for DO in marine waters established in 18 AAC 70. The 18 AAC 70 Alaska Water Quality Standards for marine waters state the surface DO concentration in coastal waters may not be less than 6.0 mg/L for a depth of one meter except when natural conditions cause this value to be depressed. DO may not be reduced below 4 mg/L at any point beneath the surface. DO concentrations in estuaries and tidal tributaries may not be less than 5.0 mg/L except where natural conditions cause this value to be depressed.

2.2.2 Vertical CTD Cast

Plots of DO, salinity and temperature obtained from the vertical cast are provided in Figures A-7.3a-d in Attachment A. The plots show little variability with depth indicating the water column was well mixed, and not stratified. The temperature and DO are almost identical in all four plots. The DO concentrations varied between 11.7 and11.8 mg/L which was similar to the values obtained during the buoy drifts by the Seabird DO probe. The salinity increased slightly from just below to just above 28 psu during the course of the four casts, presumably as the flood tide brought in more marine water.

2.2.4 Laboratory Results

Laboratory sample results for dissolved CH_4 and CO_2 from the March 29 sample event were received during this reporting period and are provided in Table A-4 in Attachment A (Sample ID CW05S, CW05M and CWO5D). These samples were collected on March 29 at multiple depths directly over the MRP during slack tide. The location of the sample point (CW05) is shown on Figure A-3 in Attachment A.

The samples were analyzed by ALS Environmental in Simi Valley, California (ALS). ALS maintains National Environmental Laboratory Accreditation Program (NELAP) and Department of Defense Environmental Laboratory Accreditation Program certification for CH_4 and CO_2 analysis (method RSK 175). A preliminary review of the data was performed and according to that review, no data required qualification.

As shown in Table A-4 in Attachment A, the CH_4 concentration ranged from non-detectable to 0.21 mg/L. The highest detection was in the sample CW05S, collected at 1 meter below the water surface, similar to the previous event (March 23). This maximum detected CH_4 concentration (0.21 mg/L) was the highest detected to date in the laboratory samples. This higher detection may be attributed to the reduced distance from the MRP than previous sample events. This laboratory sample concentration is also higher than that detected by the CH_4 sensors during the March 29 buoy drifts. However, these drifts passed a further distance from the MRP (143 and 146 meters) whereas the laboratory samples were collected at 0 meters. The highest laboratory sample result (0.21 mg/L) is also about twice as high as the value recorded by the sensor as it passed through the bubble plume on Drift #2 on April 5 (0.1 mg/L as shown on Figure A-7.2b).

The laboratory CO_2 results showed little variation at the three depths, with concentrations ranging from 1.5 to 1.8 mg/L. These values were similar to the concentrations detected during the prior sample events on March 18 and March 23, at further distances down current from the MRP (177 to 741 meters as shown on Table A-4). In-situ measurements of CO_2 by the Pro-Oceanus digital probes are of a similar magnitude. The similarity in CO_2 values obtained at multiple times and distances from the MRP by multiple methods (in-situ sensors and laboratory analysis) over the four week period suggests the methane release is not significantly changing CO_2 concentrations from typical ambient conditions.

2.3 Activities Planned for the Next Sampling Event

The next water quality sampling event is planned for April 12, 2017. Planned activities include:

- Conducting deployments of the water quality buoy at varied tidal conditions, with deployments under flowing conditions.

These planned activities may need to be modified due to site conditions and logistics.

3.0 AIR/WATER INTERFACE MONITORING

3.1 Activities Completed

No air/water interface monitoring occurred during this reporting period.

3.2 Preliminary Summary of Results

No air/water interface monitoring occurred during this reporting period.

3.3 Activities Planned for the Next Sampling Event

The next air / water interface sampling event is planned for April 12, 2017. Planned activities include conducting deployments of the Air / Water Interface buoy with a new dissolved CH_4 sensor and implementing a procedure to re-zero the CH_4 in air sensor prior to each drift. These planned activities may need to be modified due to site conditions and logistics.

REFERENCES

SLR International Corporation (SLR). 2017a Water Quality Sampling Plan. Cook Inlet Alaska Methane Pipeline Leak, March 2017.

SLR. 2017b. Air/Interface Sampling Plan. Cook Inlet Alaska Methane Pipeline Leak, March 2017

ATTACHMENT A:

PHOTOGRAPH LOG:
Water Quality and Air/Water Interface Photograph Log (April 5, 2017)

TABLES:
Table A-1: Water Quality Buoy Instrumentation Summary, April 4, 2017
Table A-2: Summary of Water Quality Buoy Drifts
Table A-3: Summary of Vertical CTD Casts, April 5, 2017
Table A-4: Water Sample Analytical Results, Pipeline Leak Area, Cook Inlet, Alaska

FIGURES:
Figure A-1: Water Quality Monitoring Buoy Schematic (April 5, 2017)
Figure A-2d: Water Quality Monitoring Week 4 (April 5, 2017), Buoy Drift Tracks and Vertical CTD Casts
Figure A-3: Water Sample Locations for Laboratory Analysis (Weeks 1-3)
<u>Week 4 Data Plots:</u>
Figure A-7.1a: Buoy Drift #1, April 5, 2017, Dissolved Oxygen
Figure A-7.1b: Buoy Drift #1, April 5, 2017, Dissolved Methane
Figure A-7.1c: Buoy Drift #1, April 5, 2107, Dissolved Carbon Dioxide
Figure A-7.2a: Buoy Drift #2, April 519, 2017, Dissolved Oxygen
Figure A-7.2b: Buoy Drift #2, April 5, 2017, Dissolved Methane
Figure A-7.2c: Buoy Drift #2, April 5, 2017, Dissolved Carbon Dioxide
Figure A-7.3a: Vertical CTD Cast #1, April 5, 2017,
Figure A-7.3b: Vertical CTD Cast #2, April 5, 2017
Figure A-7.3c: Vertical CTD Cast #3, April 5, 2017
Figure A-7.3d: Vertical CTD Cast #4, April 5, 2017

Cook Inlet Water Quality and Air/Water Interface Sampling Photo Log: Week 4 4-5-17

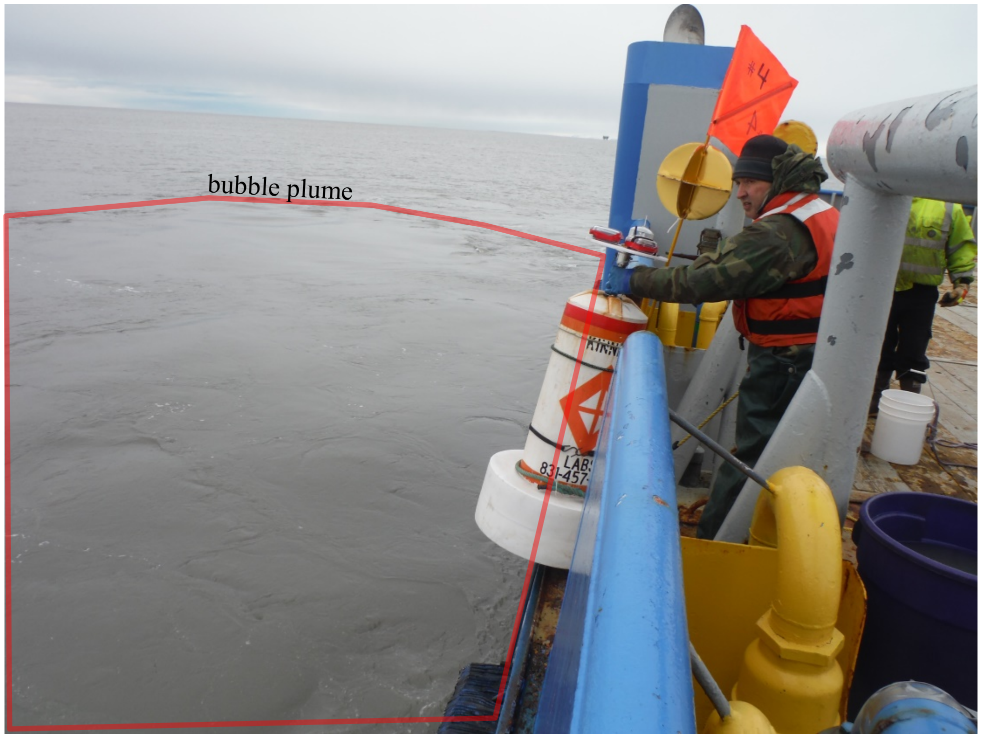


Photo 1: Buoy tethered to boat while drifting through bubble plume

Date: 4/5/2017

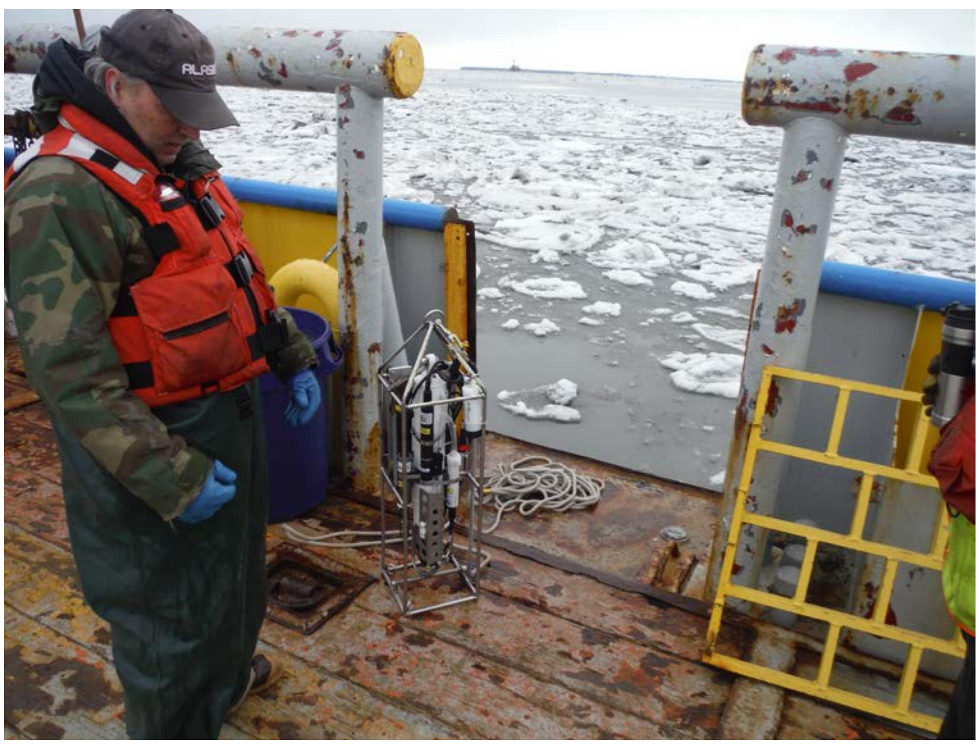


Photo 2: Heavy ice conditions temporarily prevented equipment deployment from 12:13 to 12:20.

Date: 4/5/2017

SLR	Cook Inlet Alaska Methane Pipeline Leak Water Quality Sampling Report: Week 4
SITE PHOTOGRAPHS	Job No: 105.00874.17021

Photo 3: Soaking sensors in seawater to keep them closer to ambient water conditions between drifts. **Date:** 4/5/2017

Photo 4: Performing CTD vertical cast by hand. **Date:** 4/5/2017

Table A-1: Water Quality Instrumentation Buoy Summary

Instrument Name	Parameters Measured	Measurement Unit	Measurement Frequency	Frequency Reported, Plotted on Data Analysis Figures	Notes
PME MiniDOT	Temperature	degrees Celsius (ºC)	Once per minute	Once per minute	Unable to record at higher frequencies
	Dissolved Oxygen	milligrams per liter (mg/L)			
Pro-Oceanus MiniCO2	Partial pressure of CO2 in detector	Parts per million by volume (ppmv)	Once per 4 seconds	Once per 4 seconds	Note this is measured as a gaseous phase concentration, which is then converted to the surrounding aqueous concentrations.
	Detector total pressure	millibars			
	Detector temperature	degrees Celsius (ºC)			
Pro-Oceanus MiniCH4 (two instruments utilized, with differing ranges 0-1% and 0-100%)	Partial pressure of CH4 in detector	Volume ratio (%)	Once per 4 seconds	Once per 4 seconds	Note this is measured as a gaseous phase concentration, which is then converted to the surrounding aqueous concentrations.
	Detector total pressure	millibars			
	Detector temperature	degrees Celsius			
Seabird SBE 19plus V3 SeaCat	Depth	meters (M)	1 per 1/4 second	Once per 4 seconds	Collected data is average to 4 second reporting frequency
	Pressure	decibar (dm)			
	Conductivity	Siemens per meter (S/m)			
	Temperature	degrees Celsius (ºC)			
	pH	Negative of the base 10 logarithm of the molar concentration of hydrogen			
	Optical backscatter (OBS)	Nephelometric Turbidity Units (NTU)			
	Dissolved Oxygen	milligrams per liter (mg/L)			
Garmin WAAS	Position	Latitude and longitude	Once per 2 seconds	Once per 2 seconds	

Table A-2: Summary of Water Quality Buoy Drifts

Buoy Type	Instrument(s) Depth (m)	Drift Name	General Tide Description	Proximity to Spring or Neap Tide[1]	Daily Tidal Range (High-Low) (m)[1]	Date	Approximate Release Time (from vessel)	Release Location	Approximate Retrieval Time (from water)	Retrieval Location	Drift Duration (hr:min)	Total Drift Distance (m)[2]	Average Veolcity (km/hr)[2]	Minimum Distance to MRP (m)	Drift Elapsed Time at Minimum Distace to MRP (hh:mm:ss)	Wind (Knots/direction)	Wave Height (m)	Comments
Water Quality	Surface 7 Mid 7 Deep 12.5	D01-031817	Ebb	2 days before neap tide event	4.75	3/18/2017	14:50	60 46.622 N 151 25.718 W	15:20	60 45.356 N 151 27.877 W	0:30	1766	6.1	185.9	0:01:55	calm	0	CO2 sensor at 12.5 m unintentionally shut off, no data
Water Quality	Surface 2 Mid 7 Deep 12.5	D01-031917	Flood		3.84	3/19/2017	8:15	60 46.37 N 151 26.239 W	8:40	60 47.2 N 151 25.112 W	0:25	1930	3.8	44.9	0:05:10	15, SSW	0	
Water Quality	Surface 2 Mid 7 Deep 12.5	D02-031917	Flood			3/19/2017	9:08	60 46.35 N 151 25.878 W	9:37	60 46.921 N 151 25.878 W	0:29	901	2.0	165.8	0:14:40	15, SSW	0	SeaBird DO sensor stopped recording after 5 minutes, potential icing
Water Quality	Surface 2 Mid 7 Deep 12.5	D03-031917	Flood/Slack/Ebb		--	3/19/2017	9:55	60 45.527 N 151 23.097 W	11:55	60 45.527 N 151 23.097 W	2:00	3684	1.9	9.4	1:05:45	15, SSW	0.2	
Water Quality	Surface 2 Mid 7 Deep 12.5	D01-032317	Flood	3 days after neap tide event	3.08	3/23/2017	12:07	60 46.565 N 151 25.995 W	12:30	60 47.479 N 151 24.660 W	0:23	1675	5.1	71.2	0:00:05	0.4 SSW	0	SeaBird DO sensor clogged with ice, no 12.5 meter DO data
Water Quality	Surface 2 Mid 7 Deep 12.5	D02-032317	Flood			3/23/2017	13:10	60 46.393 N 151 26.33 W	13:57	60 47.755 N 151 26.248 W	0:47	3521	4.8	3.9	0:05:15	Calm	0	SeaBird DO sensor clogged with ice, no 12.5 meter DO data
Water Quality	Surface 2 Mid 7 Deep 12.5	D03-032317	Flood/Slack/Ebb		--	3/23/2017	15:29	60 46.781 N 151 25.884 W	16:26	60 46.537 N 151 26.248 W	0:57	675	0.36 (flood Tide) / 1.44 (Ebb Tide)	165.5	0:50:35	Calm	0	
Water Quality	Surface 2 Mid 7 Deep 12.5	D04-032317	Ebb		4.33	3/23/2017	16:31	60 46.695 N 151 25.870 W	17:18	60 45.403 N 151 27.936 W	0:47	3037	3.9	2.6	0:04:45	Calm	0	
Water Quality	Surface 2 Mid 7 Deep 12.5	D01-032917	Ebb	1 day after spring tide event	8.35	3/29/2017	11:07	60 46.725 N 151 25.624 W	11:47	60 44.322 N 151 29.507 W	0:40	5193	8.2	145.7	0:02:28	11, SW	0	Water pump for SeaBrid DO sensor clogged, no 12.5 m DO data
Water Quality	Surface 2 Mid 7 Deep 12.5	D02-032917	Flood		7.86	3/29/2017	15:53	60 46.216 N 151 26.734 W	16:47	60 49.189 N 151 21.302 W	0:54	6962	8.0	142.7	0:05:32	Calm	0	Water pump for SeaBrid DO sensor clogged, no 12.5 m DO data
Water Quality	Surface 0.8 Mid 5.8 Deep 11.3	D01-040517	Flood	1 day after neap tide event	3.57	4/5/2017	13:26	60 46.618 N 151 26.228 W	13:46	60 46.654 N 151 25.531 W	0:20	793	2.5	67.8	0:08:00	5-10, SSW	0.5	
Water Quality	Surface 0.8 Mid 5.8 Deep 11.3	D01-04057	Flood/Slack/Ebb		--	4/5/2017	13:55	60 46.546 N 151 26.247 W	14:52	60 46.361 N 151 26.350 W	0:57	1094	0.72 (flood Tide) / 1.08 (Ebb Tide)	10.4	0:18:28	5-10, SSW	0.5	

Notes:

1 - Tidal information is from NOAA Tide Predictions for East Foreland. StationId:TWC1989

2-These times and corresponding statistics correspond to when the buoy instrument sensors reached deployment depth based on the CTD depth reading (12.5 meters) and when the instruments began to be retrieved at the end of the drift. This time interval corresponds to the time interval plotted on the figures.

Table A-3: Summary of Vertical CTD Casts, April 5, 2017

		Time	Latitude			Longitude			Distance to MRP (m)
Cast #1	Start	1141	60	46.866	N	151	25.594	W	645
	Stop	1146	60	46.969	N	151	25.504	W	840
Cast #2	Start	1152	60	46.771	N	151	25.761	W	411
	Stop	1157	60	46.885	N	151	25.673	W	617
Cast #3	Start	1201	60	46.705	N	151	25.850	W	261
	Stop	1206	60	46.812	N	151	25.704	W	494
Cast #4	Start	1221	60	46.636	N	151	25.968	W	91
	Stop	1231	60	46.694	N	151	25.867	W	233

Abbreviations:

MRP Methane Release Point

Table A-3: Water Sample Analytical Results
Methane Pipeline Leak Area, Cook Inlet, Alaska

Sample ID	Date	Time	Sample Depth (m)	Depth to Bottom (m)	Sample Distance Down Current From MRP (m)[1]	Tide Stage (ebb,flood, or slack (+/-1hr)	Analytical Results: RSK 175 - methane (mg/L)	Analytical Results: RSK 175 - carbon dioxide (mg/L)
CW01S	3/18/2017	1131	1	24	518	Ebb	0.0024	1.4
CW01M	3/18/2017	1130	9				0.0026	1.4 MH
Primary: CW01D	3/18/2017	1130	23				0.0019	1.3
Duplicate: CW91D	3/18/2017	1130	23				0.0019	1.4
CW02S	3/18/2017	1613	1	20.6	741	~1hr before slack tide, on the Ebb	ND [0.0013]	1.6
CW02M	3/18/2017	1615	6				ND [0.0013]	1.6
CW02D	3/18/2017	1617	12				0.0027	1.7
Primary: CW03S[2]	3/23/2017	1418	1	24	177	Flood	0.028	1.3
Duplicate: CW93S[2]	3/23/2017	1418	1				0.031	1.6
CW03M[2]	3/23/2017	1418	12				0.0075	1.5
CW04S[2]	3/23/2017	1520	1	24	257	~1hr before slack tide, on the flood	0.014	1.7
CW04M[2]	3/23/2017	1520	9				0.0092	1.5
CW04D[2]	3/23/2017	1520	23.5				0.0017	1.7
Primary: CW05S[3]	3/29/2017	1428	1	19.5	0	Slack	0.21	1.5
Duplicate: CW05A[3]	3/29/2017	1428	1				0.18	1.5
CW05M[3]	3/29/2017	1428	10				0.022	1.5
CW05D[3]	3/29/2017	1428	19				ND [0.0013]	1.8

Notes:

1 - All samples collected down current of the MRP unless otherwise noted (including those listed as collected near slack tide

2 - The carbon dioxide trip blank for this collection date was broken prior to sampling due to freezing.

3 - Sample was incorrectly identied as CW04 on chain of custody.

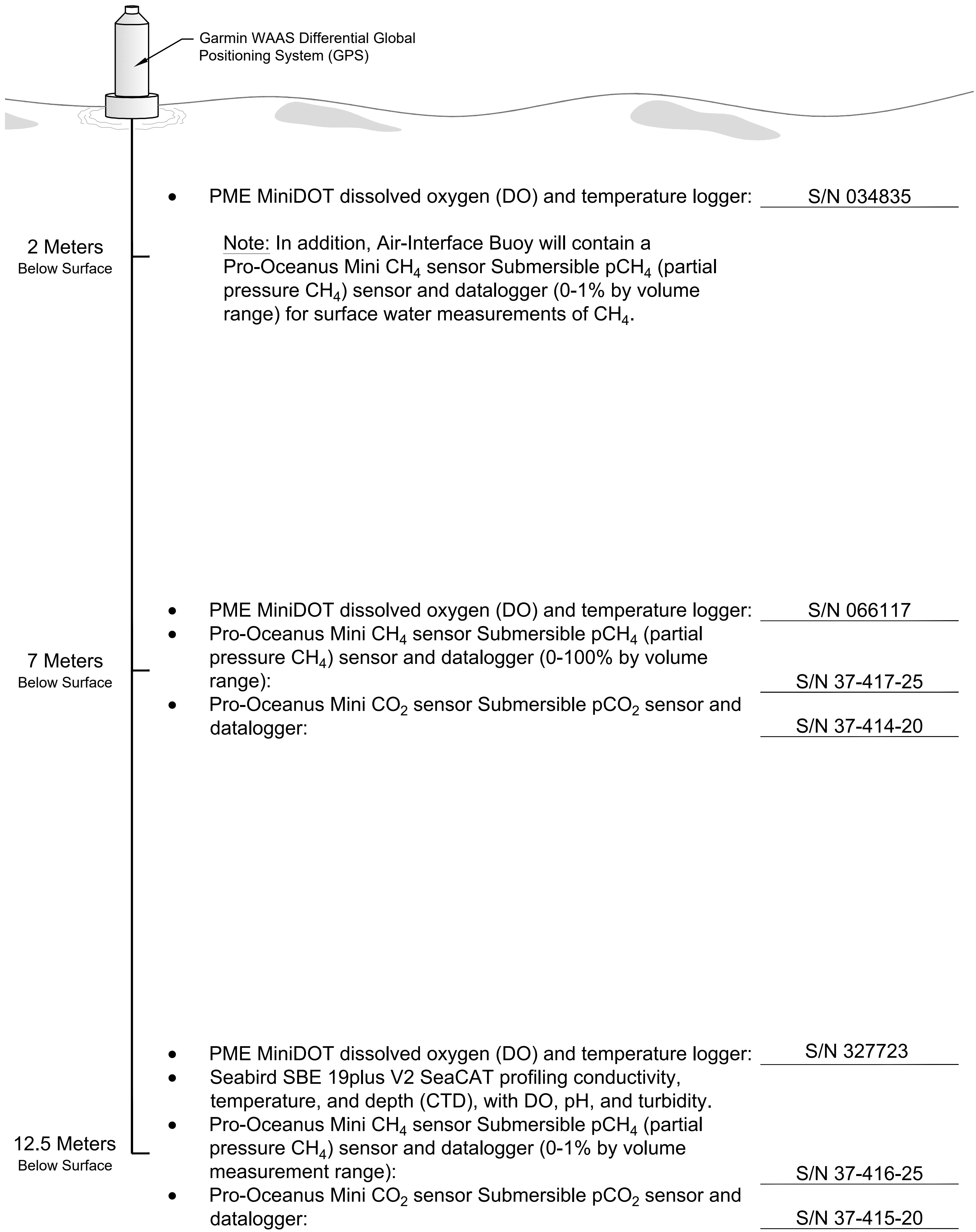
Abbreviations:

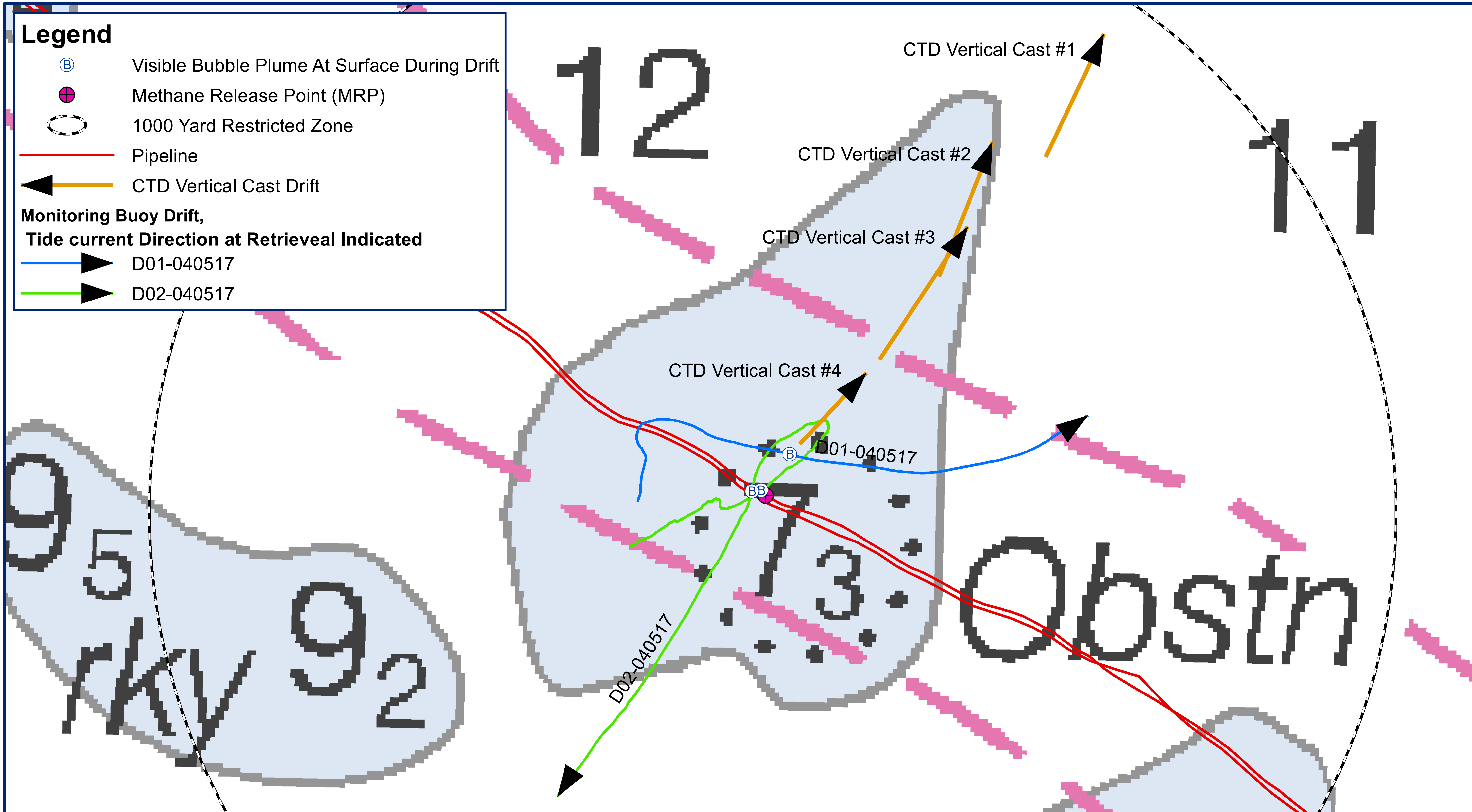
"--"	parameter was not measured
m	meters
mg/L	miligrams per liter
MRP	Methane Release Point

Analytical Data Flags:

ND	Nondetect, method reporting limit (MRL) in brackets
M (H,L,or N)	Analyte result is considered an estimated value biased (high, low, uncertain)

FIGURE 1: WATER QUALITY MONITORING BUOY SCHEMATIC
(MARCH 23, 29 and APRIL 5, 2017)





Base map referenced from National Oceanic and Atmospheric Administration (NOAA), Chart 16663, Alaska - South Coast, Cook Inlet, East Foreland to Anchorage (Scale 1:100,000).

Soundings in Fathoms (Fathoms and Feet to Eleven Fathoms at Mean Lower Low Water)

1 Fathom = 6 Feet = 1.8 Meters

0 100 200 300 400 500

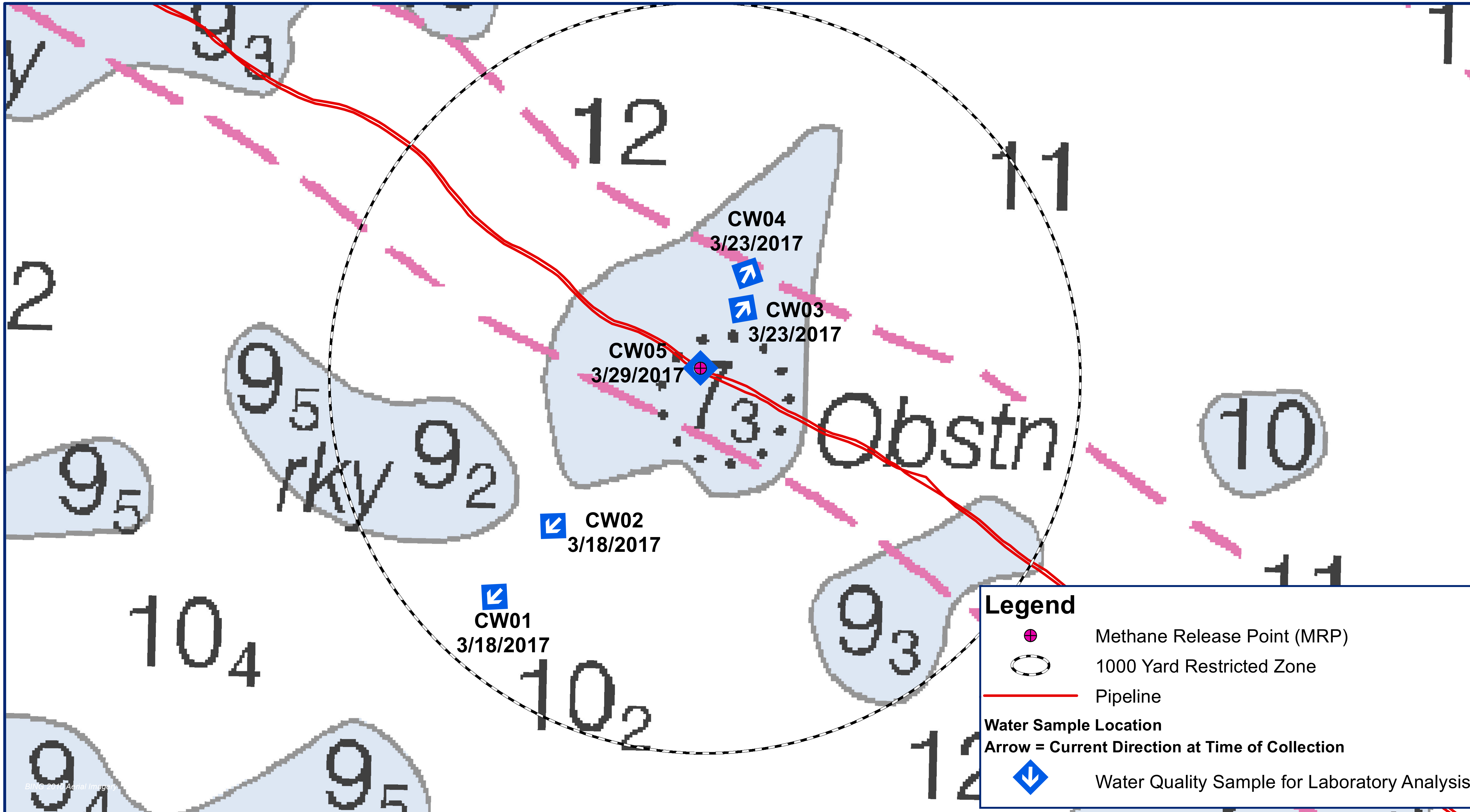
Meters

N

THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY.
ACTUAL LOCATIONS MAY VARY AND NOT ALL STRUCTURES ARE SHOWN.

SLR

Project	HILCORP ALASKA, LLC METHANE PIPELINE LEAK COOK INLET, ALASKA
Drawing	WATER QUALITY MONITORING WEEK 4 (APRIL 5, 2017) BUOY DRIFT TRACKS AND CTD VERTICAL CAST
Drawing Date	April 2017
File Name	Figure A2d Methane Release_Event4.mxd
Scale	1:5,500
Project No.	105.00874.17015
Fig. No.	A-2d



Base map referenced from National Oceanic and Atmospheric Administration (NOAA), Chart 16663, Alaska - South Coast, Cook Inlet, East Foreland to Anchorage (Scale 1:100,000).

Soundings in Fathoms (Fathoms and Feet to Eleven Fathoms at Mean Lower Low Water)

1 Fathom = 6 Feet = 1.8 Meters

0 200 400 600 800 1,000

Meters

N

THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY.
ACTUAL LOCATIONS MAY VARY AND NOT ALL STRUCTURES ARE SHOWN.

SLR

Project	HILCORP ALASKA, LLC METHANE PIPELINE LEAK COOK INLET, ALASKA
Drawing	Water Quality Monitoring, Water Sample Locations for Laboratory Analysis (Weeks 1-3)
Drawing Date	April 2017
Scale	1:9,116.37
Fig. No.	A-3
File Name	Figure A3 Methane Release_WQ Samples.mxd
Project No.	105.00874.17015

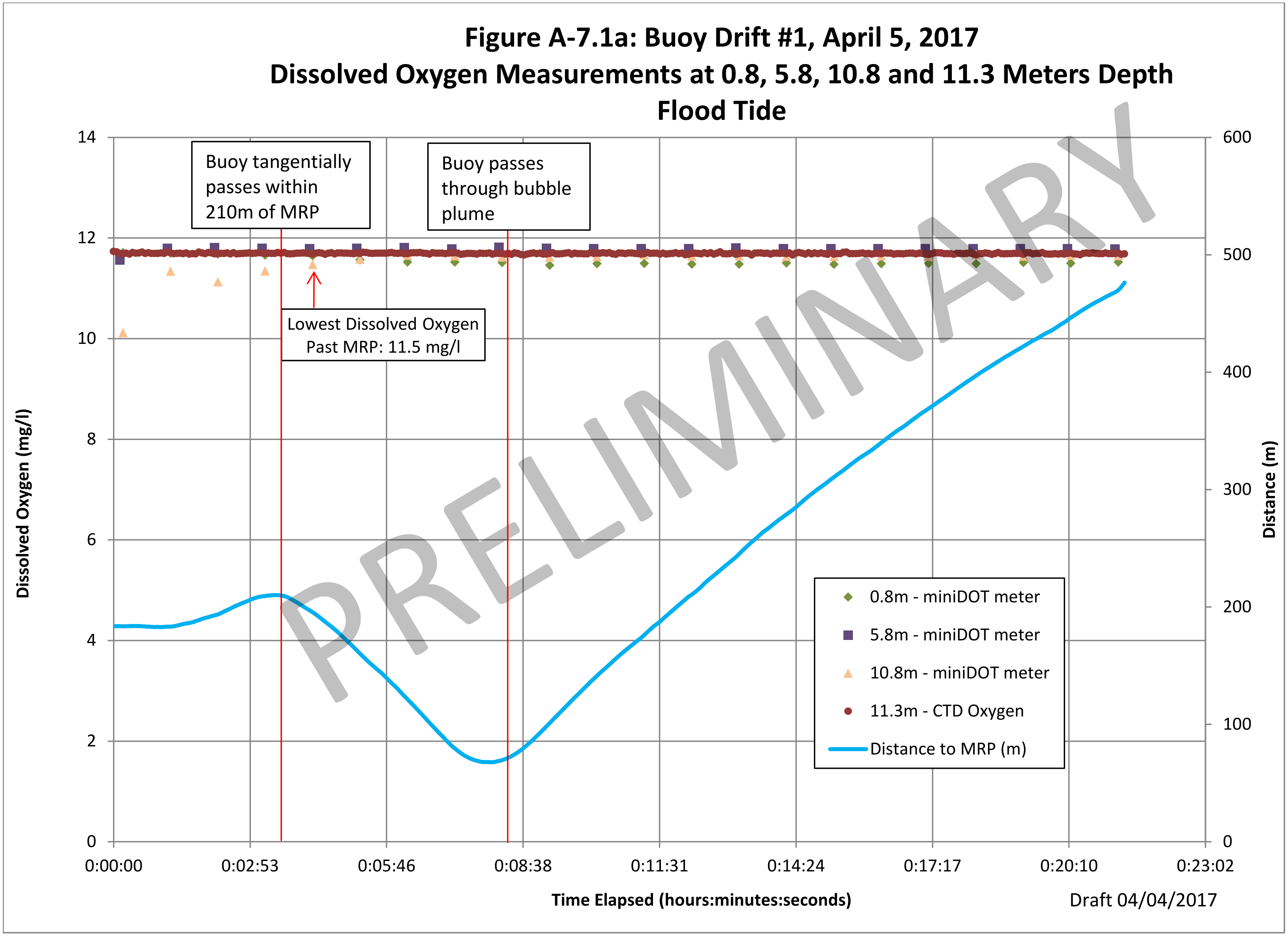


Figure A-7.1a: Buoy Drift #1, April 5, 2017
Dissolved Oxygen Measurements at 0.8, 5.8, 10.8 and 11.3 Meters Depth
Flood Tide
Buoy tangentially passes within 210m of MRP
Buoy passes through bubble plume
Lowest Dissolved Oxygen Past MRP: 11.5 mg/l
PRELIMINARY
Dissolved Oxygen (mg/l)
Distance (m)
0
2
4
6
8
10
12
14
0
100
200
300
400
500
600
0:00:00
0:02:53
0:05:46
0:08:38
0:11:31
0:14:24
0:17:17
0:20:10
0:23:02
Time Elapsed (hours:minutes:seconds)
0.8m - miniDOT meter
5.8m - miniDOT meter
10.8m - miniDOT meter
11.3m - CTD Oxygen
Distance to MRP (m)
Draft 04/04/2017

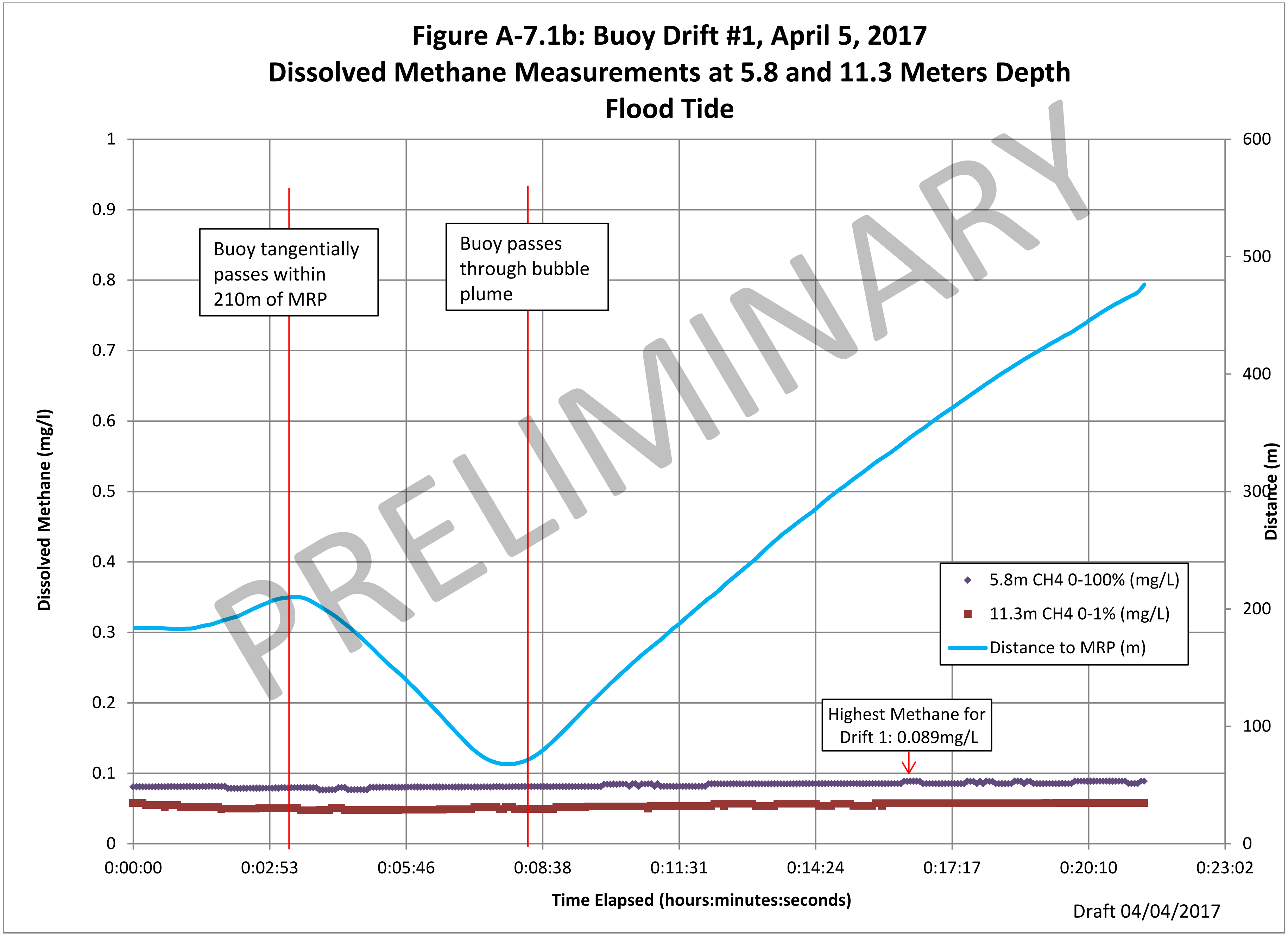


Figure A-7.1b: Buoy Drift #1, April 5, 2017
Dissolved Methane Measurements at 5.8 and 11.3 Meters Depth
Flood Tide
Buoy tangentially passes within 210m of MRP
Buoy passes through bubble plume
Highest Methane for Drift 1: 0.089mg/L
5.8m CH4 0-100% (mg/L)
11.3m CH4 0-1% (mg/L)
Distance to MRP (m)
Dissolved Methane (mg/l)
Distance (m)
Time Elapsed (hours:minutes:seconds)
0:00:00
0:02:53
0:05:46
0:08:38
0:11:31
0:14:24
0:17:17
0:20:10
0:23:02
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
600
500
400
300
200
100
PRELIMINARY
Draft 04/04/2017

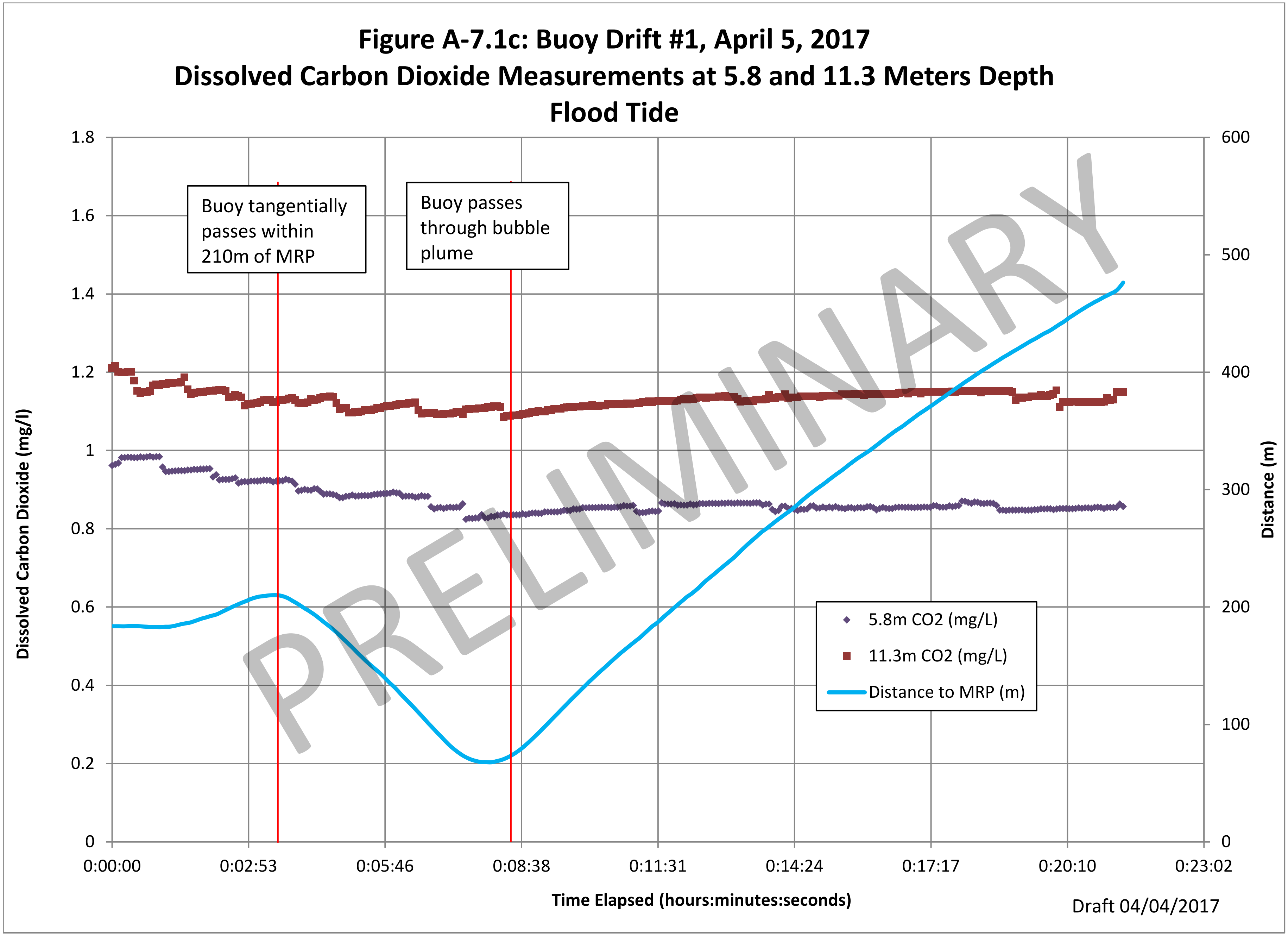


Figure A-7.1c: Buoy Drift #1, April 5, 2017
Dissolved Carbon Dioxide Measurements at 5.8 and 11.3 Meters Depth
Flood Tide
Buoy tangentially passes within 210m of MRP
Buoy passes through bubble plume
PRELIMINARY
5.8m CO2 (mg/L)
11.3m CO2 (mg/L)
Distance to MRP (m)
Dissolved Carbon Dioxide (mg/l)
Distance (m)
Time Elapsed (hours:minutes:seconds)
0:00:00
0:02:53
0:05:46
0:08:38
0:11:31
0:14:24
0:17:17
0:20:10
0:23:02
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
0
100
200
300
400
500
600
Draft 04/04/2017

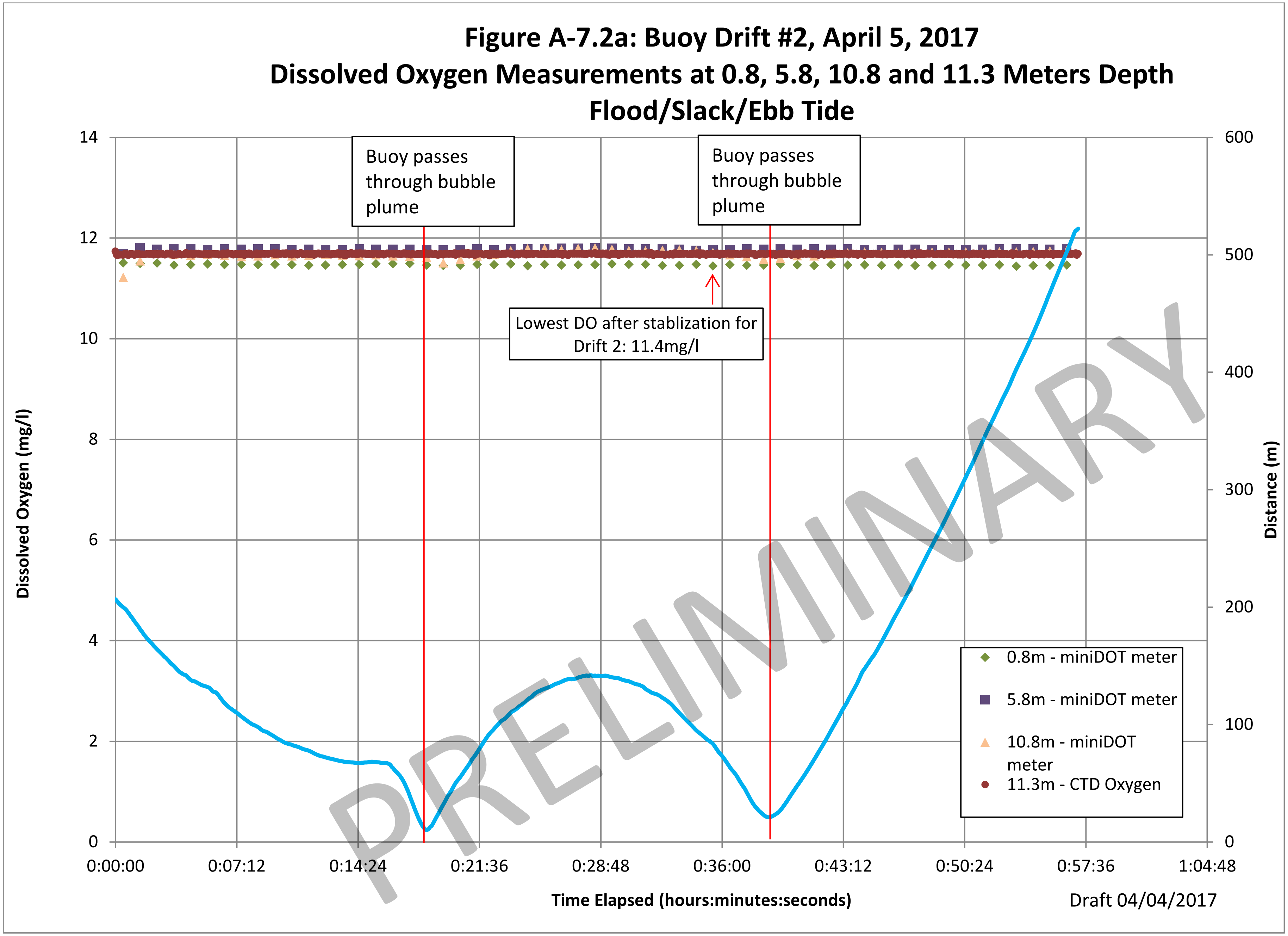


Figure A-7.2a: Buoy Drift #2, April 5, 2017
Dissolved Oxygen Measurements at 0.8, 5.8, 10.8 and 11.3 Meters Depth
Flood/Slack/Ebb Tide
Buoy passes through bubble plume
Buoy passes through bubble plume
Lowest DO after stablization for Drift 2: 11.4mg/l
Dissolved Oxygen (mg/l)
Distance (m)
14
12
10
8
6
4
2
0
600
500
400
300
200
100
0
0:00:00
0:07:12
0:14:24
0:21:36
0:28:48
0:36:00
0:43:12
0:50:24
0:57:36
1:04:48
Time Elapsed (hours:minutes:seconds)
0.8m - miniDOT meter
5.8m - miniDOT meter
10.8m - miniDOT meter
11.3m - CTD Oxygen
PRELIMINARY
Draft 04/04/2017

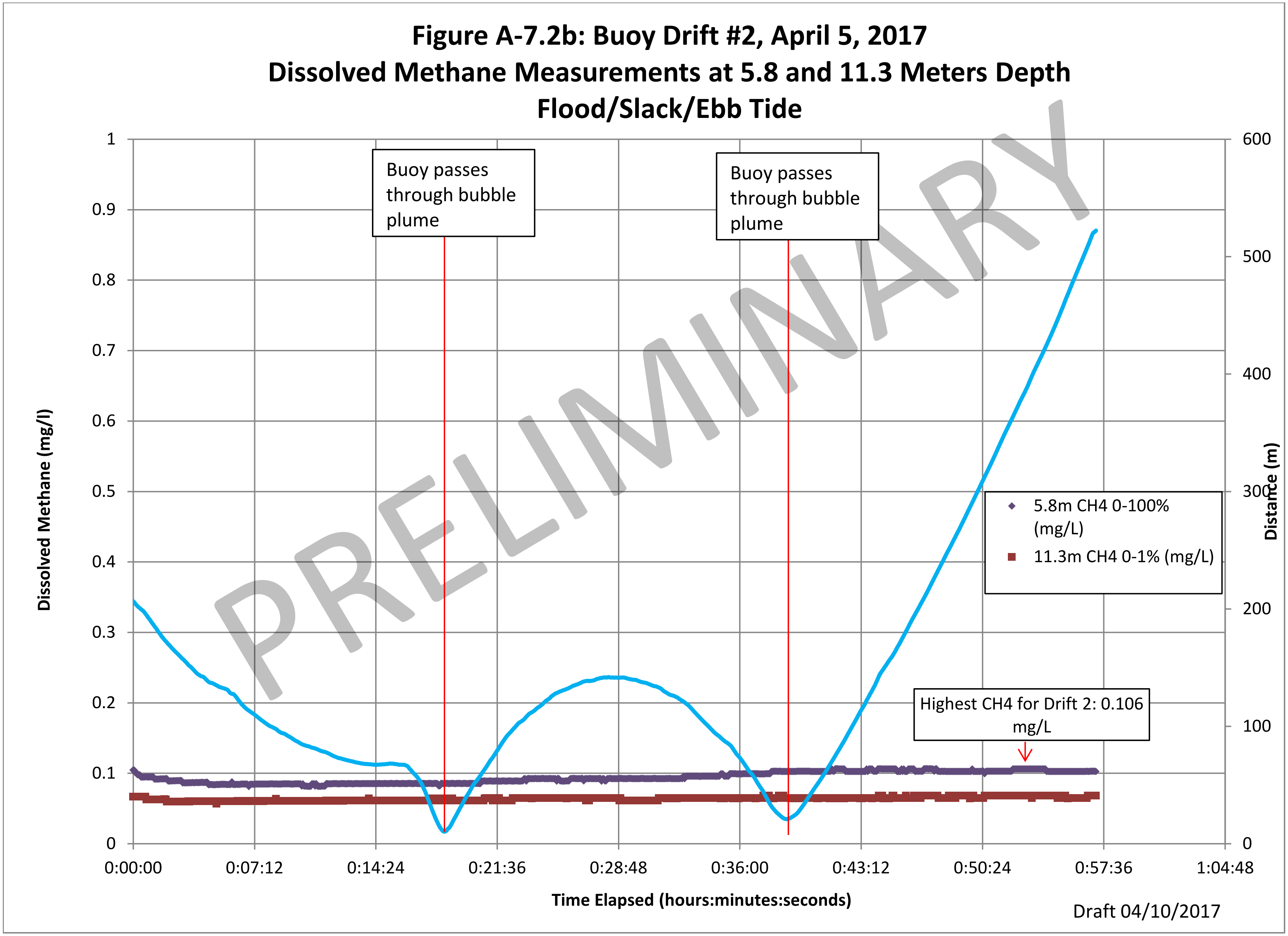


Figure A-7.2b: Buoy Drift #2, April 5, 2017
Dissolved Methane Measurements at 5.8 and 11.3 Meters Depth
Flood/Slack/Ebb Tide
Buoy passes through bubble plume
Buoy passes through bubble plume
Highest CH4 for Drift 2: 0.106 mg/L
5.8m CH4 0-100% (mg/L)
11.3m CH4 0-1% (mg/L)
Dissolved Methane (mg/l)
Distance (m)
Time Elapsed (hours:minutes:seconds)
0:00:00
0:07:12
0:14:24
0:21:36
0:28:48
0:36:00
0:43:12
0:50:24
0:57:36
1:04:48
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
100
200
300
400
500
600
PRELIMINARY
Draft 04/10/2017

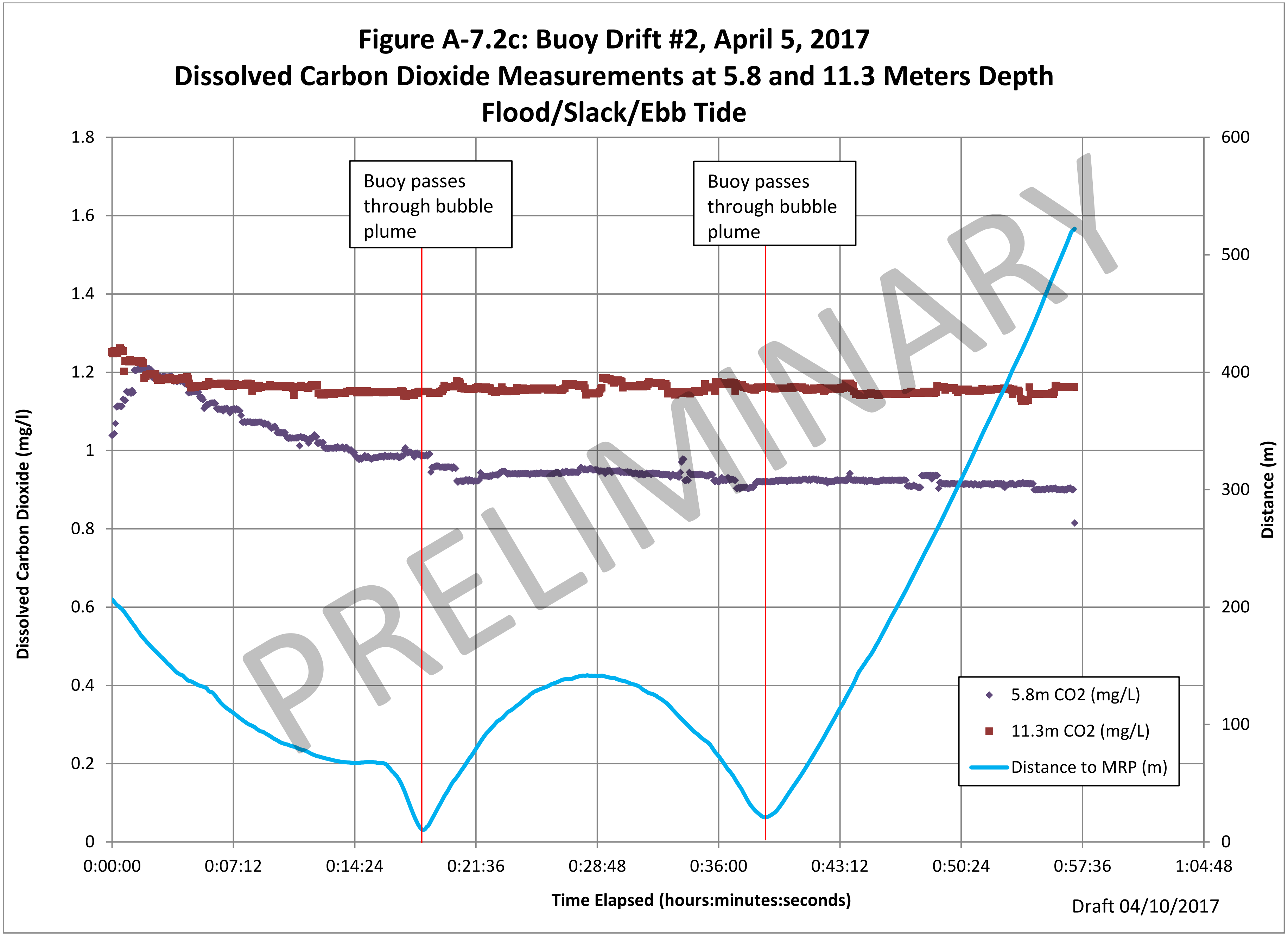


Figure A-7.2c: Buoy Drift #2, April 5, 2017
Dissolved Carbon Dioxide Measurements at 5.8 and 11.3 Meters Depth
Flood/Slack/Ebb Tide
Buoy passes through bubble plume
Buoy passes through bubble plume
PRELIMINARY
Dissolved Carbon Dioxide (mg/l)
Distance (m)
Time Elapsed (hours:minutes:seconds)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
0
100
200
300
400
500
600
0:00:00
0:07:12
0:14:24
0:21:36
0:28:48
0:36:00
0:43:12
0:50:24
0:57:36
1:04:48
5.8m CO2 (mg/L)
11.3m CO2 (mg/L)
Distance to MRP (m)
Draft 04/10/2017

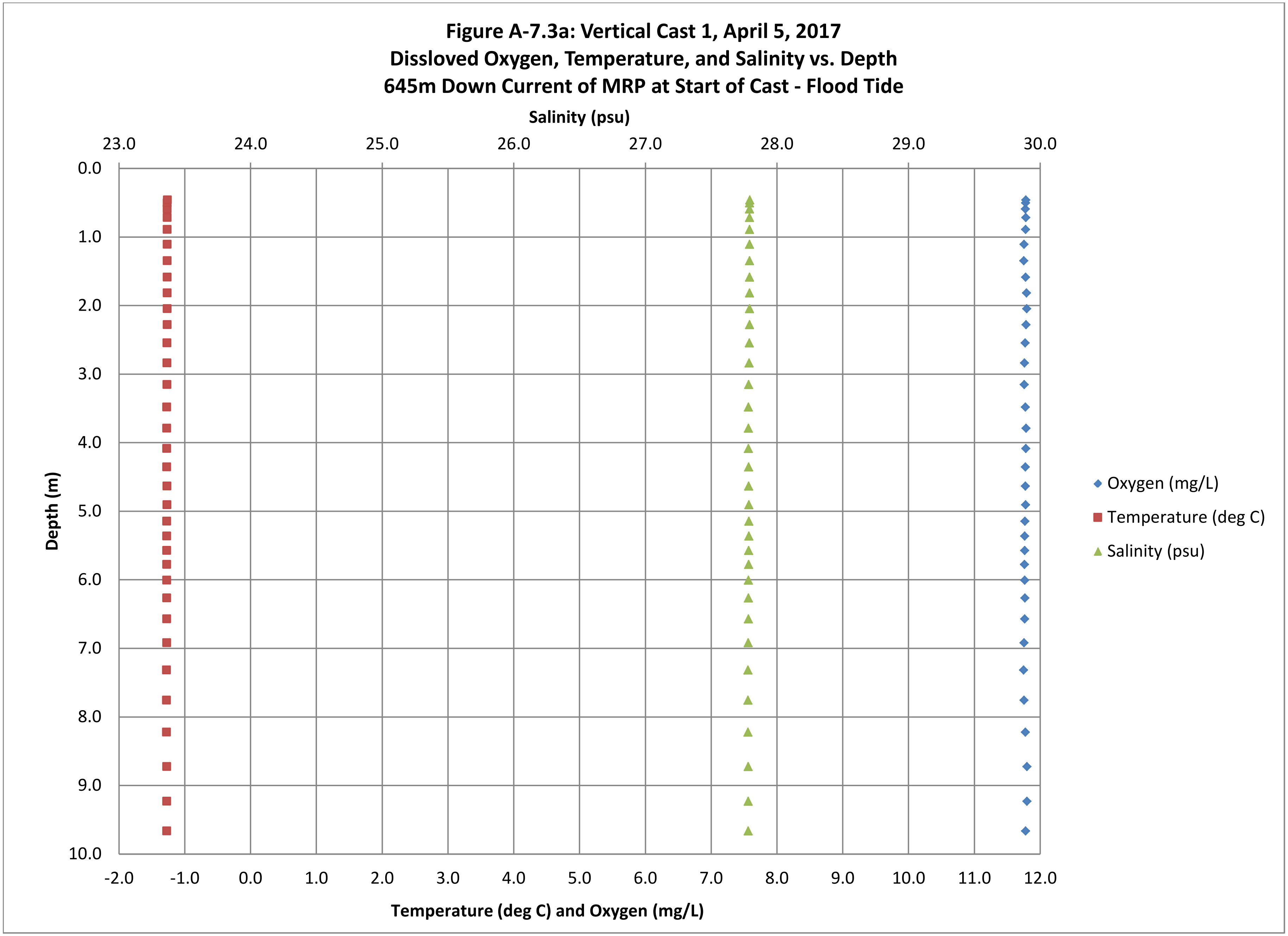


Figure A-7.3a: Vertical Cast 1, April 5, 2017
Dissloved Oxygen, Temperature, and Salinity vs. Depth
645m Down Current of MRP at Start of Cast - Flood Tide
Salinity (psu)
23.0
24.0
25.0
26.0
27.0
28.0
29.0
30.0
Depth (m)
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
Temperature (deg C) and Oxygen (mg/L)
Oxygen (mg/L)
Temperature (deg C)
Salinity (psu)

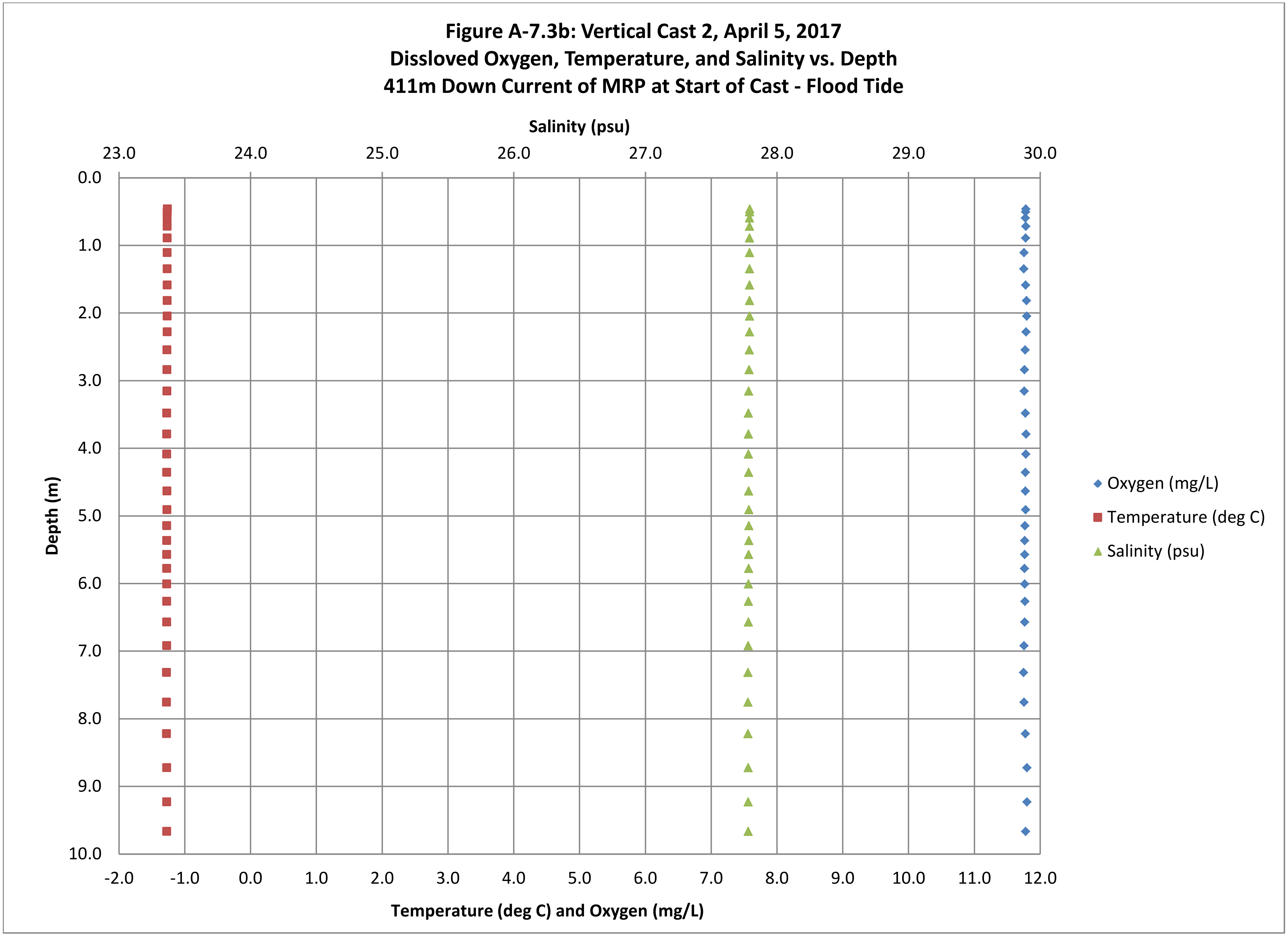


Figure A-7.3b: Vertical Cast 2, April 5, 2017
Dissloved Oxygen, Temperature, and Salinity vs. Depth
411m Down Current of MRP at Start of Cast - Flood Tide
Salinity (psu)
23.0
24.0
25.0
26.0
27.0
28.0
29.0
30.0
Depth (m)
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
Temperature (deg C) and Oxygen (mg/L)
Oxygen (mg/L)
Temperature (deg C)
Salinity (psu)

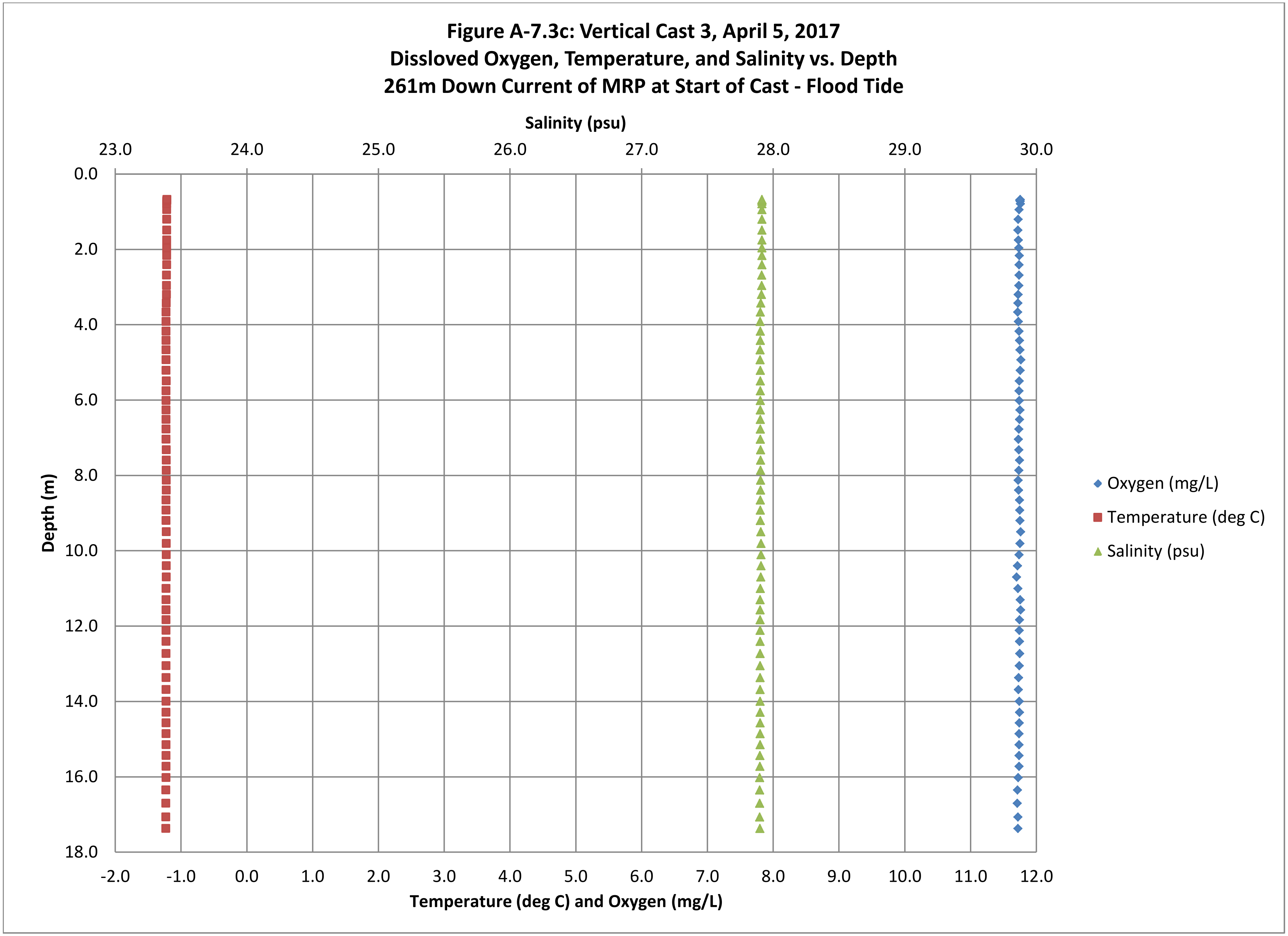


Figure A-7.3c: Vertical Cast 3, April 5, 2017
Dissloved Oxygen, Temperature, and Salinity vs. Depth
261m Down Current of MRP at Start of Cast - Flood Tide
Salinity (psu)
23.0
24.0
25.0
26.0
27.0
28.0
29.0
30.0
Depth (m)
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
Temperature (deg C) and Oxygen (mg/L)
Oxygen (mg/L)
Temperature (deg C)
Salinity (psu)

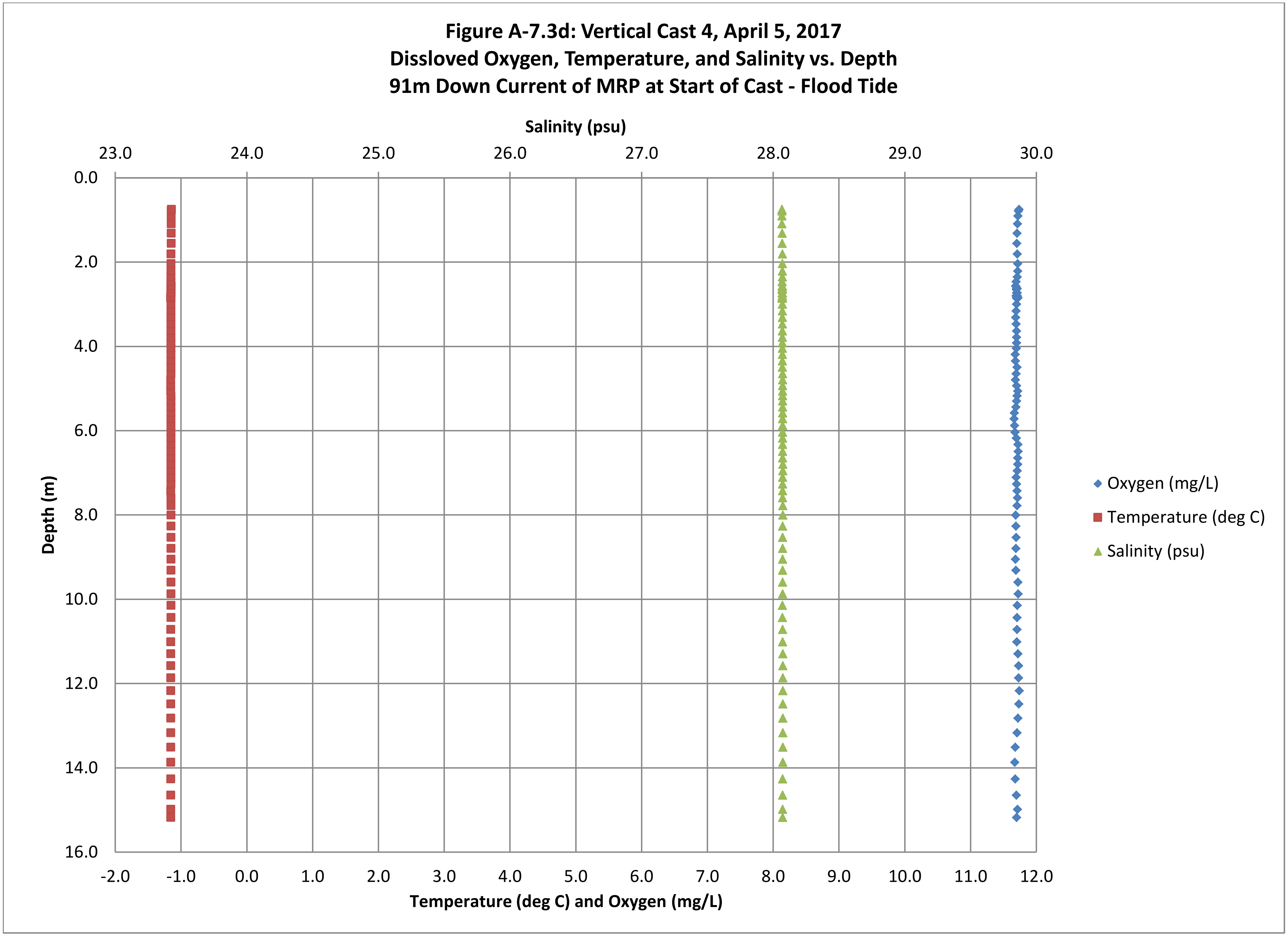


Figure A-7.3d: Vertical Cast 4, April 5, 2017
Dissloved Oxygen, Temperature, and Salinity vs. Depth
91m Down Current of MRP at Start of Cast - Flood Tide
Salinity (psu)
23.0
24.0
25.0
26.0
27.0
28.0
29.0
30.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
Depth (m)
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
Temperature (deg C) and Oxygen (mg/L)
Oxygen (mg/L)
Temperature (deg C)
Salinity (psu)

ADDITIONAL SAFETY DOCUMENTATION

DAILY JOB REPORT

Directions: *Note problems encountered, RFI's, verbal communications with Client's representative, change order work performed.*
Note any important events
Send a copy via fax to Nikiski office by 900 am.

to

Report No. 5

Peak Job No. 23054 Date 4/5/2017

Job Name HSE support for water sampling for Gas Pipeline Leak

Work By PEAK:

The work performed by 1 PEAK employee (*Safety Professional*) was to provide HSE support to the personnel obtaining water samples for the Hilcorp Pipeline Gas Leak. HSE support included: JSA, pre-job safety meeting, permit to work, continuous monitoring of three 4-gas meters and continuous safety support.

Work by Subcontractors:

Work performed by 2 subcontractors, was that of water sampling by 1 SLR employee and 1 Kinetic Lab employees.

Safety Topic/Injury's

JSA and permit to work were completed for this job. Copy of JSA/permit to work is attached with this daily job report. Discussed weather conditions with the recent precipitation. Focused on vessel safety as we were on a new vessel.

Comments:

Time line of events for this job are attached in a word document to this daily job report.

Supervisor *Safety Professional*

Signature

Subs	Trade	PEAK
No. of Men		No. of Men
1	SLR	
1	Kinnetic Lab	
	Peak HSE	1
	TOTAL	
	Equipment	
3	4-gas meters (Hilcorp)	

The follow is a list of events that took place for the Hilcorp pipeline gas leak air water interface sampling and acoustic testing on Sunday 4-5-2017:

0945 – JSA and pre-job safety meeting completed

1010 – Vessel safety brief

1012 – Depart Port aboard the Titan owned and operated by OMSI

0940 – Weather noted: Overcast, wind at 10 knots, calm seas and temperature at 37* F. Ice conditions were very clear.

1049 – Three 4-gas meters were taped to wooden mop handles and taped to the railings of the vessel. The height of all the gas meters ranged between 5'6" and 6'0". One was placed at the bow, one was placed towards the front deck on the portside of the vessel and one was placed mid-deck on the starboard side of the vessel. The monitors were turned on at this time.

1143 – First water sample taken at 500 meters with 0% LEL on gas meters. (side of vessel)

1155 – Second water sample taken at 250 meters with 0% LEL on gas meters. (side of vessel)

1202 – Third water sample taken at 100 meters with 0% LEL on gas meters. (side of vessel)

1228 – Fourth water sample taken at 0 meters with 0% LEL on gas meters. (side of vessel)

1331 – Fifth water sample taken at 0 meters with 0% LEL on gas meters. (side of vessel)

1355 – Sixth water sample taken at 0 meters with 0% LEL on gas meters. (side of vessel)

1455 – Monitors off and headed back to port.

1530 – Arrived to port and close out of Permit to Work.

There were no injuries/incidents and safety was a focus for all personnel performing today's tasks. Proper use of safety toe boots, gloves and life vests were noted throughout all tasks.

We were aboard a new vessel (Titan) due to the Resolution being down for maintenance. We focused on vessel safety and communication with the new crew.

Permit to Work (PTW) / Job Safety Analysis (JSA)

JSA's should be considered prior to any work. JSA's are mandatory for that require the use of Hilcorp Alaska's Permit to Work system.

Emergency Contact Info

Area controller: Vessel Captain
Safety: Hilcorp Safety Professional
Environmental ~~Construction Rep~~: Hilcorp Environmental Specialist
Emergency Muster Area: Bridge/deck of vessel

DATE: 4-5-2017 START TIME: 10:00 Am END TIME: 10:00 pm

FACILITY: N/A LOCATION / AREA: Cook Inlet MSG

PROJECT DESCRIPTION: methane Pipeline Leak water sampling

GENERAL SAFETY CONSIDERATIONS	Y	N	N/A
Are Standard Operating Procedures available and being followed?	✓		
Do personnel have proper tools/equipment for the job?	✓		
Are tools/equipment in good condition/inspected?	✓		
Is there a planned escape route?	✓		
Are personnel aware of the location of First Aid supplies?	✓		
Have the emergency notification procedures been covered with employees?	✓		
Has Hilcorp EH&S been notified 72 hrs. prior to Confined Space Entry projects?			✓
Are all personnel trained/ certified to use equipment/ engage in task?	✓		
Are all personnel donning appropriate PPE?	✓		
Will this project create a hazard to others in the vicinity?			✓
Do all personnel understand correct incident/spill reporting?	✓		

CONFINED SPACE ENTRY REQUIREMENTS:

The operations team and work team have evaluated the confined space and agree that none of the following conditions exist and a Confined Space Entry Permit is not required. Operations Lead or Permit Issuer Initials:_____

1) The space does not contain any type of hazardous atmosphere.
2) The space does not have the potential to entrap or engulf an entrant.
3) The space does not contain any other serious safety or health hazard.

Additional Permits Required: ☐ Hot Work ☐ Confined Space Entry ☐ Isolation of Hazardous Energy ☐ Excavation & Trenching

HAZARD-CONTROL INDEX (THIS LIST IS NOT EXHAUSTIVE)

SLIPS/TRIPS/FALLS
- [x] Clean surfaces (housekeeping)
- [x] Barricade
- [x] Focus on path
- [ ] Use alternate route
- [ ] Relocate equipment/project
- [ ] Examine scaffolding condition
- [x] Examine handrail condition

FALLS FROM ELEVATION (4'+)
- [ ] Move work to ground level
- [ ] Ladder inspections
- [ ] Proper ladder material/placement
- [x] Additional PPE (Fall Protection)
- [x] rails

PINCH POINTS/SHARP OBJECTS
- [x] Proper guarding
- [x] Proper body placement

FIRE/EXPLOSION
- [ ] Permitting
- [x] Air testing/monitoring
- [ ] Remove combustible/flam materials
- [ ] Fire watch
- [ ] Fire extinguishers
- [x] Additional PPE

HIGH NOISE LEVELS
- [ ] Relocate work
- [ ] Additional PPE (Hearing protection etc.)

ENERGIZED EQUIPMENT
- [x] Guarding
- [x] Proper body placement
- [x] No loose clothing

REPETITIVE MOTION
- [ ] Proper technique/tools
- [ ] Ask for assistance
- [ ] Work/rest schedule

PRESSURE
- [ ] Communication
- [ ] Barricading
- [ ] Shielding
- [ ] Proper body placement
- [ ] Block & bleed protocol

ELECTRICAL SHOCK
- [ ] Testing
- [x] Grounding
- [x] Equipment shielding/condition
- [ ] GFCI's
- [ ] Examine electrical clearances

LIFTING/PULLING/PUSHING
- [x] Utilize right tools for job
- [x] Proper technique
- [x] Smaller/lighter loads
- [x] Examine path
- [ ] Use alternate route
- [ ] Work rest schedule

LOCK-OUT/TAG-OUT CONDITIONS
- [ ] Electrical isolation
- [ ] Pressure isolation
- [ ] Energized equipment isolation
- [ ] Fire/explosion isolation

HAZARDOUS CHEMICALS
- [ ] Consult MSDS
- [ ] Label/store containers correctly
- [ ] Spill prevention considered
- [ ] Additional PPE (Goggles etc.)

ATMOSPHERIC
- [ ] Respirators
- [x] Testing/monitoring

WORK TEAM LEADER (print): Environmental Sampler Signature: Environmental Sampler

PERMIT APPROVER (print): Safety Professional Signature: Safety Professional

AREA CONTROLLER (print): Vessel Captain Signature: Vessel Captain

Revalidation or Extension Time (4 Hour Max):

Permit Approver (print): ______ Time: ______

Signature______

Close Out Signature:

Work Team Leader: Environmental Sampler Time: 1528

Area Controller: Vessel Captain Time: 15:12

HILCORP ALASKA, LLC: JOB SAFETY ANALYSIS (JSA)

JOB STEPS (Describe and number each step)		POTENTIAL HAZARDS ASSOCIATED WITH EACH JOB STEP (Identify each hazard with a CAPITAL letter)		CORRECTIVE ACTION(S) (Identify responsible person with Initials)	
1	Travel to location, retrieval & redeployment of equipment travel to port	A	Contacts with sea ice falls, items moving	a	Hand rails, pilot data NWS forecast	GW
		B	Heavy seas - slips, trips, falls fall overboard, items moving	b	Hand rails, secure items procedure for extreme weather	GW Capt
				b	non slip foot wear, lifevest captain discretion	GW capt
		C	Heavy wind - slips, trips, falls wind burn, items moving	c	handrails, secure items, life vest, non-slip footwear, captain discretion	GW Capt
		D	Cold temps - frostbite, skin/eye irritation, hypothermia, cold exposure	d	warm clothing/rain gear	GW
		E	Dangerous atmosphere: contact w/increased LEL%	e	continuous monitoring with three 4-gas meters.	GW
2	Rigging of equipment	A	Pinch points, crushing, cuts	a	rigging procedures, identify pinch points, gloves during	GW
				a	rigging, communication, train for use, proper inspect of equip	GW
3	Deployment and retrieval of equipment	A	Falls overboard	a	Life vests when deployment and retrieval of equipment	GW
		B	Caught -by	b	communication, eye of sight for equipment to include buoy	GW
	if use of crane	C	over head equipment falling objects	c	trained to use, hard hats safety toe boots, no work under items lifted.	GW
4	New vessel & staff	A	vessel orientation by deckhand to ensure safety on new vessel			Capt

This JSA should be reviewed by everyone involved with the project. This JSA is not considered complete until everyone involved with the project signs below, along with any other contributing personnel. Should personnel need more space to complete the JSA, or if new hazards are presented due to changing conditions, an additional JSA form should be utilized and attached to these pages. Make notes on how the task can be performed in an even safer manner, and keep JSA's on file so that they may be referenced in the future should a similar project be conducted.

INVOLVED PERSONNEL SIGNATURES:

Environmental Sampler ____ Safety Professional ____ ____

Environmental Sampler ____ ____ ____

ATTACHMENT C

ACOUSTIC MONITORING – SOUND SOURCE CHARACTERIZATION

OPERATIONS PLAN

Operation Plan

Hilcorp Cook Inlet Cavidyne Caviblaster SSC

6 April 2017

P001362-001
Document 01188
Version 0.10

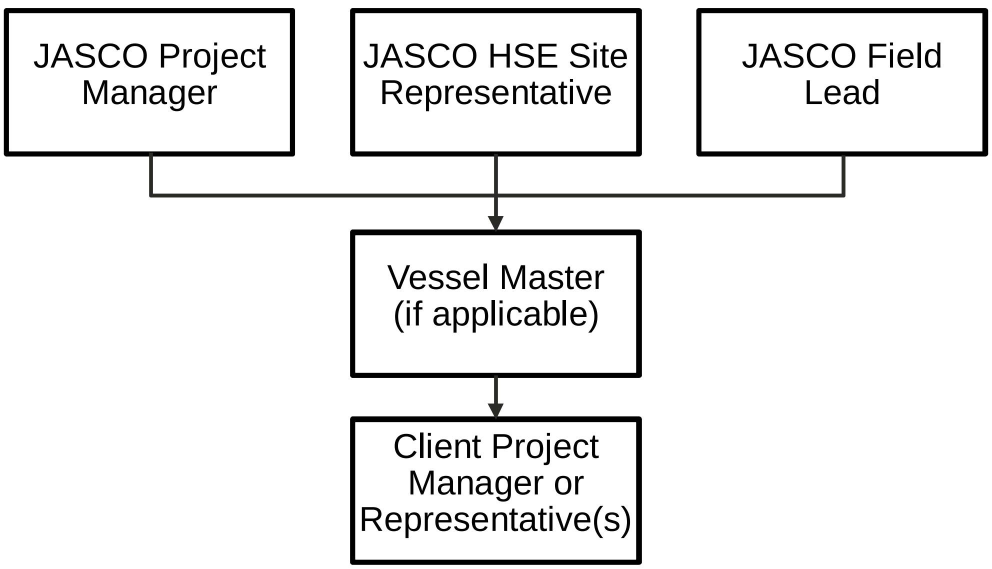
JASCO Applied Sciences (Alaska) Inc.
310 K Street, Suite 200
Anchorage, AK 99501 USA
Tel: +1-907-538-7205
www.jasco.com

Approval

An operations plan is required for all deployments where JASCO is responsible for personnel safety and/or mooring performance. This Field Operations Plan has been approved by:

Name	Title	Approved DD Mon YYYY
Names provided upon request	JASCO Project Manager JASCO HSE Site Representative JASCO Field Lead Vessel Master (if applicable)	DD Mmm YYYY

Complete approvals in the following sequence.



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1. Summary

This operation plan covers the Sound Source Characterization (SSC) study planned by JASCO Applied Sciences for Hilcorp Alaska. This plan summarizes JASCO's operational requirements, the equipment that will be employed, and the deployment and retrieval methods for that equipment.

The goal of the study is to measure underwater sound pressure levels (SPLs) as a function of distance from the Cavidyne Caviblaster source associated with Hilcorp's operations in Cook Inlet, Alaska. The Caviblaster is used to remove debris and sediment to permit pipeline repair works. This acoustic measurement will be used to estimate the distance from the Caviblaster at which underwater sound levels exceed the NOAA Level B marine mammal disturbance threshold of 120 dB rms SPL for continuous noise. For the SSC, JASCO will use its Autonomous Multichannel Acoustic Recorders (AMARs) to measure, simultaneously at two fixed distances, SPLs produced during Caviblaster and diving operations. Measurements will be conducted over approximately 2 days of recording during Caviblaster and diving operations.

2. Schedule of JASCO Operations

This schedule may be adjusted based on weather and operational constraints.

Date	Time	Location	Activity
2017 Apr 4		Halifax, Canada	JASCO ships equipment via air freight
2017 Apr 5		Nikiski, AK	Equipment arrives. Received by Hilcorp Alaska
2017 Apr 6		Nikiski, AK	*R/V Rough Rider* departs Seward.
2017 Apr 7		Nikiski, AK	JASCO Field team travels to Kenai, loads R/V Rough Rider. Equipment checkout at OSK dock.
2017 Apr 8	PM	Cook Inlet	JASCO Field Team deploys moorings using *R/V Rough Rider*.
2017 Apr 10	PM	Cook Inlet	JASCO Field Team retrieves moorings using *R/V Rough Rider*. Return transit to OSK Dock.
2017 Apr 10	AM	Nikiski, AK	JASCO Field team disembarks *R/V Rough Rider*. Downloads data and demobilizes at OSK dock
2017 Apr 11	PM	Seward, AK	*R/V Rough Rider* arrives Seward, AK.

3. Requirements

3.1. Resource Requirements

The following resources are required from the vessel to complete the deployment:

- A-frame will Working Load Limit (WLL) of 200 kg (440 lbs) or greater.
- 1 vessel crew (A-frame operator and deck hand)

3.2. Data Requirements

JASCO requires the following information to interpret the acoustic data:

- **JASCO** to provide GPS tracks for the monitoring vessel
- **JASCO** to provide as-deployed locations for each of the AMARs
- **Hilcorp** to provide position data for each site/activity:
  - In an easily parsed format (e.g., spreadsheet or text file)
  - The datum and time zone are specified
  - Position is that of the acoustic center of the source
- **Hilcorp** to provide time-stamped log of all Caviblaster activity, including settings that affect noise output.

4. Equipment

4.1. Acoustic Recording Configuration

Acoustic measurements will be performed with two autonomous recorders. The autonomous recorders are JASCO AMARs. Each is fitted with a GeoSpectrum M36-V35 hydrophone; one AMAR also has a GeoSpectrum M36-V0 hydrophone with lower sensitivity for close range measurements. Each is configured as follows:

- 128 ksps sample rate (10 Hz to 64 kHz recording bandwidth)
- 24-bit resolution
- 256 GB storage memory (512 GB storage for the dual-channel AMAR)
- 6 days continuous recording (memory limited).

4.2. Mooring Design

Each AMAR will be attached to a mooring base plate deployed to the sea bed. The mooring is shown below in Figure 1. Each mooring consists of:

(1) Base plate with anchor ballast

(1) AMAR

(1) Ground line which can be used as a backup retrieval method via grappling

(1) Anchor assembly (40 kg) with a Pop-up Acoustic Release.

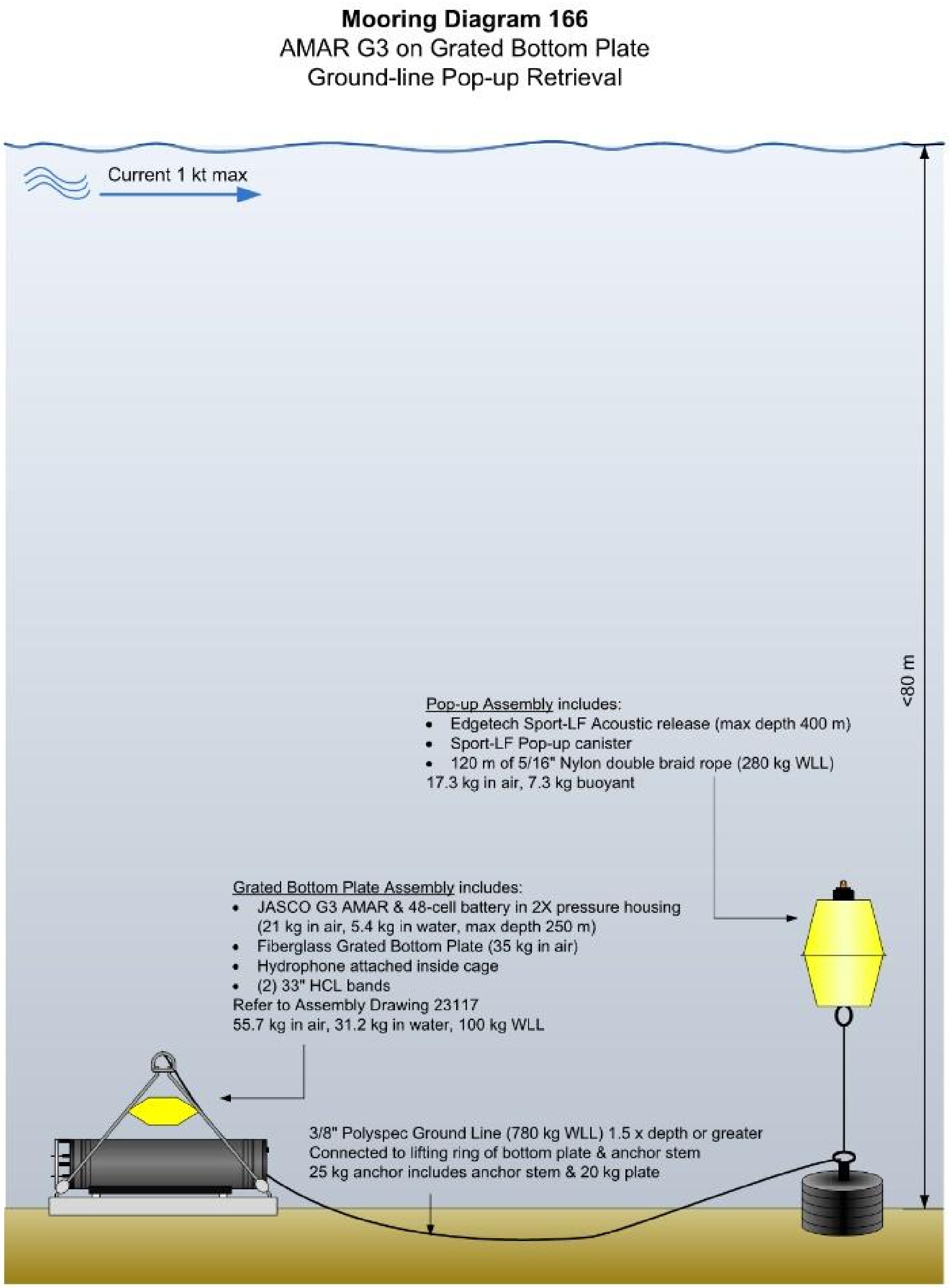

Figure 1 - Baseplate mooring design (JASCO mooring design 166). The following specifications differ from those indicated in the mooring diagram: the bottom plate is solid aluminum instead of grated fiberglass and is fitted with 40 kg of ballast; the anchor stem connects to a 40-kg anchor (2x20 kg plates); the G3 AMAR has an internal 9-cell battery pack instead of a 48-cell pack; the maximum expected current is 5 knots.

4.3. Support Vessel

The deployments, measurements and retrievals will be carried out from the *R/V Rough Rider*. The vessel is shown in Figure 2.

Figure 2. *R/V Rough Rider*

5. Measurement Plan

5.1. Locations

The AMARs will be deployed near the Middle Ground Shoal Pipeline-A leak location in a configuration designed to capture sound levels as a function of range from the source. Two AMARs will be deployed to record sound levels at multiple distances from the Caviblaster. The AMARs will be deployed at 150 m and 1000 m (as in Figure 2 and Table 1) from the leak site. Once the AMARs are in place, the as-deployed coordinates will be communicated to Hilcorp and the dive team.

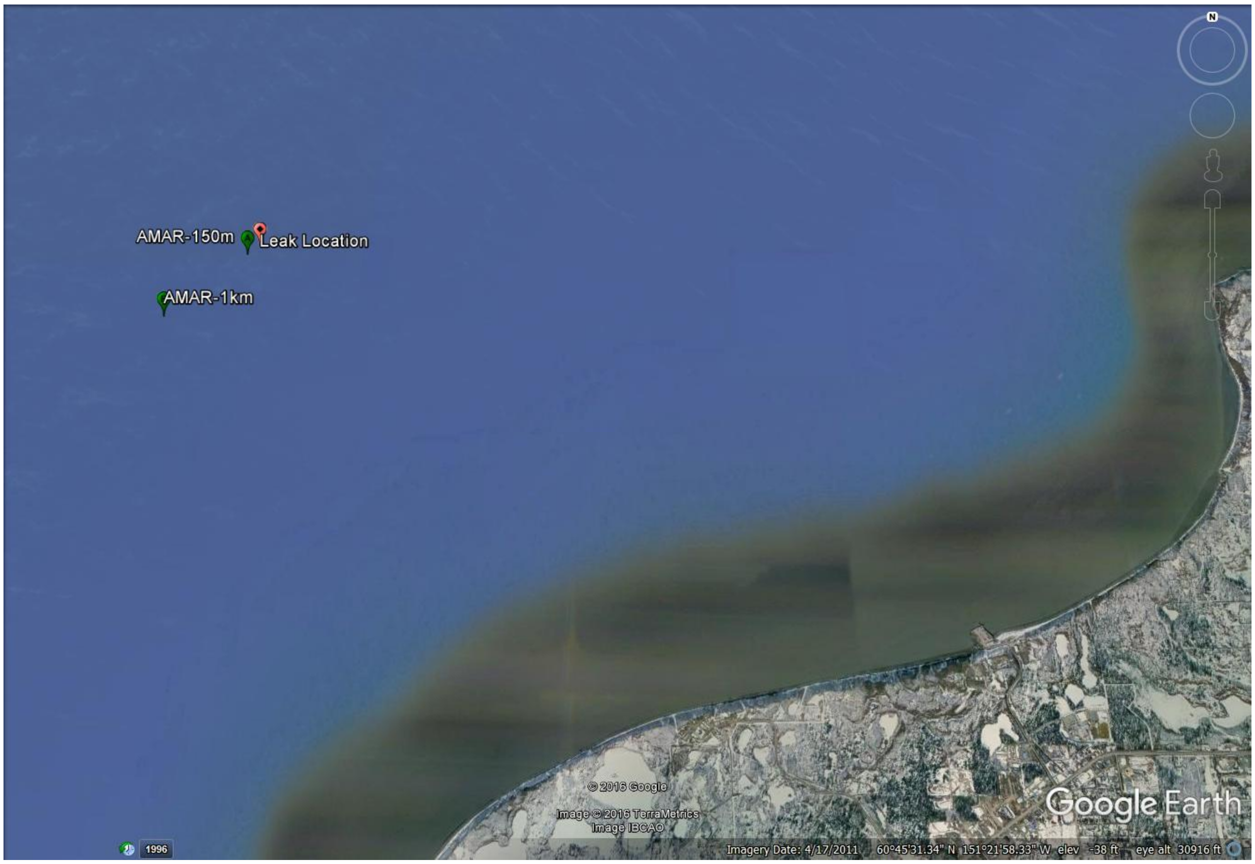

Figure 2. Proposed acoustic monitoring locations, with AMARs at 150 m and 1000 m range of the leak location where the Caviblaster will be employed.

Table 1. Proposed AMAR deployment locations (WGS84) for SSC during Caviblaster operations.

Location	Latitude	Longitude	Depth (m)
150 m	60° 46.540' N	151° 26.152' W	~25
1000 m	60° 46.172' N	151° 26.957' W	~25

5.2. Currents

Current speeds predicted from NOAA station COI1210 (Middle Ground Shoal). Slack tide windows (< 1.0 kt) are between 54 and 90 minutes long for April 7-11. The Hilcorp permit shows assumed flood bearing 234 (true) ebb 48 (true). Flood peaks range from 2.8 to 3.3 kt, ebb peaks range from -2.4 to -3.3 kt.

We expect deployments can occur at any point in the tidal cycle. Retrievals will be attempted near slack tide.

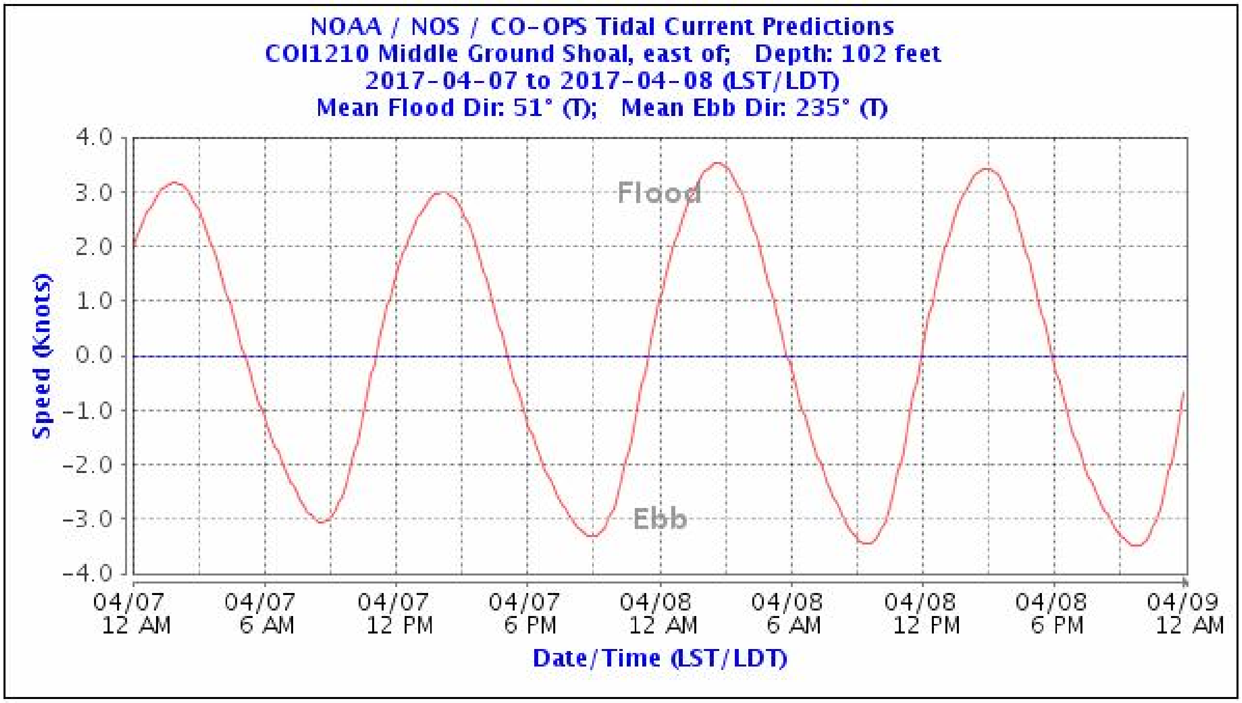

Figure 3. Predicted surface currents for April 7-9

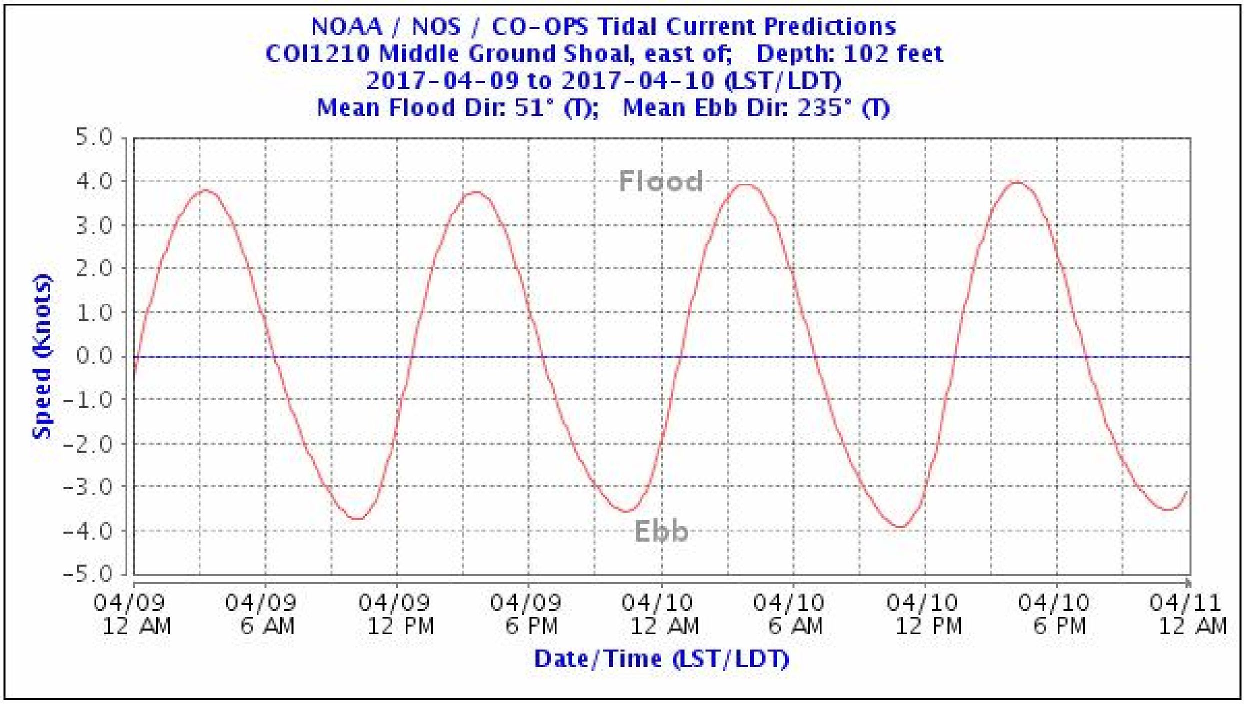

Figure 4. Predicted surface currents for April 9-11

6. Deployment Procedure

The AMAR mooring will be deployed over the stern of the *R/V Rough Rider* by the JASCO field team using the vessel's A-frame. This procedure is subject to change based on weather conditions and consultation with the vessel master and crew.

Each AMAR will be deployed as follows:

1. Job Safety Analysis meeting with JASCO crew, ship's crew, and vessel master.
2. Prepare the equipment for deployment:
    a. Complete deck checks and calibration of AMARs and acoustic releases.
    b. Assemble the mooring base plate, AMARs, releases and ground lines.
    c. Pre-load the lowering line onto the vessel main winch drum, though the A-frame block and the lifting ring on the mooring and secure the free end to a cleat on the vessel stern.
    d. Coil the ground line or flake out on deck for snag-free deployment.
3. Deploy the mooring:
    a. Using main winch lift the base plate off the deck.
    b. Boom out the A-frame until the base plate is over the water and lower the base plate to the waterline.
    c. Use the ground line as a tag line to control mooring motion until in the water.
    d. When in agreed upon position, take a GPS waypoint and begin to lower the mooring plate at a controlled pace, to the bottom using the main winch.
    e. Once the mooring is on the bottom, take another GPS waypoint. Release one end of the lowering line and pull it back on board.
    f. Manoeuver the vessel (or drift with the current) to deploy the ground line and acoustic release away from the mooring. Keep slight tension on the ground line and prevent it from tangling during deployment.
    g. Load the lowering line through the lifting point on the anchor stem
    h. Once the ground line is nearly deployed, lower the secondary anchor and acoustic release using the main winch to just below the water's surface.
    i. Manually lift the acoustic release and deploy to the water allowing it to stream out so that the line to the anchor stem is nearly taught.
    j. Release the lowering line and allow the anchor assembly to fall to the seafloor.

4. Debriefing meeting to capture lessons learned and to review any safety concerns.

7. Retrieval Procedure

The following steps outline the recommended procedure for retrieving the AMAR moorings on *R/V Rough Rider*. This procedure is subject to change based on weather conditions and consultation with the vessel master and crew.

This procedure will need to be conducted near slack tide with surface currents no more than 2 kt. Running tides will cause the pop-up float to deflect away from vertical and potentially be submerged!

The primary retrieval method is to use the pop-ups as follows:

1. Job Safety Analysis meeting with JASCO crew, ship's crew, and vessel master.
2. Position the vessel:
    a. Heading abeam the wind, the vessel approaches the location to within 100 m and disengages the motor to prevent fouling with the transducer. Ship's crew are positioned around the vessel to act as spotters.
    b. JASCO Crew 1 lowers the Command Unit transducer into the water and holds it steady.
    c. JASCO Crew 2 uses the Command Unit to check the distance to the mooring.
    d. If needed, JASCO Crew 1 brings the transducer back onboard, and reposition vessel and repeat current step.
    e. OR, if the distance is okay for retrieval, continue to Step 3.
3. Release the mooring:
    a. JASCO Crew 2 triggers the acoustic release let go of the pop-up so it can float to the surface. Confirm receipt of release response on Command Unit.
    b. The ship's crew observe the water to spot the pop-up float on the surface.
    c. If the pop-up does not surface because of high currents, wait until currents drop closer to slack tide.
    d. If the JASCO field team believes the pop-ups will not surface properly at all, move to the backup retrieval method.
    e. Once the floats are spotted, JASCO Crew 1 brings the Command Unit transducer back onboard.
4. Bring the pop-up float on board:
    a. The vessel proceeds slowly and positions the mooring on the vessel's windward side.
    b. The ship's crew use a boat hook to bring the pop-up alongside.
    c. The JASCO field team lifts the pop-up onboard, and secures the lifting line to the vessel.
    d. Once the lifting line is secured, disconnect the pop-up float.
5. Retrieve the mooring:
    a. Run the lifting line through the block on the A-frame and connect to the main winch.
    b. Use the main winch to bring in the lifting line until the secondary anchor is visible
    c. Switch the main winch from the pop up lifting line to the ground line attached to the secondary anchor
    d. Begin hauling in the ground line until base plate can be seen near the surface.
    e. Once the base plate and AMAR is visible, lift slowly to minimize swinging.
    f. Using a mooring hook attach a tag line to the base plate as soon as it is within reach.

g. Once the base plate is high enough to clear the stern, boom the A-frame in and bring the mooring on board, being careful not to damage the AMAR or releases.

h. Secure the baseplate for transit.

6. Debriefing meeting to capture lessons learned and to review any safety concerns.

The backup retrieval method is to first retrieve the ground line by grappling, as follows:

1. Stow the acoustic release command unit if it was in use for the primary retrieval procedure.
2. Attach the grapple kit to the tow line and wind the tow line onto the main winch.
3. JASCO field team will direct the crew to deploy the grapple and drag it on the bottom to catch the ground line of the mooring.
4. Once the grapple is retrieved and the ground line visible at the surface, connect a safety line to the ground line with a caribiner or mooring hook.
5. Stow the grapple and clear the working area on the deck.
6. Manually retrieve the secondary anchor side of the ground line.
7. Continue the primary retrieval procedure from Step 5, using the ground line as the lifting line.

8. Reporting

Once the recorders are retrieved, the recorders will be returned to JASCO offices for data download, analysis and reporting.

9. Health, Safety, and Environment

For the safety of the JASCO team, JASCO requests the vessel crew address the items in this list:

- The JASCO team and crew will conduct a daily safety (toolbox) meeting before any work proceeds including initial equipment loading/unloading periods, which could happen before or after measurement days.
- The vessel must demonstrate maintenance records and valid permits or certificates before it leaves dock, such that the JASCO team is satisfied that the vessel is well maintained and will meet the needs of the project work.
- The vessel captain will complete JASCO's boat safety checklist in advance of the work, if requested.
- A complete vessel safety orientation will be provided to the JASCO team before the vessel leaves the dock.
- The JASCO team must be satisfied that the vessel crew is competent. For example, a trained crane operator must be present when one is requested as JASCO teams are not trained or qualified to operate lifting devices.
- Any new, young, or untrained staff, including those that form vessel crews, should be clearly identified to everyone so these individuals can receive additional support as needed.
- First Aid in the form required by local regulations must be present on the vessel. All JASCO team members have Standard First Aid, Adult CPR, and an introduction to AED.
- Where the law requires immersion suits, the suits will be in good condition and properly sized for the JASCO crew.
- Adhere to all environmental and safety laws that apply to the vessel.
- Vessel crew will have and use proper PPE for each part of the work. These are typical PPE: PFD worksuit or floater coat, hard hat, gloves, and steel-toed boots. Hearing protection requirements will be assessed at the initial toolbox meeting for activities that can cause hearing damage, such as pile driving, blasting and other such operations. For work on deck during active pile driving, people should wear earmuffs when the distance sound travels is less than 500 m, and ear plugs when the sound will travel farther than 500 m.
- All involved crew members will participate in the JASCO Job Safety Analysis (JSA) and toolbox meetings.
- Safety calls and communication plans will be communicated to the JASCO team in advance of the work in order to confirm that such is occurring and to allow for planning time with JASCO's HSE team.
- Disposal at sea will meet all applicable environmental laws.
- To ensure JASCO staff comply with vessel safety requirements, these will be communicated to team members before work begins.

Any issues or concerns with this list need to be raised in before staff travel. Vessel crew reviewers should notify JASCO in advance of any items that cannot be complied with and indicate why.

10. Contacts

10.1. JASCO Contacts

Name	Role	Contact numbers	Email address
Provided upon request			

10.2. Client Contacts

Name	Role	Contact numbers	Email address
Provided upon request			

10.3. Vessel Contacts

Name	Role	Contact numbers	Email address
Provided upon request			