May 3, 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 #7 ending 05/02/2017

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 seventh 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.

Ice Monitoring:

Hilcorp regularly monitored ice conditions in the area of the gas leak using helicopter overflights and platform observations as conditions allowed. Observations were compared to the National Oceanic and Atmospheric Administration (NOAA) ice forecasts and provided to the Department via Situation Reports.

On April 17, 2017, Hilcorp submitted an Amendment to the Department to stop daily ice monitoring efforts due to warmer temperatures. The Amendment was accepted by the Department on April 18, 2017. Ice monitoring activities described in the Plan are considered complete.

Fish and Wildlife Monitoring:

On April 26, April 28, and May 1, one Cook Inlet Spill Prevention & Response, Inc. (CISPRI) protected species observer and one wildlife observer professional from International Bird Rescue conducted extended overflights of approximately 20 square miles surrounding the gas leak location (within a 5-mile
diameter circle). The helicopter was able to fly at approximately 300-400 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 near the helicopter. Flight circles were approximately 0.5 miles apart. Flight conditions and visibility were good during all flights. Various bird species were observed within the 20 square mile area and marine mammals were observed outside the 20 square mile area.

Wildlife observer reports are provided in Attachment A. The last fish and wildlife monitoring event is scheduled for today (5/3), conditions permitting. Observer reports from the last monitoring effort will be submitted to the Department as part of the final weekly summary report on May 10, 2016.

**Water Quality Sampling:**

The water quality buoy was successfully deployed three times on April 25, 2017. 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 #7, 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 1, 6.5, and 11.5 meters below the water surface.

Drifts passed between 27.9 and 202 meters from the gas release site. Water quality sampling during Sampling Period #7 showed limited variability in dissolved oxygen, methane, and carbon dioxide concentrations. The lowest dissolved oxygen reading observed (11.55 mg/L) was well above the water quality standard specified under 18 AAC 70 for marine waters. The highest methane concentration observed was 0.107 mg/L at 6 meters below the water surface. No violations of state water quality standards were identified.

Three four-gas meters were used to monitor air conditions continuously to establish a safe work zone during all vessel-based sampling efforts. Lower Explosive Limit (LEL) readings from the meters did not exceed 0%.

A summary report and additional safety documentation for the water quality sampling efforts are provided in Attachment B. The final weekly water quality sampling effort occurred yesterday (5/2). Data is currently being downloaded and evaluated and will be submitted to the Department as part of the final weekly summary report on May 10, 2016. Field activities associated with water quality sampling described in the Plan are considered complete.

**Air/Water Interface Sampling:**

The final monthly air/water interface sampling effort occurred yesterday (5/2). Data is currently being downloaded and evaluated and will be submitted to the Department as part of the final weekly summary report on May 10, 2016. Field activities associated with air/water interface sampling described in the Plan are considered complete.

**Acoustic Monitoring:**

Acoustic monitoring described in the Plan was conducted previously on Sunday March, 27, 2017. A second acoustic monitoring effort using Autonomous Multichannel Acoustic Recorders (AMARs) was
conducted between April 7, 2017 and April 22, 2017. On April 17, 2017, Hilcorp submitted an Amendment to the Department to submit this additional acoustic monitoring data as part of the Plan. The Amendment was accepted by the Department on April 18, 2017. Field activities associated with acoustic monitoring described in the Plan are considered complete. Acoustic data is currently being evaluated and will be submitted to the Department as soon as it is available.

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,

[Signature]

William G. Britt, Jr.
Environmental Manager

Attachments:
Attachment A: Fish and Wildlife Monitoring Summary Reports
Attachment B: Water Quality Sampling Summary Report
ATTACHMENT A

FISH AND WILDLIFE MONITORING SUMMARY REPORT
April 26, 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 Hilcorp logistics, and picked up a Hilcorp pool car at the Kenai hangar. Weather was cloudy with sprinkles, with no ice in the inlet.

I ate breakfast, and checked for any recent relevant bird sightings in the upper Cook Inlet area from eBird.org (see below) and the AK Birding listserv (none). Spring migration is well underway.

*From eBird.org:*

- Location Anchor Point--Anchor River Mouth, Kenai Peninsula County, Alaska, US
- Sun Apr 23, 2017 2:15 PM
- Duration: 2 hour(s)
- Observers: Wildlife Observer

- Marine Bird Species Seen:
  - X Surf Scoter
  - X White-winged Scoter
  - X Black Scoter
  - X Common Loon
  - X Bald Eagle
  - X Black-legged Kittiwake
  - X Herring Gull
  - X Glaucous-winged Gull
  - X Glaucous Gull

I visited CISPRI briefly during their spill drill, then arrived at OSK helipad about 10 am with PSO, from CISPRI. We arrived earlier than scheduled due to logistical coordinator’s request. We conducted the wildlife survey from 10:34-11:34 am during outgoing tide (slack tide was predicted at 11:42 am). There was no ice in the survey area, and the seas were calm with good visibility (see photo).

I sat on the outside circling window as we made clockwise circles around the leak site. The outer ending GPS point (west side) was 60° 52.1954 N, 151°24.8575 W (taken by CISPRI PSO...
who mentioned that these were a different coordinate system--?). I saw 1 gull near the dock, 1 gull sitting on a gravel island in the middle of the inlet, 2 large light-colored shorebirds (?) that flushed off some floating debris, and a raven flying past the helicopter. The pilots remarked on seeing some birds, but they were not identified. CISPRI PSO did not report any additional birds seen from the inside circling window.

I visited the Kenai River mouth area about 1 pm during low tide, and observed hundreds of gulls and a few Bald Eagles near the coast. I also made a stop at the Kenai Flats wildlife observation platform but no other species of marine birds were spotted.

I departed Kenai at 5 pm on the Twin Otter, and arrived at Ross Aviation hangar in Anchorage about 5:30 pm.

************************************************************************
April 28, 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 Hilcorp logistics, and picked up a Hilcorp pool car at the Kenai hangar. Weather was partly cloudy, with no ice in the inlet.

I ate breakfast, and checked for any updated relevant bird sightings in the upper Cook Inlet area from eBird.org and the AK Birding listserv (none). Spring migration is well underway.

I visited the Kenai River mouth about 9 am during outgoing tide, and saw hundreds of gulls and three bald eagles, but no other marine birds.

I worked at the CISPRI office to check website data and to draft reports. I arrived at OSK helipad about 12 noon with CISPRI PSO. Due to logistical request, we conducted the wildlife survey from 12:45-1:45 pm. Slack tide was predicted at 1:10 pm but actually started at 1:35 pm. There was no ice in the survey area, and the seas were calm with good visibility (see photo).

I sat on the outside circling window as we made clockwise circles around the leak site. The outer ending GPS point (west side) was 60°48.7129N, 151°34.7360W (taken by CISPRI PSO). I saw a flock of tan shorebirds (about 20) flying over the water about ½ mile south of the A Platform, and 1 gull flying over west over a gravel bar in the center of the inlet. CISPRI PSO observed additional birds seen from the inside circling window, including 1 gull flying east, 2 black and white birds flying SE (possibly White-winged Scoters after he saw them in bird field guide), 1 white and gray gull-type bird hovering over a gravel bar (likely Arctic Tern), and 1 adult Bald Eagle.

Hilcorp logistics coordinator at OSK helipad, reported that a colleague had seen a pod (about 7) belugas near the OSK dock on April 26 in the afternoon.
I departed Kenai at 4:30 pm on the Twin Otter, and arrived at Ross Aviation hangar in Anchorage about 5 pm.

************************************************************************

May 1, 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 Hilcorp logistics, and picked up a Hilcorp pool car at the Kenai hangar. Weather was mostly cloudy, with no ice in the inlet.

I ate breakfast, and checked for any updated marine bird sightings in the upper Cook Inlet area from eBird.org (see below) and the AK Birding listserv (none). Spring migration is well underway.

From eBird.org:
April 28, 2017 Kasilof River mouth –observed by Wildlife Observer
4 Surf Scoters
1 White-winged Scoter
7 Bald Eagles
30 Mew Gulls
400 Herring Gulls
10 Glaucous-winged Gulls
1 Common Loon
(also various other waterbirds, shorebirds, and songbirds)

April 25, 2017 Erik Hansen Scout Park, Kenai - observed by Wildlife Observer
5 Bald Eagles
20 Mew Gulls

I walked the beach on the north side of the Kenai River mouth from 10:15-11am during outgoing tide, and saw 3 Bald Eagles, 4 Mew Gulls, 10 Herring Gulls, and hundreds of other unidentified gulls at a distance, but no other marine birds. I also saw a pod of beluga whales (6-8 individuals) swimming out of river mouth, and a minke whale with them (identified by color, size, small dorsal fin, visible flukes when diving, and grooves on back).

I worked at the CISPRI office to draft reports. I arrived at OSK helipad about 2:30 pm with CISPRI PSO.

We began the survey at 3:30 pm. Predicted slack tide was 3:37 pm, but at Platform C it was closer to 4 pm. There was no ice in the survey area, and the seas were fairly calm with good visibility (see photo). I sat on the outside circling window as we made clockwise circles around
the leak site. The outer ending GPS point (west side) was very close to last survey (60°48.7129N, and 151°34.7360W) although we were not able to take an exact reading. I saw 5 unidentified gulls in 3 different groups in the survey area. CISPRI PSO did not see any birds from the inside circling window.

I departed Kenai at 6 pm on the Twin Otter, and arrived at Ross Aviation hangar in Anchorage about 6:30 pm.

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<th>Slack Tide Time</th>
<th>Tide Loc</th>
<th>Approx Survey Alt (ft)</th>
<th>Approx Survey Alt (sq mi)</th>
<th>% Open Water</th>
<th>Beaufort Sea State</th>
<th>Swell Time</th>
<th>Nikiski Time</th>
<th>Air Temp (deg F)</th>
<th>Wind Speed (kts)</th>
<th>Wind Dir</th>
<th>Visib (mi)</th>
<th>Cloud Cover (%)</th>
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<td>1550</td>
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<td>ESE</td>
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<td>100</td>
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<td>1 gull and 1 raven seen by PSO and Pilot in survey area.</td>
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<td>1120</td>
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<td>72</td>
<td>350</td>
<td>25</td>
<td>99</td>
<td>2</td>
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<td>4</td>
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<td>100</td>
<td>0</td>
<td>0</td>
<td>EH</td>
<td>CISPRI PSO 1 Herring Gull flying N; 2 Mew Gulls flying S; 1 Leach's Storm Petrel W; 10 Glaucous-winged Gulls flying north</td>
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<td>1</td>
<td>1</td>
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<td>46</td>
<td>4.5</td>
<td>ENE</td>
<td>100</td>
<td>30</td>
<td>0</td>
<td>TC</td>
<td>CISPRI PSO 2 Glaucous-winged Gulls flying S to N thru middle; 3 Mew Gulls sitting between A and C platform first three circles, then flew away; 100 Geese flying N to S on the West edge of area, about 1,000 feet; 3 Glaucous-winged gulls flying next to shore by Helipad as we landed</td>
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<td>41.9</td>
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<td>100</td>
<td>90</td>
<td>0</td>
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<td>CISPRI PSO 1 gull flying near dock; 1 gull perched on gravel island; 2 large shorebirds (?) flushed from floating debris; 1 raven flying past. Possibly additional unidentified birds seen by pilots.</td>
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<td>75</td>
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<td>CISPRI PSO 2 gulls, flock of 30 shorebirds, 2 possible WWSC, 1 possible ARTE, and 1 Bald Eagle.</td>
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<td>17.3</td>
<td>E</td>
<td>50-75</td>
<td>100</td>
<td>sprinkles  Chris</td>
<td>CISPRI PSO Less gravel exposed. 5 unidentified gulls seen flying.</td>
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# Cook Inlet Operations - Protected Species Observer Effort Log

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<th>Date</th>
<th>Observers' Initials</th>
<th>Start of watch</th>
<th>End of watch</th>
<th>Wind direction</th>
<th>Beaufort sea state</th>
<th>Swell (m)</th>
<th>Visibility (km)</th>
<th>Glare severity</th>
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<td>N 60°</td>
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<td>30.549'</td>
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</table>
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 #7

Prepared by SLR International Corporation (SLR)

Report Date: 5-2-2017

1.0  OVERVIEW

The seventh water quality monitoring event was conducted from aboard the Offshore Service Vessel (OSV) Resolution 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. On April 13, the leak was stopped by applying a temporary clamp over the hole in the gas line. The temporary clamp was removed on April 19 during the slack tide around mid-day to allow for the installation of the permanent clamp. This operation took several dives during slack water. During the installation of the permanent clamp there was intermittent gas leakage from the pipeline as it could only be partially tightened. The permanent clamp failed to stop all the leakage and the temporary clamp was re-installed on April 20. The temporary clamp stopped the gas leakage.
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 25, 2017 which was 5 days after the temporary clamp stopped leakage from the pipeline and one day prior to a spring tide on April 26. The April 25 monitoring event covered portions of an ebb and flood tide. The NOAA tide predictions at the nearby East Forelands area predicted a low tide at 11:27 with height of -0.61 meters above mean lower low water (MLLW) on April 25. 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) scientist. 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. This was verified by review of the depth reading obtained by the CTD, which was located at the end of the line. As with Weeks 4, 5, and 6, during Week 7 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 meter above the water surface, and thus reduced the depth of the instruments in the water column a similar amount. Monitoring depths for this reporting period were approximately 1, 6 and 11.5 meters bws. A summary of the parameters measured by each instrument and frequency is provided in Attachment A, Table A-1.

During event 7, the site conditions impacted the activities completed as well as the collection of data, as noted below:
No dive crew or buoys were near the MRP, therefore drifts could proceed without danger of entanglement in buoy lines.

No sea ice was encountered during the seventh event. The seas were relatively flat.

Air temperatures varied between 4 and 8 ºC with water temperatures typically about 0.9 to 1.3 ºC.

The MiniCH4 and MiniCO2 sensors at both depths 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 the Week 4 event, these sensors had been mounted with the membrane facing toward the seafloor. Starting on Week 5, the deeper (12 meter) sensor was mounted upward as well.

The deep and middle depth sensors where soaked in a container of seawater prior to and between drifts to keep them closer to ambient conditions when deployed. The sea water was collected from Cook Inlet prior the first drift near the project site. This technique was used the previous week as well, and appeared to reduce the sensors equilibrium time following deployment.

Three water quality buoy drifts (monitoring transects) were conducted through the area surrounding the MRP on April 25 at differing tidal stages. The duration of each water quality buoy drift varied from approximately 17 to 45 minutes. The average drift speed varied between 8.8 and 9.7 kilometers per hour. Table A-2 in Attachment A provides a summary of the buoy deployments. Attachment A. Figure A-2g illustrates the path of the three buoy drifts. During all three drifts the temporary clamp was installed on the natural gas line and no gas was observed bubbling around the MRP.

Drift #1 occurred during the ebb tide. The buoy was deployed approximately 1,700 meters up current of the MRP and was allowed to drift down current at total of 5978 meters, with periodic adjustment using the vessel to guide it safely past the MRP. The buoy passed within 29.6 meters of the MRP about 13 minutes into the drift.

Drift #2 occurred during the flood tide. The drift began approximately 1,500 meters up current of the MRP. Wind interfered with projected drift pattern and the drift was terminated immediately after passing the MRP due the poor trajectory. At its closest point, the buoy was 202 meters southwest of the MRP. At that point it was decided to reposition the buoy for another attempt at passing closer to the MRP.

Drift #3 occurred during the flood tide. The drift began approximately 700 meters up current of the MRP, and the buoy drifted down current a total of 4007 meters. The buoy passed within 27.9 meters of the MRP about 6.5 minutes into the drift.

No CTD casts were performed during Week 7.

No water samples for laboratory analysis were collected during Week 7.

A photograph log documenting the data collection methods and site conditions during Week 7 is included in Attachment A.
2.2 Summary of Results

2.2.1 Buoy Transects-Week 7

Data plots for the primary parameters of interest (DO, CH₄ and CO₂) for the water quality buoy Drifts #1 and #3 completed on April 25 are provided on Figures A-10.1 and A-10.2 in Attachment A. Drift #2 was terminated when it became evident the buoy would not come close to the MRP. The data obtained during Drift #2 was not considered relevant for analysis or reporting purposes, and is not discussed.

- Dissolved Oxygen- The lowest DO value recorded after the sensor had time to stabilize and passed the MRP was 11.55 mg/L during Drift #1 and 11.53 mg/L during Drift #3. These lowest values were both recorded on the deepest DO sensor deployed at 11.5 meters on the CTD. There was no significant drop in DO concentrations recorded by the sensors as they passed the MRP, and measurements from each sensor were relatively stable throughout the drift (Attachment A, Figures A-10.1a and A-10.2a).

- Dissolved Methane: The maximum CH₄ concentration recorded was 0.107 and 0.096 mg/L during Drifts #1 and #3, respectively. These values were recorded on the sensor deployed at 6 meters. The sensor at 11.5 meters recorded values about 0.05 to 0.6 mg/L less than the sensor at 6 meters which has been a typical pattern observed during the monitoring events. The recorded CH₄ concentrations did not show a noticeable (sharp) increase as the sensors passed the MRP, and were relatively stable and consistent throughout the two drifts (Attachment A, Figure A-10.2b and A-10.2b). Overall, the recorded CH₄ concentrations were in the lower range of concentrations measured during the project, and similar to the previous four weeks (March 29-April 25 events).

- Dissolved Carbon Dioxide - CO₂ concentrations recorded during Drifts #1 and #2 did not show any sharp upward fluctuation as the buoy passed the MRP (Figure A-10.1c and Figure A-10.2c in Attachment A). The recorded concentrations varied the most during the initial 5 to 10 minutes of each drift and prior to passing the MRP, presumably as the instrument equilibrated with the water conditions. The measured CO₂ concentrations were typically between 0.9 and 1.2 mg/L, which is consistent with the values recorded each week during the project.

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 Laboratory Results

There were no new laboratory sample results received for dissolved CH\textsubscript{4} and CO\textsubscript{2} this reporting period. All results for samples collected to date have been previously reported. The next water sampling event is planned for May 2.

2.3 Activities Planned for the Next Sampling Event

The next water quality sampling event is planned for May 2, 2017. Planned activities include:

- Collecting discrete water samples at similar locations to the sampling performed to-date for the project.
- 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. The water sampling is considered a higher priority than the buoy drifts. This is the final planned water quality monitoring event.

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 May 2, 2017. Planned activities include conducting deployments of the Air / Water Interface buoy in the vicinity of the MRP. These planned activities may need to be modified due to site conditions and logistics. This is the final planned air/water interface monitoring event.

REFERENCES


ATTACHMENT A:

PHOTOGRAPH LOG:
Water Quality and Air/Water Interface Photograph Log (April 25, 2017)

TABLES:
Table A-1: Water Quality Buoy Instrumentation Summary, April 25, 2017
Table A-2: Summary of Water Quality Buoy Drifts

FIGURES:
Figure A-1: Water Quality Monitoring Buoy Schematic (March 23-April 25, 2017)
Figure A-2e: Water Quality Monitoring Week 6 (April 25, 2017), Buoy Drift Tracks

Week 5 Data Plots:
Figure A-10.1a: Buoy Drift #1, April 25, 2017, Dissolved Oxygen
Figure A-10.1b: Buoy Drift #1, April 25, 2017, Dissolved Methane
Figure A-10.1c: Buoy Drift #1, April 25, 2107, Dissolved Carbon Dioxide
Figure A-10.2a: Buoy Drift #3, April 25, 2017, Dissolved Oxygen
Figure A-10.2b: Buoy Drift #3, April 25, 2017, Dissolved Methane
Figure A-10.2c: Buoy Drift #3, April 25, 2017, Dissolved Carbon Dioxide
Cook Inlet Water Quality and Air/Water Interface Sampling
Photo Log: Week 7
4-25-17
Photo 1: Typical conditions during Week 7. There was no sea ice and relatively flat seas. Buoy is seen here tied to the boat during Drift 1. Bubbles were not observed on the water surface near the MRP at any point during the day. Date: 4/25/2017

Photo 2: CTD and mid-level sensors were stored in a container of seawater collected from Cook Inlet near the project site to keep them as close to in-situ conditions as possible between drifts. Date: 4/25/2017
Photo 3: View of the deck and stern on the Resolution during Drift 3. Buoy is attached to the side of the boat on right. Conditions remained ice-free with waves less than 1 foot. Winds were approximately 10 knots out of the North.

Date: 4/25/2017
<table>
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<tr>
<th>Instrument Name</th>
<th>Parameters Measured</th>
<th>Measurement Unit</th>
<th>Measurement Frequency</th>
<th>Frequency Reported, Plotted on Data Analysis Figures</th>
<th>Notes</th>
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<td>PME MiniDOT</td>
<td>Temperature</td>
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<td>Once per minute</td>
<td>Once per minute</td>
<td>Unable to record at higher frequencies</td>
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<td></td>
<td>Dissolved Oxygen</td>
<td>milligrams per liter (mg/L)</td>
<td>Once per minute</td>
<td>Once per minute</td>
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<tr>
<td>Pro-Oceanus MiniCO2 (0-1000ppm)</td>
<td>Partial pressure of CO2 in detector</td>
<td>Parts per million by volume (ppmv)</td>
<td>Once per 4 seconds</td>
<td>Once per 4 seconds</td>
<td>Note this is measured as a gaseous phase concentration, which is then converted to the surrounding aqueous concentrations.</td>
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<tr>
<td></td>
<td>Detector total pressure</td>
<td>millibars</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Detector temperature</td>
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<tr>
<td>Pro-Oceanus MiniCH4 (two instruments utilized, with differing ranges 0-1% and 0-100%)</td>
<td>Partial pressure of CH4 in detector</td>
<td>Volume ratio (%)</td>
<td>Once per 4 seconds</td>
<td>Once per 4 seconds</td>
<td>Note this is measured as a gaseous phase concentration, which is then converted to the surrounding aqueous concentrations.</td>
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<tr>
<td></td>
<td>Detector total pressure</td>
<td>millibars</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Detector temperature</td>
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<tr>
<td>Seabird SBE 19plus V3 SeaCat</td>
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<td>meters (M)</td>
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<td>Once per 4 seconds</td>
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<td>Garmin WAAS</td>
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<td>Once per 2 seconds</td>
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<tr>
<td></td>
<td>Dissolved Oxygen</td>
<td>milligrams per liter (mg/L)</td>
<td>Once per 2 seconds</td>
<td>Once per 2 seconds</td>
<td></td>
</tr>
</tbody>
</table>
# Table A-2: Summary of Water Quality Buoy Drifts

| Buoy Type | Instrument (m) | Depth (m) | Drift Name | General Tide Description | Proximity to Spring or Neap tide event | Daily Tidal Range (High-Low) (m) | Date | Release Location | Retrieval Location | Start of Data Collection (h:mm:ss) | End of Data Collection (h:mm:ss) | Duration of Data Collection (h:mm:ss) | Total Drift Distance (m) | Average Drift Velocity (km/hr) | MRP Methane Release Point | MRP (m) | Minimum Distance to MRP (m) | Drift Elapsed Time at Minimum Distance to MRP (h:mm:ss) | Wind (knots & direction) | Wave Height (m) | Comments |
|-----------|----------------|-----------|------------|--------------------------|---------------------------------------|------------------------------------|------|----------------|----------------|--------------------------------|----------------------------|--------------------------------|-------------------------------|-----------------|----------------|-------------------------|---------------------------|---------------------|----------|
| Water Quality Surface Ebb | D01-031817 | Ebb | 4.75 | 3/18/2017 | 40 46.52 N | 45 46.35 N | 14:52:20 | 15:09:55 | 0:17:35 | 1766 | 6.1 | 185.9 | 0:01:55 | calm | 0 | CO2 sensor at 12.5 m unintentionally shut off, no data |
| Water Quality Surface Flood | D01-031917 | Flood | 3.84 | 3/19/2017 | 40 45.37 N | 45 37.7 N | 8:15:45 | 8:49:55 | 0:30:10 | 1930 | 3.8 | 44.9 | 0:05:10 | 15, SSW | 0 | SeaBird DO sensor stopped recording after 5 minutes, potential clog |
| Water Quality Surface Flood | D02-031917 | Flood | 9.09 | 3/19/2017 | 40 33.78 N | 45 30.78 N | 9:09:40 | 9:36:55 | 0:27:15 | 901 | 2.0 | 165.8 | 0:14:40 | 15, SSW | 0 | SeaBird DO sensor stopped recording after 5 minutes, potential clog |
| Water Quality Surface Flood | D01-032317 Flood/Slack Ebb | – | – | 3/23/2017 | 40 46.57 N | 45 46.57 N | 9:58:00 | 11:57:33 | 1:59:33 | 3684 | 1.9 | 9.4 | 1:05:45 | 15, SSW | 0.2 | SeaBird DO sensor stopped recording after 5 minutes, potential clog |
| Water Quality Surface Flood | D01-032317 Flood | 3.08 | 3/23/2017 | 40 46.38 N | 45 47.49 N | 12:09:50 | 12:29:30 | 0:19:40 | 1675 | 5.1 | 71.2 | 0:00:05 | 0.4 SSW | 0 | SeaBird DO sensor clogged with ice, no 12.5 meter MRP data |
| Water Quality Surface Flood | D02-032317 Flood | 13:10:40 | 13:54:55 | 0:44:15 | 3521 | 4.8 | 3.9 | 0:06:15 | Calm | 0 | SeaBird DO sensor clogged with ice, no 12.5 meter MRP data |
| Water Quality Surface Flood | D03-032317 Flood/Slack Ebb | – | – | 3/23/2017 | 40 46.74 N | 45 46.57 N | 15:29:55 | 16:24:32 | 0:54:35 | 675 | 0.36 (Tide Tidal) | 1.44 (Ebb Tide) | 165.5 | 0.50:35 | Calm | 0 |
| Water Quality Surface Flood | D04-032317 Ebb | 4.33 | 3/23/2017 | 40 46.03 N | 45 49.40 N | 16:31:35 | 17:18:55 | 0:47:20 | 3037 | 3.9 | 2.6 | 0:04:45 | Calm | 0 | |
| Water Quality Surface Flood | D01-032917 Ebb | 8.35 | 3/29/2017 | 40 47.75 N | 45 46.32 N | 11:07:24 | 11:45:36 | 0:38:12 | 5193 | 8.2 | 145.7 | 0:02:28 | 11, SW | 0 | Water pump for SeaBird DO sensor clogged, no 12.5 m MRP data |
| Water Quality Surface Flood | D02-030917 Flood | 7.86 | 3/29/2017 | 40 47.63 N | 45 46.58 N | 15:44:32 | 16:46:56 | 0:52:24 | 6962 | 5.0 | 142.7 | 0:05:32 | Calm | 0 | Water pump for SeaBird O2 sensor clogged, no 12.5 m MRP data |
| Water Quality Surface Flood | D01-040517 Ebb | 3.57 | 4/5/2017 | 40 49.31 N | 45 49.57 N | 13:26:48 | 13:48:08 | 0:21:20 | 793 | 2.5 | 67.8 | 0:06:00 | 5-10, SSW | 0.5 | |
| Water Quality Surface Flood | D01-0405 Flood/Slack Ebb | – | – | 4/5/2017 | 40 49.54 N | 45 49.57 N | 13:55:32 | 14:52:40 | 0:57:08 | 1094 | 1.74 (Tide Tidal) | 1.08 (Ebb Tide) | 10.4 | 0:18:28 | 5-10, SSW | 0.5 |
| Water Quality Surface Flood | D01-041217 Ebb | 7.29 | 4/12/2017 | 40 47.25 N | 45 46.63 N | 11:21:08 | 12:09:20 | 0:48:12 | 6367 | 7.9 | 61.1 | 0:09:12 | Calm | 0 | |
| Water Quality Surface Flood | D02-041217 Flood | 6.98 | 4/12/2017 | 40 47.25 N | 45 46.63 N | 15:31:36 | 15:57:32 | 0:25:56 | 3614 | 7.4 | 222.9 | 0:07:32 | Calm | 0 | |
| Water Quality Surface Flood | D01-041917 Flood | 2.56 | 4/19/2017 | 40 49.79 N | 45 47.83 N | 9:32:48 | 11:18:36 | 1:45:48 | 5427 | 3.1 | 32.1 | 0:20:44 | 5, SSW | 0.2 | Temporary clamp was installed on pipeline leak on April 13, and inflatable during this drift |
| Water Quality Surface Flood | D02-041917 Ebb | 3.54 | 4/19/2017 | 40 49.79 N | 45 48.00 N | 13:05:44 | 14:16:16 | 1:10:32 | 4765 | 4.2 | 18.5 | 0:18:16 | Calm | 0.2 | Temporary clamp was removed during this drift. Bubbling observed on water surface near MRP |
| Water Quality Surface Flood | D01-042517 Ebb | 7.01 | 4/25/2017 | 40 48.20 N | 45 48.34 N | 10:07:36 | 10:56:36 | 0:49:00 | 5978 | 9.7 | 29.6 | 0:12:48 | 5-10 | 0.3 | Temporary clamp was re-installed on April 20 and in place during this event. No bubbling observed |
| Water Quality Surface Flood | D02-042517 Flood | 7.59 | 4/25/2017 | 40 48.04 N | 45 47.74 N | 13:08:12 | 13:24:56 | 0:16:44 | 1727 | 8.6 | 202.3 | 0:16:44 | 5-10 | 0.3 | Drift terminated due to poor trajectory (missed MRP) |
| Water Quality Surface Flood | D03-042517 Flood | 7.59 | 4/25/2017 | 40 48.19 N | 45 47.81 N | 13:41:00 | 14:18:28 | 0:37:28 | 4007 | 8.8 | 27.9 | 0:06:24 | 10 | 0.3 | |

**Notes:**
1. Total information is from NOAA Tidal Predictions for East Foreland, Station 1 WC1989
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.
FIGURE 1: WATER QUALITY MONITORING BUOY SCHEMATIC
(MARCH 23, 29 and APRIL 5, 12, 19, 25, 2017)

- PME MiniDOT dissolved oxygen (DO) and temperature logger: S/N 034835
  Note: In addition, Air-Interface Buoy will contain a Pro-Oceanus Mini CH₄ sensor Submersible pCH₄ (partial pressure CH₄) sensor and datalogger (0-100% by volume range) for surface water measurements of CH₄.

- PME MiniDOT dissolved oxygen (DO) and temperature logger: S/N 066117
  - Pro-Oceanus Mini CH₄ sensor Submersible pCH₄ (partial pressure CH₄) sensor and datalogger (0-100% by volume range): S/N 37-417-25
  - Pro-Oceanus Mini CO₂ sensor Submersible pCO₂ sensor and datalogger: S/N 37-414-20

- PME MiniDOT dissolved oxygen (DO) and temperature logger: S/N 327723
  - Seabird SBE 19plus V2 SeaCAT profiling conductivity, temperature, and depth (CTD), with DO, pH, and turbidity.
  - Pro-Oceanus Mini CH₄ sensor Submersible pCH₄ (partial pressure CH₄) sensor and datalogger (0-1% by volume measurement range): S/N 37-416-25
  - Pro-Oceanus Mini CO₂ sensor Submersible pCO₂ sensor and datalogger: S/N 37-415-20
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

THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY.
ACTUAL LOCATIONS MAY VARY AND NOT ALL STRUCTURES ARE SHOWN.
Figure A-10.1a: Buoy Drift #1, April 25, 2017
Dissolved Oxygen Measurements at 1, 6, 11 and 11.5 Meters Depth
Flood Tide

Lowest dissolved oxygen past MRP: 11.55mg/L

Buoy tangentially passes within 30m of MRP
Highest dissolved methane past MRP: 0.107 mg/L

Dissolved Methane Measurements at 6 and 11.5 Meters Depth
Flood Tide

Buoy tangentially passes within 30m of MRP

Highest dissolved methane past MRP: 0.107 mg/L

Figure A-10.1b: Buoy Drift #1, April 25, 2017
Figure A-10.1c: Buoy Drift #1, April 25, 2017
Dissolved Carbon Dioxide Measurements at 6 and 11.5 Meters Depth
Flood Tide

Buoy tangentially passes within 30m of MRP
Figure A-10.2a: Buoy Drift #3, April 25, 2017
Dissolved Oxygen Measurements at 1, 6, 11 and 11.5 Meters Depth
Flood Tide

Dissolved Oxygen Measurements at 1, 6, 11 and 11.5 Meters Depth
Flood Tide

Buoy tangentially passes within 28m of MRP

Lowest dissolved oxygen past MRP: 11.53 mg/L
Figure A-10.2b: Buoy Drift #3, April 25, 2017
Dissolved Methane Measurements at 6 and 11.5 Meters Depth
Flood Tide

Buoy tangentially passes within 28m of MRP

Highest dissolved methane past MRP: 0.096 mg/L

Draft 05/01/2017
Figure A-10.2c: Buoy Drift #3, April 25, 2017
Dissolved Carbon Dioxide Measurements at 6 and 11.5 Meters Depth
Flood Tide

Buoy tangentially passes within 28m of MRP

- 6m CO2 (mg/L)
- 11.5m CO2 (mg/L)
- Distance to MRP (m)

Draft 05/01/2017
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.

Work By PEAK:
The work performed by 1 PEAK employee (Safety Professional I) 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 Kinematic 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.

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

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<th>PEAK No. of Men</th>
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TOTAL Equipment

3 4-gas meters (Hilcorp)

Supervisor

[Signature]
The following is a list of events that took place for the Hilcorp pipeline gas leak air water interface sampling and acoustic testing on Sunday 4-25-2017:

0800 – JSA and pre-job safety meeting completed

0815 – Depart Port aboard the Resolution owned and operated by OMSI

0830 – Weather noted: Overcast, wind at 5 knots, 1 foot seas and temperature at 40° F.

0900 – 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.

1010 – First water sample buoy with 0% LEL on gas meters. (side of vessel)

1310 – Second water sample buoy with 0% LEL on gas meters. (side of boat)

1430 – Monitors off and headed back to port.

1450 – 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.
**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.

**DATE:** 4-25-17  **START TIME:** 9:00  **END TIME:** 2000

**FACILITY:** N/A  **LOCATION / AREA:** Cook Inlet MSW  **PROJECT DESCRIPTION:** Water sampling & water air interface

**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.

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**HAZARD CONTROL INDEX (THIS LIST IS NOT EXHAUSTIVE)**

**SLIPS, TRIPS/FAILS**
- Clean surfaces (housekeeping)
- Barricade
- Focus on path
- Use alternate route
- Relocate equipment/project
- Examine scaffolding condition
- Examine handrail condition

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

**PRIOR POINTS/SHARP OBJECTS**
- Proper guarding
- Proper body placement

**FIRE/EXPLOSION**
- Permitting
- Fire testing/monitoring
- Remove combustible/flam materials
- Fire watch
- Fire extinguishers
- Additional PPE

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

**ENERGIZED EQUIPMENT**
- Safety
- Proper body placement
- No loose clothing

**REPEETITIVE MOTION**
- Proper technique/tools
- Ask for assistance
- Work/rest schedule

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

**ELECTRICAL SHOCK**
- Testing
- Grounding
- Equipment shielding/condition
- GFCI’s
- Examine electrical clearances

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

**LOCK-OUT/TAG-OUT CONDITIONS**
- Electrical isolation
- Pressure isolation
- Energized equipment isolation
- Fire/exlosion isolation

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

**ATMOSPHERIC**
- Respirators
- Testing/monitoring

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

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

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

**Revalidation or Extension Time (4 Hour Max):**

<table>
<thead>
<tr>
<th>Permit Approver (print)</th>
<th>Time:</th>
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<tbody>
<tr>
<td>Signature</td>
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**Close Out Signature:**

<table>
<thead>
<tr>
<th>Work Team Leader</th>
<th>Time:</th>
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<td>Signature</td>
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<table>
<thead>
<tr>
<th>Area Controller</th>
<th>Time:</th>
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<tr>
<td>Signature</td>
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<tr>
<td>JOB STEPS (Describe and number each step)</td>
<td>POTENTIAL HAZARDS ASSOCIATED WITH EACH JOB STEP (Identify each hazard with a CAPITAL letter)</td>
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<tr>
<td>----------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1 Travel to location retrieval &amp; redeployment of equipment and travel to port</td>
<td>A Heavy seas/wind - fall overboard B Wind burn, items moving, falls cool temps - frostbite, skin eye irritation, cold exposure D Dangerous atmosphere - contact C with increased LEL 0%</td>
</tr>
<tr>
<td>2 Rigging of equipment</td>
<td>A Pinch points, crushing, cuts</td>
</tr>
<tr>
<td>3 Deployment and retrieval of equipment</td>
<td>A Falls over board, tripped B Caught by moving/falling overhead C Material, crush, struck by</td>
</tr>
</tbody>
</table>

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:

[Signatures]

Environmental Sampler

Environmental Sampler

Safety Professional