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APPENDIX G WETLAND FIELD SURVEY REPORTS

The following reports are included in this Appendix.

G.1. 2014 WETLAND FIELD STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK
(MP 709.5) (USAI-UR-SRZZZ-00-000012-000)

G.2. 2015 WETLAND FIELD STUDY REPORT (USAI-P1-SRZZZ-00-000002-000)


G.3. 2016 WETLAND AND VEGETATION FIELD STUDY REPORT (USAI-PE-SRREG-00-000002-007)



2014 WETLAND FIELD STUDY REPORT LIVENGOOD (MP 401) TO TRAPPER CREEK (MP 709.5)

USAI-UR-SRZZZ-00-000012-000

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	2014 WETLAND STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE I OF IV

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	2014 WETLAND STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE III OF IV

TABLE OF CONTENTS


1.0	INTRODUCTION.....	1
1.1	PROJECT DESCRIPTION.....	1
1.2	PURPOSE.....	1
1.3	STUDY AREA	3
2.0	METHODOLOGY	4
2.1	DEFINITIONS AND WETLAND NAMING CONVENTIONS	4
	2.1.1 Cowardin Classification.....	4
	2.1.2 Hydrogeomorphic Classes.....	6
2.2	WETLAND PARAMETERS AND INDICATORS	8
	2.2.1 Hydrophytic Vegetation.....	8
	2.2.2 Wetland Soils	9
	2.2.3 Wetland Hydrology.....	10
2.3	AERIAL INTERPRETATION (PRE-MAPPING)	10
2.4	FIELD TARGET SELECTION	11
2.5	WETLAND FIELD DATA COLLECTION	11
	2.5.1 Crew Composition.....	12
	2.5.2 Wetland Determination Field Protocols	13
2.6	QUALITY ASSURANCE/QUALITY CONTROL	13
2.7	WETLAND MAP REVISIONS.....	14
2.8	WETLAND FUNCTIONAL ASSESSMENT	14
2.9	JURISDICTIONAL DETERMINATION	14
3.0	RESULTS	16
3.1	WETLAND FIELD DATA COLLECTION	16
3.2	WETLAND MAP REVISIONS.....	16
3.3	NEXT STEPS	20
4.0	ACRONYMS AND ABBREVIATIONS.....	21
5.0	REFERENCES	22
6.0	APPENDICES	24

Appendix A – Summary of 2014 Wetland and Vegetation Mapping and Field Targets Completed

Appendix B – 2014 Wetland Determination Field Survey Protocols

Appendix C – 2014 Wetlands Field Data Summary Table and U.S. Army Corps of Engineers Alaska District Wetland Determination Forms

Appendix D – 2014 Wetland Delineation Maps


	2014 WETLAND STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE IV OF IV

LIST OF TABLES

Table 1. Wetland Types within the Project Mapping Corridor from Livengood (MP 401) to Trapper Creek (MP 709.5), Alaska	5
Table 2. Hydrogeomorphic Classes within the Project Mapping Corridor from Livengood (MP 401) to Trapper Creek (MP 709.5), Alaska	7
Table 3. Field Targets Completed in 2014.....	16
Table 4. Wetland Acreage within the Project Mapping Corridor South of Livengood, by Hydrogeomorphic and Cowardin Types	18
Table 5. Preliminary Stream Crossings and Flow Regimes, Along the Project Route South of Livengood, by Study Spread	19
Table 6. Major Waterbody Crossings Along the Project Route South of Livengood	20

LIST OF FIGURES

Figure 1. 2014 Project Study Area	2
Figure 2. Field Data Collection by a Wetland Scientist	12

	2014 WETLAND STUDY REPORT – LIVENGOOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 1 OF 33

1.0 INTRODUCTION

This Wetland Field Study Report provides an interim review of the wetlands that were mapped and field surveyed for the Alaska Liquefied Natural Gas (LNG) Project (Project) during the 2014 field season. This report includes the area of the proposed Project's Mainline corridor (see description below) from Livengood (MP 401) to approximately 43 miles south of Trapper Creek (MP 709.5) (**Figure 1**). This portion of the Project corridor was not part of the previous Alaska Pipeline Project (APP) effort (APP 2011).


1.1 PROJECT DESCRIPTION

The Alaska Gasline Development Corporation, BP Alaska LNG LLC, ConocoPhillips Alaska LNG Company, ExxonMobil Alaska LNG LLC, and TransCanada Alaska Midstream LP (Applicants) plan to construct an integrated Project (the Alaska LNG Project) with interdependent facilities for the purpose of liquefying supplies of natural gas from Alaska, in particular from the Point Thomson Unit (PTU) and Prudhoe Bay Unit (PBU) production fields on the Alaska North Slope (North Slope), for export in foreign commerce. Proposed Project facilities include: a 42-in diameter, 800-mi natural gas pipeline from the North Slope to a Liquefaction Facility near Nikiski. The Liquefaction Facility is comprised of an LNG Plant and marine terminal. The natural gas pipeline would include an offshore section crossing the Cook Inlet. Two pipeline study corridors across the Cook Inlet are being considered, an east pipeline corridor and a west pipeline corridor.

1.2 PURPOSE

The purpose of wetlands and waterbodies mapping is to identify on aerial imagery potential "waters of the United States (U.S.), including wetlands," that are regulated by the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act (40 Code of Federal Regulations [CFR] Part 230) and Section 10 of the Rivers and Harbors Act (33 CFR Part 328.3[b]) that may be impacted by the Project. As part of the Section 404 permitting process, all projects must avoid impacts to wetlands whenever possible, minimize impacts to wetlands to the maximum extent practicable, and compensate for all unavoidable wetland impacts.

Field surveys were conducted in 2014 to verify the accuracy of wetland types and boundaries as determined in pre-field mapping. Field data will also be used to improve the accuracy of future Project wetland mapping efforts. This information is required for the National Environmental Policy Act process as expected to be administered by FERC and for Section 404 and Section 10 permits administered by the USACE. Additionally, this data will constitute baseline information for the FERC's Resource Report No. 2.

	2014 WETLAND STUDY REPORT – LIVNGOOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 2 OF 24

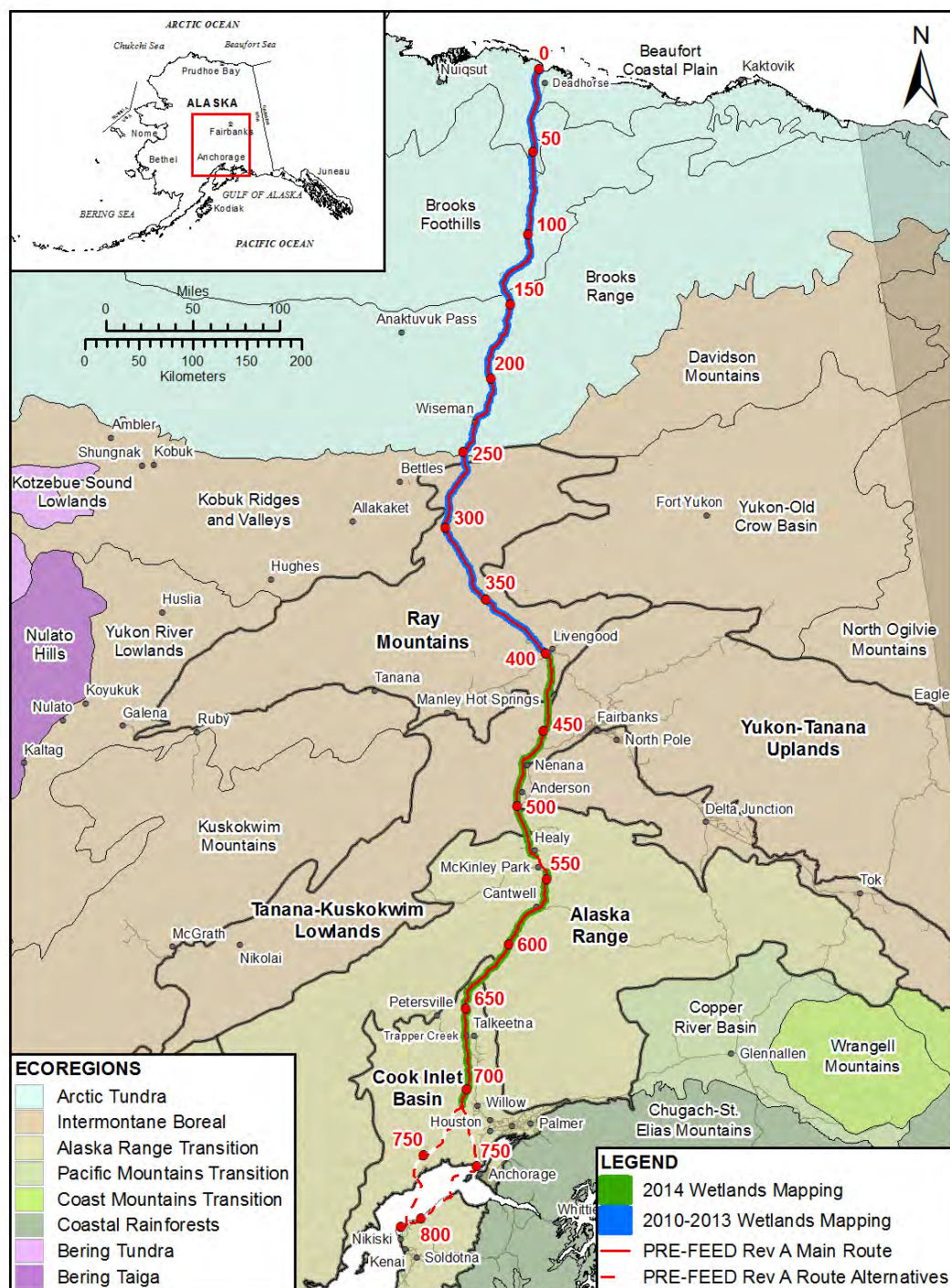



Figure 1. 2014 Project Study Area

	2014 WETLAND STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 3 OF 24

1.3 STUDY AREA

The 2014 field season focused on higher confidence routing areas (90% confidence sections of the March 14, 2014 Focus Study Route) along the Project corridor, approximately from Livengood (MP 401) to 43 miles south of Trapper Creek (MP 709.5). Since the proposed Project route was revised (August 5, 2014) during the 2014 field season, not all sections of the revised 90% confidence areas have been field verified. **Appendix A** lists sections of the proposed route south of Livengood that still need to be mapped and/or field verified. Approximately 49 miles of the revised route will need to be mapped after aerial photography is obtained, and 170 miles will need to be field verified in 2015.


The Project route south of Livengood passes through two ecoregions with five sub-ecoregions, as described by Nowacki et al. (2001):

- Intermontane Boreal Ecoregion
 - Ray Mountains Sub-Ecoregion
 - Yukon-Tanana Uplands Sub-Ecoregion
 - Tanana-Kuskokwim Lowlands Sub-Ecoregion
- Alaska Range Transition Ecoregion
 - Alaska Range Sub-Ecoregion
 - Cook Inlet Basin Sub-Ecoregion

Ecoregions are defined as a unit of land or water with a geographically distinct compilation of species, communities, and environmental conditions. The Alaska LNG corridor, south of Livengood, begins in the Ray Mountains, continues south and passes through the Tanana-Kuskokwim Lowlands, briefly passing through the Yukon-Tanana Uplands, and then through the Alaska Range, before ending in the Cook Inlet Basin Sub-Ecoregion. Ecoregion descriptions are presented in the 2014 Vegetation Study Report (Alaska LNG 2014a). The wetlands survey area was divided into two corridors: a wetland mapping corridor and a field survey corridor. The mapping corridor was 2,000 feet wide (1,000 feet on either side of the proposed centerline). All wetlands and waterbodies were mapped within the mapping corridor using aerial photograph interpretation. The smaller field survey corridor was 300 feet wide (150 feet on each side of the proposed centerline) and centered within the mapping corridor. Field work was concentrated within the field survey corridor, ensuring that the wetland field work occurred near areas most likely to be disturbed by the proposed Project. The locations of any facilities outside of the two corridors were not included in the mapping or field survey.

The field survey area south of Livengood was divided into four geographic spreads for planning purposes for all disciplines:

- Livengood to Healy (LH), Pipeline milepost (MP) 401-525;
- Healy to Trapper Creek (HT), MP 525-667;
- Trapper Creek to Cook Inlet (TI), MP 667-767; and
- Cook Inlet to Nikiski (IN), MP 767-804.

	2014 WETLAND STUDY REPORT – LIVENGOOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 4 OF 24

2.0 METHODOLOGY

Wetland Determination Field Survey Protocols (**Appendix B**) were prepared by experienced wetland scientists prior to the 2014 field season. The protocols, summarized below, follow standard methods used to delineate wetlands for large linear projects in Alaska. The protocols comprise a three-phased iterative approach, including: 1) wetland pre-mapping relying primarily on aerial photo interpretation; 2) collection of ground reference data at pre-determined field targets; and 3) revision of the wetland pre-mapping based on the results of the field efforts. The same approach was followed for the Project mapping corridor north of Livengood, as part of the prior APP effort.


Pre-mapping was completed in 2013 and 2014 for the Mainline corridor from Livengood (MP 401) to approximately 43 miles south of Trapper Creek (MP 709.5) (**Appendix A** lists sections of the route that have not been pre-mapped). As noted above, the study effort did not include any off-corridor access roads or facility sites. Initial pre-mapping results were presented in a 2013 Wetland Mapping Report – South of Livengood (Alaska LNG 2013). This 2014 Wetland Field Study Report summarizes the pre-mapping effort and focuses on results of the field data collection. Since data from the Wetland Field Study and the Vegetation Field Study were collected at the same time, some of the vegetation classification data are presented in the appendices of this report. All of the information and methodology used for the Vegetation Study is provided in the 2014 Vegetation Field Study Report (Alaska LNG 2014a). The goal of the Vegetation Study was to identify vegetation cover types according to the Alaska Vegetation Classification System (Viereck et al. 1992).

2.1 DEFINITIONS AND WETLAND NAMING CONVENTIONS

The USACE defines wetlands as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.” Most wetlands are considered to be waters of the U.S. and are within the jurisdiction of the USACE (33 CFR Part 328.3[b]). Jurisdictional status is based on connectivity to Traditional Navigable Waters (TNW). Wetlands are considered jurisdictional “if the wetland, either alone or in combination with similarly situated lands in the region, significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as ‘navigable.’” (*Rapanos v. United States* and *Carabell v. United States* [33 U.S. Code §1251 et seq.]) (Stonestreet et al. 2009). Other non-wetland waters of the U.S. under the jurisdiction of the USACE, include deepwater aquatic habitats, unvegetated ponds, river channels, and other special aquatic sites as described by the USACE (See Section. 2.9).

2.1.1 Cowardin Classification


All wetlands and other waters of the U.S. in the wetland mapping corridor were classified using the “Classification of Wetlands and Deepwater Habitats of the United States” (Cowardin et al., 1979), commonly referred to as the Cowardin classification system. Cowardin classifies wetlands and aquatic habitats by system, subsystem, class, subclass, and water regime and is based on hydrologic setting (riverine, lacustrine, estuarine, palustrine), vegetation structure (forested, scrub-shrub, emergent, aquatic bed), and water regime (saturated, seasonally flooded, semi-permanently flooded, etc.).

	2014 WETLAND STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 5 OF 24

The Cowardin classifications are used as the standard codes in the National Wetland Inventory (NWI). The NWI Program has mapped many of the wetlands across the U.S., including many in the Project's mapping corridor (at a smaller scale than the Alaska LNG mapping). It was developed largely for mapping based on interpretation of high-altitude aerial photography. **Table 1** lists the most common Cowardin classifications found in the 2014 field survey corridor.

Table 1. Wetland Types within the Project Mapping Corridor from Livengood (MP 401) to Trapper Creek (MP 709.5), Alaska

Cowardin Wetland and Deepwater Habitat Types	Description	Example
Disturbed (D) (non-wetland)	Gravel-filled or previously graded areas, man-made structures	Roads, pads, buildings*
Lacustrine Limnetic (L1)	Deepwater habitats within the lacustrine system	Deepwater lakes*
Lacustrine Littoral (L2)	Vegetated habitats within the lacustrine system, or shoreward bound to 2 meters below annual low water	Lake fringes with unvegetated shallow water, or submerged or floating vegetation
Palustrine Aquatic Bed (PAB)	Habitats dominated by plants growing on or below the water surface	Ponds with submerged or floating vegetation such as pondweeds, water lilies
Palustrine Emergent (PEM)	Habitats dominated by erect, rooted, herbaceous species	Emergent wetlands with grasses, sedges, rushes
Palustrine Moss-Lichen (PML)	Habitats dominated by moss or lichen species	Wetlands with mosses or lichens
Palustrine Scrub-Shrub (PSS)	Habitats dominated by woody vegetation less than 6 meters tall/3-inch diameter at breast height (DBH)	Scrub-shrub wetlands with willow or alder thickets, black spruce, tussock tundra, ericaceous bogs
Palustrine Forested (PFO)	Habitats dominated by woody tree species greater than 6 meters tall/3-inch DBH	Forested wetlands with black spruce, tamarack
Palustrine Unconsolidated Bottom (PUB)	Habitats containing at least 25% cover of particles smaller than stones, and less than 30% cover by vegetation	Ponds with unvegetated shallow water, or submerged or floating vegetation
Riverine Lower Perennial Unconsolidated Shoreline/Unconsolidated Bottom (R2US/UB)	Low-gradient rivers/streams with slow water velocity	Valley bottom streams*
Riverine Upper Perennial Unconsolidated Shoreline/Unconsolidated Bottom (R3US/UB)	High-gradient rivers/streams with fast water velocity	Mountain streams*
Riverine Intermittent Streambed (R4SB)	Channels containing flowing water only part of the year	Intermittent streams*

	2014 WETLAND STUDY REPORT – LIVENGOOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 6 OF 24

Upland (U) (non-wetland)	Habitats that do not contain criteria diagnostic of wetlands	Non-wetland communities, ranging from closed spruce forest, mixed woodlands, shrublands to alpine tundra
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* Unvegetated areas

2.1.2 Hydrogeomorphic Classes


Wetlands within the Project mapping corridor were also assigned a hydrogeomorphic (HGM) classification (Smith et al., 1995; and Brinson, 1993) during the mapping process. The HGM classification of wetlands comprises three components: 1) landscape setting; 2) water source (precipitation, surface flow, or groundwater discharge); and 3) hydrodynamics (direction and strength of flow). The three components of the HGM classes are largely responsible for determining a wetland's ecosystem function. The HGM classes in the 2014 field survey corridor are defined below per Smith et al. (1995) and are summarized in **Table 2**.

Riverine – Riverine wetlands occur in floodplains and riparian corridors in association with stream channels. Dominant water sources are often overbank flow from the channel or subsurface hydraulic connections between the stream channel and wetlands; however, sources may be interflow and return flow from adjacent uplands, occasional overland flow from adjacent uplands, tributary inflow, and precipitation. At their headwaters, riverine wetlands often are replaced by slope or depressional wetlands where the channel morphology may disappear. They may intergrade with poorly drained flats or uplands. Perennial flow in the channel is not a requirement.

Depressional – Depressional wetlands occur in topographic depressions. Dominant water sources are precipitation, groundwater discharge, and both interflow and overland flow from adjacent uplands. The direction of flow is normally from the surrounding uplands toward the center of the depression. Elevation contours are closed, thus allowing the accumulation of surface water. Depressional wetlands may have a combination of inlets and outlets or lack them completely. Dominant hydrodynamics are vertical fluctuations, primarily seasonal. Depressional wetlands may lose water through intermittent or perennial drainage from an outlet, by evapotranspiration, and, if they are not receiving groundwater discharge, may slowly contribute to groundwater. Peat deposits may develop in depressional wetlands.

Slope – Slope wetlands normally are found where there is a discharge of groundwater to the land surface. They normally occur on sloping land; elevation gradients may range from steep hillsides to slight slopes. Slope wetlands are usually incapable of depressional storage because they lack the necessary closed contours. Principal water sources are usually groundwater return flow and interflow from surrounding uplands, as well as precipitation. Hydrodynamics are dominated by downslope unidirectional water flow. Slope wetlands can occur in nearly flat landscapes if groundwater discharge is a dominant source to the wetland surface. Slope wetlands lose water primarily by saturation, subsurface and surface flows, and by evapotranspiration. Slope wetlands may develop channels, but the channels serve only to convey water away from the slope wetland. Fens are a common example of slope wetlands.

Flat – There are two types of “flat” wetlands: mineral soil flats and organic soil flats. Mineral soil flats are most common on interfluvies, extensive relic lake bottoms, or large floodplain terraces where the main source of water is precipitation. They receive virtually no groundwater discharge which distinguishes them from depressions and slopes. Dominant hydrodynamics are vertical

	2014 WETLAND STUDY REPORT – LIVENGGOOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 7 OF 24

fluctuations. They lose water by evapotranspiration, saturation overland flow, and seepage to underlying groundwater. They are distinguished from flat upland areas by their poor vertical drainage, often due to spodic horizons and hardpans, and low lateral drainage, usually due to low hydraulic gradients. Mineral soil flats that accumulate peat can eventually become organic soil flats.

Organic soil flats differ from mineral soil flats, in part, because their elevation and topography are controlled by vertical accretion of organic matter. They occur commonly on flat interfluvies, but may also be located where depressions have become filled with peat to form a relatively large flat surface. Water source is dominated by precipitation, while water loss is by saturation, overland flow, and seepage to underlying groundwater. Raised bogs share many of these characteristics, but may be considered a separate class because of their convex upward form and distinct edaphic conditions for plants. Organic flats wetlands over permafrost soils are common in Interior Alaska. These flats can and often occur on slopes up to 20%.


Lacustrine Fringe – Lacustrine fringe wetlands are adjacent to lakes where the water elevation of the lake maintains the water table in the wetland. In some cases, these wetlands consist of a floating mat attached to land. Additional sources of water are precipitation and groundwater discharge, the latter dominating where lacustrine fringe wetlands intergrade with uplands or slope wetlands. Surface water flow is bidirectional, usually controlled by water-level fluctuations such as seiches in the adjoining lake. Lacustrine fringe wetlands are indistinguishable from depressional wetlands where the size of the lake becomes so small relative to fringe wetlands that the lake is incapable of stabilizing water tables. Lacustrine fringe wetlands lose water by flow returning to the lake after flooding, by saturation surface flow, and by evapotranspiration. Organic matter normally accumulates in areas sufficiently protected from shoreline wave erosion.

Table 2. Hydrogeomorphic Classes within the Project Mapping Corridor from Livengood (MP 401) to Trapper Creek (MP 709.5), Alaska

Hydrogeomorphic Class	Dominant Water Source	Dominant Hydrodynamics	Examples
Riverine	Overbank flow from channel	Unidirectional, horizontal	Riparian scrub-shrub wetlands
Depressional	Groundwater	Vertical	Kettle wetlands
Slope	Groundwater	Unidirectional, horizontal	Avalanche chutes
Flat	Precipitation	Vertical	Peat bogs
Lacustrine Fringe	Overbank flow from lake	Bidirectional, horizontal	Emergent lake edge wetlands

These HGM classes of wetlands have the potential to perform the following eight functions (Magee and Hollands 1998):

- Modification of groundwater discharge: The capacity of a wetland to influence the amount of water moving from the groundwater to surface water.
- Modification of groundwater recharge: The capacity of a wetland to influence the amount of water moving from surface water to groundwater.

	2014 WETLAND STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 8 OF 24

- Storm and flood-water storage: The storage of inflowing water from storm or flooding events, resulting in detention and retention of water on the wetland surface.
- Modification of stream flow: The modification of inflow hydrology by the wetland to produce the outlet stream's hydrology.
- Modification of water quality: Removal of suspended and dissolved solids from surface water and dissolved solids from groundwater and conversion into other forms, plant or animal biomass, or gases. Wetlands with a low slope-angle or location in depressions provide a high level of this function.
- Export of detritus: Export of organic detritus from the wetland to adjacent and downstream aquatic ecosystems.
- Contribution to abundance and diversity of wetland vegetation: The capacity of a wetland to produce an abundance and diversity of hydrophytic plant species individually or as part of a group of wetlands in a local landscape (Tiner 1984).
- Contribution to abundance and diversity of wetland fauna: The capacity of a wetland to support large and / or diverse populations of animal species that spend part or all of their lifecycle in wetlands, individually, or as part of a mosaic of wetlands in a local landscape.

2.2 WETLAND PARAMETERS AND INDICATORS


Wetland determinations were made according to currently accepted methods in Alaska, as described in the “Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region” (Regional Supplement) (USACE, 2007a), and the “USACE Wetlands Delineation Manual” (USACE Manual) (USACE, 1987). These methods require a three-parameter approach, of which the three essential characteristics of a wetland (hydrophytic vegetation, hydric soils, and wetland hydrology) must be present to have a positive wetland determination.

Wetland indicators are field verifiable and measurable characteristics of vegetation, soil, and hydrology that generally indicate that the parameter in question is present. The absence of an indicator, however, does not always mean that a parameter is not met, or that a wetland is not present. For these “problematic” situations, the Regional Supplement provides procedures to determine if a parameter is present or not. These generally rely on an understanding of the hydrogeomorphology of a site, and the best professional judgment of the wetland scientist. Each parameter, along with select Alaska-specific indicators, is described below.

2.2.1 Hydrophytic Vegetation

Hydrophytic vegetation, or a community dominated by plants with special adaptations to survive saturated or anaerobic conditions, is required for a positive wetland determination. The U.S. Fish and Wildlife Service prepared the “National List of Vascular Plant Species That Occur in Wetlands” in 1988 (Reed, 1988), which categorizes species based on their estimated probability of occurring in a wetland. USACE took over the task of updating this plant list (Lichvar, and Gillrich 2011, Lichvar et al. 2014). Indicator ratings and their descriptions are as follows:

- OBL (obligate wetland) – almost always found in wetlands, rarely in uplands;

	2014 WETLAND STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 9 OF 24

- FACW (facultative wetland) – usually found in wetlands but occasionally found in uplands;
- FAC (facultative) – commonly occurs in either wetlands or uplands;
- FACU (facultative upland) – occasionally found in wetlands, but usually occurs in uplands;
- UPL (obligate upland) – rarely found in wetlands, almost always in uplands.

Plant species with an indicator status of OBL, FACW, or FAC are considered adapted for life in saturated or anaerobic soil conditions. Such species are referred to as hydrophytic vegetation, or hydrophytes.

The presence of hydrophytic vegetation is determined by satisfying either a Dominance Test or a Prevalence Index. The Dominance Test is generally a quick way to characterize the vegetative community, however, communities with a large number of low cover species are more accurately characterized by the Prevalence Index, a weighted average of the wetland indicator status of all plant species in the community. Both methods were used when collecting field data.


If both of these indicators fail, yet the site exhibits both hydric soil and wetland hydrology (see description below), wetland scientists may examine FACU vegetation within the community for morphological adaptations indicating that it is indeed acting as a hydrophyte. Typical morphological adaptations observed in Alaska wetlands include white spruce (*Picea glauca*) with a narrow growth form, widely spaced needles, and less bushy branching; or resin birch (*Betula neoalaskana*) with multiple trunks, an “apple tree” like growth, smaller size, and a rotten core in the tree trunk. If these morphological adaptations were observed, the species may be considered FAC at the site in question, and the Dominance Test recalculated.

2.2.2 Wetland Soils

Hydric soils are also required for a positive wetland determination. The National Resources Conservation Service (NRCS) has defined a hydric soil as “a soil that in its undrained condition is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation” The criteria for hydric soils includes certain soil taxonomic groups that are poorly drained during the growing season, or soils that are frequently ponded or frequently flooded for long or very long durations during the growing season.

Due to anaerobic conditions, hydric soils exhibit certain characteristics that can be observed in the field. These characteristics may include the following:

- High organic content representing accumulation and slow decomposition in anaerobic conditions;
- Reduction of ferric (Fe³⁺) to ferrous iron (Fe²⁺) and consequent leaching from the soil profile, causing a greenish- or bluish-gray color (gley formation);
- Generation of hydrogen sulfide, noted by characteristic odor;
- Spots or blotches of different color interspersed with the matrix, or dominant color (mottling); and

	2014 WETLAND STUDY REPORT – LIVENGOOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 10 OF 24

- Dark soil colors (low soil chroma).

Indicators have been established by USACE to assist with identification of hydric soils. These indicators are found in the Regional Supplement and the “Field Indicators of Hydric Soils in the United States” (USDA, NRCS 2010). The absence of listed indicators, however, does not preclude the soil from being hydric. If indicators of hydrophytic vegetation and wetland hydrology are present, but hydric soils are not evident, the procedure outlined in the Regional Supplement for problematic hydric soils was followed.

2.2.3 Wetland Hydrology

Wetland hydrology is the third parameter required for a positive wetland determination. The most ephemeral of the three parameters, surface water or saturation, need not be present throughout the entire year to meet the definition of wetland hydrology. According to the USACE Manual (1987), wetland hydrology is present when there is inundation or soil saturation to the surface continuously for at least five percent of the growing season in most years. Indicators of wetland hydrology include observing ponding or soil saturation, as well as evidence of previous inundation, such as dry algae on bare soil, watermarks on soils or leaves, and drainage patterns. Where positive indicators were observed, it was assumed that wetland hydrology occurs for a sufficient period of the growing season.


2.3 AERIAL INTERPRETATION (PRE-MAPPING)

Wetland boundaries for the mapping corridor south of Livengood were delineated on digital ortho-rectified and geo-referenced true color aerial imagery with 1.6-foot pixel resolution using the following aerial imagery:

- Healy Area Orthophoto (U.S. Census Bureau 2006);
- Digital Orthophoto Quarter Quadrangles - Anderson Area (Natural Resources Conservation Service, NRCS, 2006);
- Northern Central Corridor Ortho Mosaic (Digital Globe 2013a);
- Southern Corridor Ortho Mosaic (Digital Globe 2013b);
- Talkeetna Aerial Orthophoto (Matanuska Susitna Borough, MSB, 2011a);
- Caswell Aerial Orthophoto (MSB 2011b); and
- Willow Aerial Orthophoto (MSB 2011c).

Data from the following sources was also used during the mapping process:

- U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) digital datasets and hardcopy maps;
- NRCS Soil Survey digital datasets and hardcopy maps;
- Light Detection and Ranging generated topographic contours (TransCanada 2011, MSB 2011d);
- Pertinent previous studies, such as Terrestrial and Aquatic Habitat Mapping Along the Alaska Natural Gas Pipeline System (USFWS 1980), the Denali Pipeline Project, the instate Alaska Stand Alone Pipeline Project, and the Alaska Pipeline Project;

	2014 WETLAND STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 11 OF 24

- U.S. Geological Survey Digital Raster Graphics (e.g., topographic maps);
- Existing Geographic Information System (GIS) layers including waterbodies, contours, and roads; and
- Existing Land Status GIS layers including: State of Alaska, U.S. Bureau of Land Management, and Native allotments.

All wetland mapping was created in a GIS platform, using a “heads-up” digitizing effort. This “heads-up” process applies aerial image interpretation to delineate vector polygons of ground features. This is the generally accepted wetland and deepwater habitat mapping technique employed by the U.S. Fish and Wildlife Service personnel as part of the NWI program (Dahl *et al.* 2009). Data sources were overlaid on aerial photography and wetland, non-wetland, and areas of uncertain wetland status were identified by interpreting color, texture, and landscape position, among other elements. Aerial photography clues can include dwarf or stunted trees, topography characteristics (such as swales, toe slopes and depressions), and obvious signs of inundation.

All wetlands were mapped at a scale of 1:2,400 (1 inch to 200 feet) or finer. Lakes, ponds and rivers were mapped at a scale of 1:1,200 (1 inch to 100 feet). Larger rivers and streams were delineated as polygons. Smaller streams, those with bankfull widths of approximately 10 feet or less, were mapped as lines.

Approximately 49 miles of the Project route have not been pre-mapped due to a lack of adequate aerial imagery. There is also a 12 mile gap in the 90% confidence route that has not been pre-mapped (**Appendix A**).

2.4 FIELD TARGET SELECTION

Field targets were selected from the pre-mapping based on changes in the wetlands types, aerial vegetation signatures, NWI classification, and NRCS soil classification. The primary focus of the pre-selected field targets was to characterize specific wetland types which represent all similar wetland types in the region and to identify wetland/upland boundaries by selecting paired plots. Field targets were used to confirm areas where wetland subject matter experts had high confidence in their aerial interpretation, and were used to confirm or correct wetland boundary locations. Field targets were also placed in low-confidence areas to provide field data where the photo signatures or landscape features were not clearly indicative of wetland or upland. Field targets spanned the full range of Cowardin and HGM classes within the Project mapping corridor.

Field targets were evaluated during the field season provided there was land access. If a field target could not be accessed, a new field target was located on a nearby accessible parcel in an area with similar aerial photography vegetation signatures and site conditions as the original field target.

2.5 WETLAND FIELD DATA COLLECTION

The 2014 wetland field study was conducted from early June through early September, and focused on field targets from Livengood (MP 401) to 43 miles south of Trapper Creek (MP 709.5).


	2014 WETLAND STUDY REPORT – LIVENGOOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 12 OF 24



Photo taken by V. Watkins


Figure 2. Field Data Collection by a Wetland Scientist

2.5.1 Crew Composition

Two three-person crews collected data in 2014. Each crew consisted of a field crew chief, an assistant wetland scientist / Global Positioning System (GPS) Technician, and a wilderness safety specialist. Each position had defined roles and responsibilities in the field and required a specific level of technical expertise.

Field crew chiefs were required to have proven field experience and a strong familiarity with wetland science. They were in charge of the field crews and ultimately responsible for data collection quantity and quality; daily reporting; crew health and safety; and data submittal on a daily or near-daily basis. Field crew chiefs also planned the workday for the crew, coordinated with Project management, and addressed any technical issues.

Wetland scientists / GPS technicians were required to be experienced in field work, familiar with wetland science principles, and to have attended a wetland delineation training course. They assisted in the wetland field survey (**Figure 2**) with appropriate supervision by the field crew chief. The wetland scientist / GPS technician was also responsible for electronic data collection at each site using a Trimble backpack-mounted GPS instrument. They worked closely with field

	2014 WETLAND STUDY REPORT – LIVENGOOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 13 OF 24

crew chiefs to verify that the data was accurate and complete, and were also responsible for the maintenance and care of the GPS equipment, managing the crew's electronic data, and ensuring data files were uploaded to the Project's SharePoint site on a daily or near-daily basis.

Wilderness safety specialists were professionally trained in firearms proficiency, Alaska wilderness survival, and First Aid / cardiopulmonary resuscitation. They were responsible for protecting the field crew from aggressive wildlife encounters, and assisting the field crew chief in the communication of and compliance with all Project health and safety policies.

2.5.2 Wetland Determination Field Protocols

Wetland Determination Field Survey Protocols are provided in **Appendix B**. As described in the protocols, data was collected as either a Determination Point (DP), where a hard copy Wetland Determination Form was completed, or an Observation Point (OP), in which notes and photographs were used to describe wetland status and the community. All wetlands and waterbodies were classified using Cowardin codes.

The field crew chief examined vegetation and topography to determine appropriate sampling location(s) at each field target. Although field targets were used to guide the location of field crews, field crew chiefs were allowed discretion in the number, type (DP or OP), and final location of data points. This flexible approach allowed scientists to collect data in locations that best described the target community, allowed them to collect additional data as field conditions warranted, and enhanced efficiency by allowing scientists to collect observational data if a similar community was thoroughly described nearby. Wetland scientists used their best professional judgment and collected appropriate field data to adequately revise the wetland pre-mapping.

Field crew chiefs maintained field logbooks and hardcopy field maps with aerial photography, field targets, and pre-mapped wetland boundaries and classifications. The wetland scientist / GPS technician entered some of the data into electronic data forms specific to DPs and OPs. Daily field quality assurance/quality control (QA/QC) procedures are described in Section 2.6. Hardcopy and electronic data forms, field notes, maps, GPS data, and site photos were uploaded daily to the Project SharePoint website.


2.6 QUALITY ASSURANCE/QUALITY CONTROL

The wetland and vegetation technical lead conducted quality audits during the first week of each deployment. These audits ensured data quality and consistency between teams, and provided an opportunity for any problems to be corrected immediately.

Each crew member was responsible for collecting and recording clear and accurate data. The field crew chief reviewed all hardcopy and electronic data forms and completed a QA/QC checklist before leaving each site.

The field crew manager ensured that all data files were uploaded to the Project website. These transmitted files were then downloaded and reviewed by office-based data management staff. The wetland technical lead checked each hardcopy data sheet and electronic data form for quality and consistency, as it was received. If problems arose, the field crew was notified promptly to ensure that any data quality issues were corrected immediately.

Wetland mapping was also reviewed by experienced wetland scientists both after the initial pre-mapping, and after map revisions were complete.

	2014 WETLAND STUDY REPORT – LIVENGOOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 14 OF 24

2.7 WETLAND MAP REVISIONS

The wetland pre-mapping was revised to incorporate the results of the 2014 field studies, including revision of the wetland classifications (e.g., HGM and Cowardin). Map revisions followed procedures outlined in the Wetland Determination Field Survey Protocols (**Appendix B**), and included the 2014 GPS data, Wetland Determination Forms, Vegetation Classification Forms for upland sites, site photographs, logbooks, and field maps as additional data sources. Map revisions were only made with post-processed GPS data and field forms that passed the QA/QC process (Section 2.6).

Generally, the wetland pre-mapping revision process involved:


- Exporting spatial data for all field targets and photo points from the Alaska LNG database;
- Compiling electronic copies of all notes, sketches, and photographs associated with above points; and
- Using this data in a GIS platform to update files through heads-up digitizing, or modifying the initial map on screen as described in Section 3.2 of the Wetland Determination Field Survey Protocols.

Note that, when updating the map for both wetland and upland polygons, changes were not necessarily applied solely to the polygon containing field data. Rather, field data were used to “recalibrate” that portion of the map (generally within one half mile of the data collection site), represented by a particular spectral signature (combination of color, tone, shadow, etc.), and recoded in that area as deemed appropriate. As the aerial imagery used for pre-mapping had seasonal variations (including imagery taken prior to green-up), revisions were most often needed to correct pre-mapping interpretations of vegetation height, percent canopy coverage, and plant species composition.

2.8 WETLAND FUNCTIONAL ASSESSMENT


Wetlands are known to provide a variety of ecological functions depending on the location and type of wetland. At sites determined to be wetland, a Wetland Functional Assessment Data Sheet was collected. Information from this data sheet will be incorporated into the functional models described in *A Rapid Procedure for Assessing Wetland Functional Capacity* (Magee and Hollands 1998). Hydrogeomorphic (HGM) classes of wetlands and the eight wetland functions identified by Magee and Hollands are described in Section 2.1.2 and in the Wetland Determination Field Survey Protocols (**Appendix B**). The functional assessment models provide a Functional Capacity Index for each wetland function. The Functional Capacity Index indicates the potential degree to which the wetland performs the function and is only comparable to other wetlands within the same HGM class and region. The results from the models will be extrapolated to the applicable wetlands within the mapping corridor. This information will potentially serve as the basis to determine appropriate compensatory mitigation for the unavoidable impacts of the Project. Wetland functional assessment data will be reported in 2016, after all field data is collected.

2.9 JURISDICTIONAL DETERMINATION

	2014 WETLAND STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 15 OF 24

The USACE regulates wetlands and other waters of the U.S. that are under their jurisdiction. Jurisdictional status is based on connectivity to Traditional Navigable Waters (TNW) (Rapanos v. United States and Carabell v. United States [33 U.S. Code §1251 et seq.]).

The Project, similar to other large pipeline and energy projects permitted by the USACE, will assume that all delineated wetlands fall under USACE jurisdiction; because the FERC requires that the Project adhere to certain construction requirements in all wetlands, regardless of jurisdiction, it will be assumed that all wetlands fall within USACE jurisdiction for purposes of planning, permitting, mitigation, and construction methods.

	2014 WETLAND STUDY REPORT – LIVENGOOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 16 OF 24

3.0 RESULTS

3.1 WETLAND FIELD DATA COLLECTION

A total of 212 field targets comprising wetlands, non-wetlands, and uncertain areas were sampled by field crews during the 2014 field season (**Table 3**). Wetland crews collected Wetland Determination Data Forms at 192 field targets, Vegetation Classification Data Forms at 10 field targets and OPs at 10 field targets. The 2014 wetland determination data forms and the Wetland and Vegetation Field Data Summary Table are provided in **Appendix C**.

Table 3. Field Targets Completed in 2014

Spread	Milepost	Total Number of Field Targets Completed	Number of Field Targets Completed Within Current 90% Confidence Field Survey Corridor
Livengood to Healy	401 - 525	46	28
Healy to Trapper Creek	525 - 667	102	84
Trapper Creek to Cook Inlet	667 - 767	64	34
Cook Inlet to Nikiski	767 - 804	0	0
Total:		212*	146

*66 of the field targets completed fall outside of the current proposed route (90% confidence route) (**Appendix A**).


Since the proposed Project route was revised on August 5, 2014, after pre-mapping and field surveys began, 66 field targets were surveyed in areas that are no longer within the 90% confidence portions of the route. A total of 146 field targets have been completed within the current 90% confidence field survey corridor. Also, some sections that have been rerouted have either (1) only been pre-mapped and not field verified or (2) not been pre-mapped or field verified due to a lack of quality aerial imagery (**Appendix A**).

3.2 WETLAND MAP REVISIONS

The wetland delineation pre-mapping was revised according to the criteria summarized in Section 2.7 of this report. The 2014 final wetland delineation maps are included as **Appendix D**. A summary of wetland acreage per spread within the Project mapping corridor south of Livengood is presented in **Table 4** in which wetlands are organized by HGM (Brinson, 1993) and Cowardin (Cowardin et al.1979) classifications. Of the approximate 71,026 acres in the mapping corridor, wetlands and other waters of the U.S comprise 23,183 acres or 33 percent of the total.

Within the Livengood to Healy spread approximately 42% of the area is wetland. About 78% of the wetlands in this spread are palustrine scrub-shrub and palustrine forested wetlands, the majority of which are dominated by black spruce (*Picea glauca*) plant communities on permafrost soils. About 21% of the wetlands within this reach are higher quality wetlands, such as depressional palustrine emergent, palustrine, aquatic bed, palustrine unconsolidated bottom, and riverine wetlands. These wetlands are mostly semipermanently or permanently flooded wetlands providing aquatic habitats for a variety of species.

Within the Healy to Trapper Creek spread about 22% of the area is wetland. This spread contains far fewer acres of the lower quality permafrost wetlands (about 14% of all wetlands

	2014 WETLAND STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 17 OF 24

within the spread). About 55% of the wetlands within this spread are depressional higher quality wetlands, and about 25% of the wetlands in this spread are within riverine systems.

About one third (36%) of the Trapper Creek to Cook Inlet spread covered by this report is wetland. About 94% of these wetlands are classified as depressional, and 5% are riverine wetlands. About 26% of these depressional and riverine wetlands consist primarily of semipermanently or permanently flooded wetlands, such as palustrine unconsolidated bottom, palustrine aquatic bed, palustrine emergent, and riverine systems.


	2014 WETLAND STUDY REPORT – LIVENGOOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 18 OF 24

Table 4. Wetland Acreage within the Project Mapping Corridor South of Livengood, by Hydrogeomorphic and Cowardin Types

HGM and Cowardin Classification	Livengood to Healy (acres)	Healy to Trapper Creek (acres)	Trapper Creek to Cook Inlet (MP 709.5) (acres)	Grand Total (acres)
Flat				
PEM	17.07	2.22	0	19.29
PEM/SS	79.39	82.80	0	162.19
PFO	472.58	8.78	0.43	481.79
PFO/EM	0	4.59	0	4.59
PFO/SS	2838.10	4.18	0	2842.28
PSS	5210.34	773.24	0	5983.58
PSS/EM	1031.67	904.55	0	1936.22
PSS/FO	116.30	0	0	116.30
Depressional				
L1UB	0	111.32	0	111.32
L2UB	0	7.93	0	7.93
PAB	14.93	114.28	183.31	312.52
PAB/EM	0	39.07	11.35	50.42
PEM	160.68	1025.66	242.85	1429.19
PEM/SS	20.73	713.54	549.73	1284
PFO	1.90	286.49	266.17	554.56
PFO/EM	0	0.64	0	0.64
PFO/SS	1.13	60.09	254.22	315.44
PML	0	0.68	0	0.68
PSS	40.10	1286.26	1003.72	2330.08
PSS/EM	403.04	328.84	174.19	906.07
PSS/FO	0	0.36	736.03	736.39
PUB	24.60	123.71	80.39	228.70
PUB/AB	0	3.45	8.17	11.62
PUB/EM	0	1.87	0	1.87
Slope				
PEM	0	23.99	0	23.99
PEM/SS	0	13.87	0	13.87
PFO/SS	0	62.15	0	62.15
PSS	2.98	12.56	0	15.54
PSS/EM	0	33.86	0	33.86
PUB	0	0.45	0	0.45
Lacustrine Fringe				
PAB	0	0.77	24.61	25.38
Riverine				
PAB	32.63	0.88	1.43	34.94
PEM	30.84	41.23	7.72	79.79
PEM/SS	72.84	15.80	56.94	145.58
PFO	296.41	49.37	0	345.78
PFO/SS	633.79	0	0	633.79
PSS	362.16	215.21	73.34	650.71
PSS/EM	456.42	105.85	21.00	583.27
PSS/FO	0	24.79	0	24.79
PSS/US	0	0.21	12.35	12.56
PUB	5.91	25.59	3.30	34.8
PUB/SS	0	1.44	0	1.44
R2UB	134.54	68.97	11.24	214.75
R2US	0.47	22.33	0	22.80

PAGE 19 OF 24

Total Area	207,661.67	51,633.93	151,027.74	11,001.02
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Waterbody crossings occurring along the Project route are presented in **Table 5**. A total of 132 intermittent, lower perennial and upper perennial stream and river crossings were mapped within the approximately 309-mile length of this portion of the Project route. Nine of these waterbody crossings are major crossings (>100 feet). **Table 6** shows the nine major crossings that were identified during the wetland mapping process. More detailed information on waterbody crossings can be found in the 2014 Stream Hydrology Survey Report (Alaska LNG 2014b).

Table 5. Preliminary Stream Crossings and Flow Regimes, Along the Project Route South of Livengood, by Study Spread

Study Spread	Stream Classification								
	Lower Perennial (R2) Crossing			Upper Perennial (R3) Crossing			Intermittent (R4) Crossing		
	Major (>100 ft)	Intermediate (10-100 ft)	Minor (<10 ft)	Major (>100 ft)	Intermediate (10-100 ft)	Minor (<10 ft)	Major (>100 ft)	Intermediate (10-100 ft)	Minor (<10 ft)
Livengood to Healy	3	5	1	0	3	0	0	5	24
Healy to Trapper Creek	1	1	0	4	11	12	1	3	33
Trapper Creek to Cook Inlet	0	0	0	0	7	4	0	3	11
Cook Inlet to Nikiski	0	0	0	0	0	0	0	0	0
Total:	4	6	1	4	21	16	1	11	68
Grand Total:	132								



	2014 WETLAND STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 20 OF 24

Table 6. Major Waterbody Crossings Along the Project Route South of Livengood

Major Crossings			
Study Spread	Stream Classification	Stream Name	MP
Livengood to Healy	R2	Chatanika River	438.8
		Tanana River	470.2
		Nenana River #1	478.9
		Chulitna River	644.5
Healy to Trapper Creek	R3	Yanert Fork	544.9
		Nenana River #4	563.1
		Jack River	569.0
		Troublesome Creek	643.3
	R4	Dry Creek	528.0


3.3 NEXT STEPS

Some sections of the proposed 90% confidence Project route were revised after the 2014 field studies were underway. Two rerouted segments near Trapper Creek were pre-mapped and field verified in September. The four additional rerouted segments, any alternative segments, and off-corridor areas will need to be pre-mapped, and then field verified in 2015. Sections of the route lacking adequate aerial photography will also need to be pre-mapped and field verified. **Appendix A** lists sections of the proposed route south of Livengood that still need to be mapped and/or field verified. Additional aerial photography is expected to be delivered on 12/23/14.

	2014 WETLAND STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 21 OF 24


4.0 ACRONYMS AND ABBREVIATIONS

APP	Alaska Pipeline Project
CFR	Code of Federal Regulations
DP	Determination Point
FERC	Federal Energy Regulatory Commission
GIS	Geographic Information System
GPS	Global Positioning System
HGM	Hydrogeomorphic
LNG	Liquefied Natural Gas
MP	Milepost
NRCS	National Resources Conservation Service
NWI	National Wetland Inventory
OP	Observation Point
PJD	Preliminary Jurisdictional Determination
Project	Alaska LNG
QA/QC	Quality Assurance/Quality Control
ROW	Right-of-Way
TNW	Traditional Navigable Water
U.S.	United States
USACE	U.S. Army Corps of Engineers


	2014 WETLAND STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 22 OF 24

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	2014 WETLAND STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 23 OF 24

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	2014 WETLAND STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	PAGE 24 OF 24

6.0 APPENDICES

	2014 WETLAND STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	

APPENDIX A – SUMMARY OF 2014 WETLAND AND VEGETATION MAPPING AND FIELD TARGETS COMPLETED

Summary of Wetland and Vegetation Mapping

Livengood (MP 401) to Approximately 43 Miles South of Trapper Creek (MP 709.5)

➤ Unmapped Areas Due To Lack Of Aerial Photography

- MP 405.5 – MP 432
- MP 480 – MP 500.5 (we have imagery of this section, but it's very poor quality)
- MP 592.4 – MP 592.8
- MP 586 – MP 587.1

➤ Field Verification Of Rerouted Areas Needed

- MP 407 – MP 433
- MP 440 – MP 454
- MP 468 – MP 516
- MP 585 – MP 605

➤ 90% Confidence Area Gaps

- MP 533 – MP 545

➤ 2014 Field Season Field Data Point Locations

- Wetland Points

Points Located Within The Most Current 90% Confidence Route		Points Located Outside The Current 90% Confidence Route	
Feature ID	Field Target #	Feature ID	Field Target #
W61LH001	1	W61LH006	6
W61LH002	2	W61LH007	7
W61LH003	3	W61LH010	7
W61LH004	4	W61LH008	8
W61LH005	5	W61LH009	9
W61LH023	23	W61LH011	11
W61LH024	24	W61LH012	12
W61LH025	25	W61LH013	13
W61LH026	26	W61LH014	14
W61LH027	27	W61LH015	15
W61LH028	35	W61LH016	16
W61LH029	36	W61LH017	17
W61LH031	37	W61LH018	18
W61LH032	38	W61LH019	19
W61LH033	39	W61LH020	20
W61LH034	40	W61LH021	21
W61LH035	41	W61LH047	20
W61LH036	42	W61LH022	22
W61LH037	43	W61LH030	34
W61LH038	44	W61HT038	61
W61LH039	45	W61HT032	76
W61LH040	47	W61HT033	77
W61LH041	46	W61HT035	78
W61LH042	48	W61HT034	79
W61LH043	49	W61HT007	80

W61LH044	50	W61HT008	81
W61LH045	51	W61HT009	82
W61LH046	52	W61HT013	83
W61HT001	53	W61HT014	84
W61HT011	54	W61HT015	85
W61HT010	55	W60HT039	100
W61HT012	56	W61HT016	115
W61HT004	58	W61HT017	114
W61HT003	57	W61HT018	113
W61HT005	59	W61HT019	117
W61HT002	60	W60HT054	130
W61HT037	62	W60HT055	132
W61HT036	63	W60HT025	148
W61HT025	64	W60TI051	150
W61HT026	65	W60TI040	151
W61HT024	66	W60TI039	152
W61HT023	67	W60TI046	156
W61HT027	68	W60TI045	155
W61HT028	69	W60TI044	154
W61HT030	70	W60TI042	160
W61HT029	71	W60TI043	159
W61HT006	72	W60TI041	161
W61HT022	73	W60TI047	162
W61HT021	74	W60TI048	162
W61HT031	75	W60TI037	163
W60HT002	86	W60TI036	164
W60HT001	87	W60TI035	165
W60HT003	88	W60TI032	166
W60HT033	89	W60TI034	168
W60HT034	90	W60TI031	167
W60HT015	91	W60TI030	169
W60HT028	92	W60TI027	170
W60HT029	93	W60TI028	171
W60HT030	94	W60TI029	172
W60HT031	95	W60TI023	173
W60HT032	97	W60TI024	174
W60HT035	98	W60TI025	175
W60HT037	99	W60TI020	176
W60HT038	100	W60TI019	177
W60HT040	101	W60TI022	178
W60HT041	102	W60TI017	179
W60HT042	103	W60TI018	180
W60HT024	104	W60TI015	181
W60HT026	106	W60TI016	182
W60HT027	107		
W60HT044	108		
W60HT045	109		
W60HT046	110		
W60HT048	112		
W61HT020	116		
W60HT050	119		

W60HT049	118		
W60HT019	122		
W60HT018	121		
W60HT051	123		
W60HT020	125		
W60HT021	126		
W60HT023	128		
W60HT004	133		
W60HT007	134		
W60HT006	135		
W60HT005	136		
W60HT053	138		
W60HT056	139		
W60HT008	142		
W60HT009	141		
W60HT010	143		
W60HT012	145		
W60HT013	146		
W60HT014	147		
W60HT057	202		
W60HT047	149		
W60HT059	203		
W60TI038	153		
W60TI049	157		
W60TI050	158		
W60TI052	205		
W60TI053	206		
W60TI054	207		
W60TI055	208		
W60TI056	209		
W60TI058	210		
W60TI059	212		
W60TI061	214		
W60TI062	215		
W60TI063	216		
W60TI064	217		
W60TI065	218		
W60TI068	220		
W60TI067	221		
W60TI014	183		
W60TI013	184		
W60TI012	185		
W60TI010	186		
W60TI008	187		
W60TI006	188		
W60TI004	190		
W60TI003	191		
W60TI001	193		
W60TI069	223		
W60TI070	224		

- Vegetation Points

Points Located Within The Most Current 90% Confidence Route		Points Located Outside The Current 90% Confidence Route	
Feature ID	Field Target #	Feature ID	Field Target #
W60HT016	91	W60TI033	166
W60HT036	98	W60TI026	173
W60HT043	103	W60TI021	176
W60HT017	120		
W60HT052	124		
W60HT022	127		
W60HT011	144		
W60HT058	202		
W60TI072	210		
W60TI057	211		
W60TI060	213		
W60TI066	219		
W60TI011	186		
W60TI009	187		
W60TI007	189		
W60TI005	190		
W60TI002	192		
W60TI071	225		


- Wetland Observation Points

Points Located Within The Most Current 90% Confidence Route		Points Located Outside The Current 90% Confidence Route	
Feature ID	Field Target #	Feature ID	Field Target #
W61LH002_OP	2	W61LH006_OP	6
W61LH005_OP	5	W61LH009_OP	9
W61LH025_OP	25	W61LH011_OP	11
W61LH028_OP	35	W61LH011_OP1	10
W61LH031_OP	37	W61LH012_OP	12
W61LH033_OP	39	W61LH016_OP	16
W61LH034_OP	40	W61LH030_OP	34
W61LH035_OP	41	W61LH030_OP1	34
W61LH037_OP	43	W61HT014_OP	84
W61LH038_OP	44	W61HT015_OP	85
W61LH039_OP	45	W61HT017_OP	114
W61LH041_OP	46	W61HT016_OP	115
W61LH041_OP1	46	W61HT019_OP	117
W61LH042_OP	48	W60HT055_OP1	131
W61LH043_OP	49	W60HT055_OP	131
W61LH046_OP	52	W60TI028_OP	171
W61HT001_OP	53	W60TI023_OP	173
W61HT011_OP	54	W60TI025_OP	175
W61HT010_OP	55	W60TI020_OP	176
W61HT012_OP	56	W60TI015_OP	181
W61HT003_OP	57		

W61HT004_OP	58		
W61HT005_OP	59		
W61HT002_OP	60		
W61HT038_OP	61		
W61HT036_OP	63		
W61HT025_OP	64		
W61HT024_OP	66		
W61HT023_OP	67		
W61HT027_OP	68		
W61HT006_OP	72		
W61HT022_OP1	73		
W61HT022_OP	73		
W61HT031_OP	75		
W60HT015_OP	91		
W60HT028_OP	92		
W60HT030_OP	94		
W60HT031_OP	96		
W60HT026_OP	105		
W60HT045_OP	109		
W60HT046_OP	111		
W60HT023_OP	129		
W60HT053_OP	137		
W60HT053_OP1	140		
W60HT059_OP	203		
W60HT059_OP1	204		
W60TI052_OP	205		
W60TI055_OP	208		
W60TI063_OP	216		
W60TI068_OP	220		
W60TI013_OP	184		
W60TI012_OP	185		
W60TI010_OP	186		
W60TI008_OP	187		
W60TI001_OP	193		

Alternative Routes - South of MP 709.5

- Mapping was completed on two alternate routes from MP 709.5 south to Nikiski. The new 90% confidence route from MP 709.5 southwest to Tyonek has also been mapped, but only where aerial imagery is available. This section of the mapping still needs a QA/QC check.
 - Mapping completed from MP 709.5 to 731, and from MP 757 to 767 (Cook Inlet).
 - Mapping not completed from MP 731 to MP 757 (aerial imagery is needed).
- Field verification is needed for all alternate routes south of MP 709.5.
- There is no 90% confidence route for any segments on the Kenai Peninsula

	2014 WETLAND STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	

APPENDIX B – 2014 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS

Alaska LNG

2014 Wetland Determination

Field Survey Protocols

USAKE-UR-SPFLD-00-0008

Rev	Rev date	Description	Prepared By	Checked By	Endorsed By	Approved By
A	3.20.14	Issued for Review and Comment	VW			
0	4.4.14	Issued for Information				
1	4.16.14	Issued for Information				
2	5.20.14	Issued for Information				

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	PAGE i OF iv

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ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	PAGE iii OF iv

TABLE OF CONTENTS

1.0	PROJECT DESCRIPTION	1
2.0	INTRODUCTION.....	3
2.1	OBJECTIVES	3
2.2	PROJECT AREA.....	3
3.0	METHODS.....	5
3.1	OVERVIEW	5
3.2	WETLAND PRE-MAPPING	5
3.3	FIELD TARGET SELECTION.....	6
3.4	WETLAND FIELD DATA COLLECTION	7
3.5	MAP REVISIONS	7
3.6	WETLAND FUNCTIONAL ASSESSMENT	8
3.7	JURISDICTIONAL DETERMINATION	9
3.8	DATA RECORDING AND PROCESSING	9
3.9	QUALITY ASSURANCE/QUALITY CONTROL	10
3.10	REPORTING.....	10
4.0	FIELD STUDIES EXECUTION.....	11
5.0	REFERENCES	12
6.0	APPENDICES	14

APPENDIX A WETLAND DETERMINATION DATA FORM

APPENDIX B WETLAND SURVEY GEAR LIST

APPENDIX C QUALITY ASSURANCE/QUALITY CONTROL CHECKLIST

APPENDIX D FIELD STUDIES EXECUTION

FIGURES

FIGURE 1 PROPOSED ALASKA LNG ROUTE

Note – All pipeline routing and/or facility siting information described in this document should be considered preliminary and subject to change.

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	PAGE iv OF iv

ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
FCI	Functional Capacity Index
FERC	Federal Energy Regulatory Commission
GIS	Geographic Information System
GPS	Global Positioning System
GTP	Gas Treatment Plant
HGM	hydrogeomorphic
LNG	liquefied natural gas
MP	milepost
MSB	Matanuska Susitna Borough
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
PBU	Prudhoe Bay Unit
PTU	Point Thomson Unit
ROW	right-of-way
RPW	Relatively Permanent Water
U.S.	United States
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	PAGE 1 OF 14

1.0 PROJECT DESCRIPTION

BP, ConocoPhillips, ExxonMobil, and TransCanada are currently developing a potential project, known as the Alaska LNG Project, to treat, transport, and deliver natural gas from the Alaska's North Slope to a new liquefied natural gas (LNG) plant and marine terminal on Cook Inlet (the "Project"). The proposed Project includes the following major components in Alaska: an LNG Plant, a Gas Pipeline, a Gas Treatment Plant (GTP), a Prudhoe Bay Unit (PBU) Gas Transmission Line, and a Point Thomson Unit (PTU) Gas Transmission Line. In October 2013, the Project selected a site in the Nikiski area on the Kenai Peninsula as the preferred location for a proposed natural gas liquefaction plant and marine terminal. Pipeline routing definition from the Prudhoe Bay Unit to the plant location is ongoing.

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	PAGE 2 OF 14



Figure 1. Proposed Alaska LNG Route

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	PAGE 3 OF 14

2.0 INTRODUCTION

Alaska LNG will conduct wetland determination surveys to verify the pre-field mapping wetland types and boundaries of all waters of the United States (U.S.), including wetlands, within the defined corridor and in specific areas along the Project route. The 2014 field survey will be conducted on a limited basis focusing portions of the route between Livengood and Trapper Creek, Alaska.

All waters of the U.S. are regulated by the U.S. Army Corp of Engineers (USACE) under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. All projects, as part of the Section 404 permitting process, must avoid impacts to wetlands wherever possible, minimize impacts to wetlands to the maximum extent practicable, and compensate for all unavoidable wetland impacts.

Results of the wetland surveys will facilitate the eventual evaluation of project-related direct, indirect, and cumulative impacts under the Federal Energy Regulatory Commission (FERC) Resource Report 2 (Water Use and Quality), the National Environmental Policy Act, and Section 404 and Section 10 permits administered by the USACE.

This document presents the wetland determination field survey protocols that will be used during the 2014 field season. It discusses the protocols used in both the field and office for delineating the boundaries of areas that are regulated by USACE and may be impacted by the proposed project.

2.1 OBJECTIVES

The main objectives for the Alaska LNG 2014 wetland field season are:

- Complete wetland surveys in the vicinity of the pre-selected field targets;
- Collect data at field-selected observation points and at additional wetland determination points where necessary to adequately update the field maps; and
- Update the pre-field wetland mapping based on results of the field data.

2.2 PROJECT AREA

The wetlands survey area for the project is divided into two corridors: A wetland mapping corridor and a field survey corridor. The mapping corridor has been preliminarily established as a 2,000 foot corridor (1,000 feet on either side of the proposed alignment centerline). This mapping corridor width may be modified, with the approval of USACE, to exclude terrain features such as steep mountain slopes or lands on the far side of rivers, which are not under consideration for use. All wetlands and waterbodies will be mapped within the mapping corridor using aerial photograph interpretation. The smaller field survey corridor is 300-feet-wide (150-feet on each side of the proposed alignment centerline) and centered within the mapping corridor. Field work will be concentrated within the field survey corridor, ensuring that the wetland field work occurs near areas most likely to be disturbed by the proposed project.

The Alaska LNG field survey area south of Livengood is divided into four geographic spreads for planning purposes:

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	PAGE 4 OF 14

- Livengood to Healy, milepost (MP) 399-520;
- Healy to Trapper Creek, MP 520-660;
- Trapper Creek to Cook Inlet, MP 660-743; and
- Cook Inlet to Nikiski, MP 743-806.

The 2014 field season will focus on areas along this Project corridor, approximately between Livengood and Trapper Creek.

The Alaska LNG project route south of Livengood will pass through two ecoregions, Boreal-Intermontane Boreal and Alaska Range Transition, with five sub-ecoregions, as described by Nowacki et al. (2001). Ecoregions are defined as a unit of land or water with a geographically distinct compilation of species, communities, and environmental conditions. The Alaska LNG corridor, south of Livengood, begins in the Ray Mountains, continues south and passes through the Tanana-Kuskokwim Lowlands, briefly passing through the Yukon-Tanana Uplands, and then through the Alaska Range, before ending in the Cook Inlet Basin sub-ecoregion.

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	PAGE 5 OF 14

3.0 METHODS

3.1 OVERVIEW

The USACE defines wetlands as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.” These wetlands are considered to be waters of the U.S. and are within the jurisdiction of the USACE (33 Code of Federal Regulations (CFR) Part 328.3[b]).

Other non-wetland waters of the U.S. under the jurisdiction of the USACE include deepwater aquatic habitats, unvegetated ponds, river channels, and other special aquatic sites as described by the USACE (Federal Register 1982). Unvegetated ponds, lakes, and river channels in the survey area are classified as other waters of the U.S., but not wetlands.

Uplands are non-wetland areas that are neither deepwater aquatic habitats, nor other special aquatic sites.

All wetlands and other waters of the U.S. in the preliminary Alaska LNG corridor will be delineated and classified using standard National Wetland Inventory (NWI) codes as described in *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979). Cowardin classifies wetlands and aquatic habitats by system, subsystem, class, subclass, and water regime and is based on hydrologic setting (riverine, lacustrine, estuarine, palustrine), vegetation structure (forested, scrub-shrub, emergent, aquatic bed), and water regime (saturated, temporarily flooded, seasonally flooded, semi-permanently flooded, etc.).

One deviation from standard NWI protocols for this project will be the use of two non-wetland categories. One category will include all vegetated uplands. The other will be labeled “Disturbed/Fill” and include uplands that have been impacted by human development, including all roads, gravel pads, buildings, and farmland.

Standard methods are used to delineate wetlands for large linear projects in Alaska. The protocols comprise a three-phased iterative approach, including: 1) wetland pre-mapping relying primarily on aerial photo interpretation; 2) collection of ground reference data at pre-determined field targets; and 3) revision of wetland pre-mapping based on results of field efforts.

3.2 WETLAND PRE-MAPPING

The wetland pre-mapping has been completed for the preliminary Alaska LNG route. Wetland boundaries were delineated on digital ortho-rectified and geo-referenced true color aerial photography with 1.6-foot pixel resolution using the following aerial imagery:

- Healy Area Orthophoto (U.S. Census Bureau 2006);
- Digital Orthophoto Quarter Quadrangles - Anderson Area (Natural Resources Conservation Service, NRCS, 2006);
- Northern Central Corridor Ortho Mosaic (Digital Globe 2013a);
- Southern Corridor Ortho Mosaic (Digital Globe 2013b);

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	PAGE 6 OF 14

- Talkeetna Aerial Orthophoto (Matanuska Susitna Borough, MSB, 2011a);
- Caswell Aerial Orthophoto (MSB 2011b);
- Willow Aerial Orthophoto (MSB 2011c);
- Point MacKenzie Aerial Orthophoto (MSB 2011d); and
- Nikiski Area Aerial Orthophoto (Kenai Peninsula Borough 2006).

Data from the following sources was also used during the mapping process:

- U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) digital datasets and hardcopy maps;
- NRCS Soil Survey digital datasets and hardcopy maps;
- Light Detection and Ranging (LIDAR) generated topographic contours (TransCanada 2011, MSB 2011e);
- Kenai Watershed Forum – Cook Inlet Wetlands for the Kenai Peninsula and the Matanuska Susitna Boroughs (Gracz 2011);
- Pertinent previous studies, such as Terrestrial and Aquatic Habitat Mapping Along the Alaska Natural Gas Pipeline System (USFWS 1980), the Denali Pipeline Project, the instate Alaska Stand Alone Pipeline Project, and the Alaska Pipeline Project;
- U.S. Geological Survey Digital Raster Graphics (e.g., topographic maps);
- Existing Geographic Information System (GIS) layers including waterbodies, contours, and roads; and
- Existing Land Status GIS layers including: State of Alaska, U.S. Bureau of Land Management, and Native allotments.

All wetland mapping was created in a GIS geodatabase, using a “heads-up” digitizing effort. This “heads-up” process applies aerial image interpretation to delineate vector polygons of ground features. This is the generally accepted wetland and deepwater habitat mapping technique employed by the U.S. Fish and Wildlife Service personnel as part of the NWI program (Dahl *et al.* 2009). Data sources were overlaid on aerial photography and wetland, non-wetland, and areas of uncertain wetland status were identified by interpreting color, texture, and landscape position, among other elements. Aerial photography clues can include dwarf or stunted trees, topography characteristics (such as swales, toe slopes and depressions), and obvious signs of inundation.

All wetlands were mapped at a scale of 1:2,400 (1 inch to 200 feet) or finer. Lakes, ponds and rivers were mapped at a scale of 1:1,200 (1 inch to 100 feet). Larger rivers and streams were delineated as polygons. Smaller streams, those with bankfull widths of approximately 10 feet or less, were mapped as vector lines.

3.3 FIELD TARGET SELECTION

Field targets were selected based on changes in the wetlands types, aerial vegetation signatures, NWI classification, and NRCS soil classification. The primary focus of the pre-

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	PAGE 7 OF 14

selected field targets will be to characterize specific wetland types which represent all similar wetland types in the region and to identify wetland/upland boundaries by selecting paired plots. Field targets will be used to confirm areas where wetland Subject Matter Experts have high confidence in their aerial interpretation, and will be used to confirm or correct wetland boundary locations. Field targets were also placed in low-confidence areas to provide field data where the photo signatures or landscape features were not clearly indicative of wetland or upland. The USACE may want to review and approve the 2014 field target locations that are selected to ensure that an appropriate range of representative wetlands are sampled.

Field targets may be re-evaluated based on the status of land access permissions. When necessary, new field targets will be located on nearby accessible parcels in areas with similar aerial photography vegetation signatures and site conditions as the original field targets.

3.4 WETLAND FIELD DATA COLLECTION

Wetland determinations will be made using the USACE *Wetlands Delineation Manual* (1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region* (Regional Supplement) (2007a).

In order for an area to be identified as a wetland, the following three parameters must be present:

- Hydrophytic vegetation: The prevalent vegetation must be adapted to areas of saturated or inundated soils.
- Hydric soils: The soil must be classified as hydric or possess characteristics that are associated with reducing soil conditions.
- Wetland hydrology: The area must be inundated or saturated at some time during the growing season.

Field targets will be accessed via existing highways and secondary roads where available. A helicopter will be required to access remote sites. A Global Positioning System (GPS) device will be used to locate sites and to collect coordinates. At each field target, a USACE *Wetland Determination Data Form – Alaska Region* (**Appendix A**) will be used to determine if the site is a wetland, other water of the U.S., or upland. All wetlands and waterbodies will be delineated and classified using NWI codes. The GPS device will also be used to collect limited field data on an electronic form that will be developed for the Project.

Field crews will also collect qualitative wetland data at observation points and establish additional field targets and complete *Wetland Determination Data Forms* where necessary, and will not be limited by the pre-selected field targets. The field crews will identify changes in wetland types or wetland/upland boundaries not easily identified on the aerial photography. Wetland scientists will use their best professional judgment and collect appropriate field data to adequately revise the wetland pre-mapping. A detailed wetland field survey gear list is provided in **Appendix B**.

3.5 MAP REVISIONS

As wetlands field data becomes available, the field data will be downloaded in the office and plotted on the base maps of the corridor. The location of each plot will be attributed with the

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	PAGE 8 OF 14

information collected in the field. This allows the creation of a reference dataset linking an aerial photography signature to a wetland status and vegetation type. This reference dataset will be used to finalize the mapping of the 2,000-foot corridor.

3.6 WETLAND FUNCTIONAL ASSESSMENT

Wetlands are known to provide a variety of ecological functions depending on the location and type of wetland. At sites determined to be wetland, a *Wetland Functional Assessment Data Sheet* (**Appendix A**) will be collected. Information from this data sheet will be incorporated into the functional models described in *A Rapid Procedure for Assessing Wetland Functional Capacity* (Magee and Hollands 1998). Magee and Hollands have identified five hydrogeomorphic (HGM) classes of wetland that occur in Alaska.

- Depressional wetlands: Depressional wetlands occur in a topographic depression. Predominant water sources are direct precipitation, surface water runoff, and groundwater (Brinson 1976).
- Slope wetlands: Slope wetlands generally occur on a hillside and water flow is predominantly unidirectional parallel to the slope. The water source is primarily groundwater and occasionally precipitation (Brinson 1976).
- Lacustrine fringe wetlands: A lacustrine fringe wetland borders a lake and lacks any topographic features. The water source is surface water and flow is bidirectional.
- Flat wetlands: There are two types of flats wetlands: organic and mineral flats. Flat wetlands in Alaska are primarily organic flats. Organic flats “can occur on relatively gentle to moderate slopes up to 20% in steepness. In relatively undisturbed conditions and without significant human alteration, the dominant hydrodynamics are vertical, even on relatively gentle to moderate slopes (i.e. slopes < 20%). Specifically, the main hydrologic input to wetlands within the organic soil flat class in interior Alaska is precipitation” (ADEC/USACE 1999).
- Riverine wetlands: Riverine wetlands are adjacent to rivers and are dominated by overbank flooding. Water flow is bidirectional locally with an overall regional flow down the river valley.

Magee and Hollands use these HGM classes to compare the functions of wetlands within a particular HGM class. Each HGM class represents a separate functional model, which is used to define the Functional Capacity Index (FCI) of eight functions. The eight functions identified by Magee and Hollands are listed below.

- Modification of groundwater discharge: The capacity of a wetland to influence the amount of water moving from the groundwater to surface water.
- Modification of groundwater recharge: The capacity of a wetland to influence the amount of water moving from surface water to groundwater.
- Storm and flood-water storage: The storage of inflowing water from storm or flooding events, resulting in detention and retention of water on the wetland surface.
- Modification of stream flow: The modification of inflow hydrology by the wetland to produce the outlet stream’s hydrology.

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USACE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	PAGE 9 OF 14

- Modification of water quality: Removal of suspended and dissolved solids from surface water and dissolved solids from groundwater and conversion into other forms, plant or animal biomass, or gases. Wetlands with a low slope-angle or location in depressions provide a high level of this function.
- Export of detritus: Export of organic detritus from the wetland to adjacent and downstream aquatic ecosystems.
- Contribution to abundance and diversity of wetland vegetation: The capacity of a wetland to produce an abundance and diversity of hydrophytic plant species individually or as part of a group of wetlands in a local landscape (Tiner 1984).
- Contribution to abundance and diversity of wetland fauna: The capacity of a wetland to support large and / or diverse populations of animal species that spend part or all of their lifecycle in wetlands, individually, or as part of a mosaic of wetlands in a local landscape.

The Magee and Hollands functional assessment method requires site-specific information to be entered into a model that will produce a FCI for each wetland function. The FCI indicates the potential degree to which the wetland performs the function and is only comparable to other wetlands within the same HGM class and region. The FCI scale is from 0.0 to 1.0. Most of the model inputs will be collected in the field, with the remaining variables taken from available GIS datasets (such as wetland size and land ownership). The results from the functional assessment models will be extrapolated to the applicable wetlands within the mapping corridor. This information will potentially serve as the basis to determine appropriate compensatory mitigation for the unavoidable impacts of the project. The *Wetland Functional Assessment Data Sheet* will be reviewed and adjusted as necessary to collect appropriate data for the different ecoregions.

3.7 JURISDICTIONAL DETERMINATION

USACE regulates wetlands and other waters of the U.S. that are under their jurisdiction. Jurisdictional status is based on connectivity to Traditional Navigable Waters (*Rapanos v. United States* and *Carabell v. United States* [33 U.S. Code §1251 et seq.]). Field visits by USACE, the Federal Energy Regulatory Commission, the Environmental Protection Agency, and the Owner's Representative could also be conducted (with minimal notice) to observe field survey teams while they are conducting wetland delineations, and to review protocols and any data collected.

The Project, similar to other large pipeline and energy projects permitted by the USACE, will assume that all wetlands found fall under USACE jurisdiction. Because the FERC requires that the Project adhere to certain construction requirements in all wetlands, regardless of jurisdiction, the Project will assume that all wetlands found will be within the USACE jurisdiction for permitting, mitigation, and construction method purposes.

3.8 DATA RECORDING AND PROCESSING

Data will be recorded on hardcopy field forms (**Appendix A**), and some of the data will be entered into an electronic data form. Electronic data files will be uploaded to a Project website

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	PAGE 10 OF 14

through an internet connection or by a satellite link, and will include GPS locations, electronic data form, site photos, site sketches, and field notes.

3.9 QUALITY ASSURANCE/QUALITY CONTROL

The Wetlands Technical Lead will conduct quality audits during the first week of each deployment. These audits will ensure data quality and consistency between teams, and will provide an opportunity for any problems to be corrected immediately.

Each crew member is responsible for collecting clear and accurate data according to the sampling protocol. The Field Crew Chief will review all hardcopy and electronic data forms and complete a quality assurance/quality control (QA/QC) checklist (**Appendix C**) before leaving each site.

The Field Crew Manager will ensure that all data files, hardcopy and electronic, are uploaded to the Project website. These transmitted files will then be downloaded and reviewed by office-based data management staff. The Wetland Technical Lead will check each hardcopy data sheet and electronic data form for quality and consistency, as it is received. If problems arise, the field crew will be notified promptly to ensure that any data quality issues are corrected immediately.

3.10 REPORTING

The results of the 2014 field work will be compiled into a field survey report at the end of the season. The report will include a GIS dataset comprised of field-verified wetland mapping, field sample locations, and data collected at each site. It will also outline the field survey methods and identify all wetland types found throughout the corridor describing common plant species, hydrology indicators, and hydric soil indicators.

After the 2015 wetland field season, a report on the Wetland Functional Assessment for all wetlands surveyed will be provided. The Wetland Functional Assessment will be submitted to USACE for review and concurrence. Once USACE concurs, the wetland boundaries delineated will be used to calculate project impacts for Section 404 permitting. The Wetland Functional Assessment will help USACE characterize the impacted wetlands to determine appropriate compensatory mitigation for the unavoidable project impacts to wetlands and other waters of the U.S.

Results of this survey will be provided in the FERC Resource Report 2.

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	PAGE 11 OF 14

4.0 FIELD STUDIES EXECUTION

Field study execution details are currently being developed. **Appendix D** will include field execution details consisting of: field crew composition, schedule and march charts, field target maps, and general project-wide permits and approvals. Field safety will also be discussed and a specific Job Safety Analysis (JSA) developed for wetland surveys will be included.

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	PAGE 12 OF 14

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ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	PAGE 13 OF 14

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ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	PAGE 14 OF 14

6.0 APPENDICES

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	

APPENDIX A – WETLAND DETERMINATION DATA FORM

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: _____ (A) Total Number of Dominant Species Across All Strata: _____ (B) % Dominant Species that are OBL, FACW, or FAC: _____ (A/B)
1.				
2.				
3.				
4.				
Total Cover: _____ 50% of total cover: _____ 20% of total cover: _____				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species: _____ X 1 = _____ FACW species: _____ X 2 = _____ FAC species: _____ X 3 = _____ FACU species: _____ X 4 = _____ UPL species: _____ X 5 = _____ Column Totals: _____ (A) _____ (B) PI = B/A = _____
Sapling/Shrub Stratum (_____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
Total Cover: _____ 50% of total cover: _____ 20% of total cover: _____				

VEGETATION (use scientific names of plants)				
Herb Stratum (_____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Hydrophytic Vegetation Indicators: _____ Dominance Test is > 50% _____ Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
1.				
2.				
3.				
4.				
5.				_____ % Bare Ground _____ % Cover of Wetland Bryophytes _____ Total Cover of Bryophytes _____ % Cover of Water Hydrophytic Vegetation Present (Y/N): _____ Notes: (If observed, list morphological adaptations below)
6.				
7.				
8.				
9.				
10.				
Total Cover: _____ 50% of total cover: _____ 20% of total cover: _____				

WETLAND DETERMINATION DATA FORM

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			
Surface Water Present (Y/N): _____	Depth (in): _____	Wetland Hydrology Present (Y/N): _____	
Water Table Present (Y/N): _____	Depth (in): _____		
Saturation Present (Y/N): (includes capillary fringe)	Depth (in): _____		
Notes: _____			

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent- Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (>1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches, Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvial/Quaternary Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	

APPENDIX B – WETLAND SURVEY GEAR LIST

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	

Wetland and Vegetation Gear	Communication
1 – Sharp shooter shovel (fiberglass, not wood handle)	1 - VHF Radio
1 – U-Dig-it (Hand shovel)	1 - charger for vhf radio
1 – Compass	1 - Iridium Satellite Phone
1 – Hand lens	1 charger for satellite phone
1 – Leatherman/sample knife (folding) 4” serrated	Safety/Survival Pack (Need for 2teams)
1 – Digital camera	2 – Sleeping Bags
1 - calculator	1 – Tent
1 – extra batteries for digital camera	1- Wilderness First Aid Kit
1 – pH meter (pen kind) with storage solution	1 - Flare gun kit
1 – Pocket rod (measuring tape)	1 - Emergency procedures Manual
1- Opaque small spray bottle filled with alpha-alpha dipyrityl	1 - Iodine Tablets /Filter
2 packages – gallon Ziploc bags	1 - 50’ Nylon Rope/Parachute cord
1 package- pint Ziploc bags	1 – small Flashlight/headlamp (for soil pit)
1- Squirt Water bottle (for moistening soil to color)	2 - Space Blankets
200+ – USACE Wetland Determination Form – Alaska Region (on Rite-in-the-Rain) with functional assessment	1 – Bear Spray
1 set – Field Maps on Rite-in-the-Rain	1 – Tarp (10’ x 12’)
4+ – Rite-in-the-Rain Field notebooks (spiral with lines)	1 – Gloves – Work/Latex/Insulated rubber
12+ – Mechanical Pencils w/ extra lead	matches
12+ – Sharpies (red and black)	1 – Roll of duct tape
1- Laptop Computer (for downloading data every night)	Flagging tape (1 bright color per team)
2 – Clipboards	BPA-free water jug
Extra Rite-in-the-Rain paper	Personal Gear
1 – 12 inch file (for shovel sharpening) with handle	1 - Xtratuffs
1 – scissors	1 – Felt insoles for Xtratuffs
1 – tape	1 - Blaze Orange Surveyor Field Vest
2 – post it notes	1 - Mosquito Head Net
2 – toilet paper	1 – Rain Jacket/Pants
1- Roll of duct tape	2 - Bug Spray
1 – (see through) small dry bag for soil kit	2 – Sunblock
1 – (see through) medium dry bag for field reference materials	1 – Sun Glasses
1 – dry erase board (for pictures)	1 - Water Bottle
1 – plant press	1 - Backpack
Books	1 - Hat
1 – Munsell Soil Color charts	Cell phone and charger
1 – Flora of Alaska and Neighboring Territories – Eric Hulten	1 – umbrella
1 – Trees and Shrubs – Viereck	Boot dryers
1 – Western Boreal Forest and Aspen Parkland – MacKinnon and Pojar	
1 – Wetland Sedges of Alaska – Tande and Lipkin	
1 – Willows of Interior Alaska – Collett	
1 – National List of Plant Species that Occur in Wetlands – Alaska Region - Reed 1988 (print)	
1 – Field Guide to Alaskan Wildflowers – Verna Pratt	
1 – Wildflowers along the Alaskan Highway – Verna Pratt	
1 – Rapid Procedure for Assessing Wetland Functional Capacity: Based on HGM Classification – Hollands and Magee (print)	
1 – 1987 Wetland Delineation Manual (print)	
1 – 2007 Regional Supplement to the Corps of Engineers Wetland Delineation Manual – Alaska Region (print)	
1 – Classification of Wetlands and Deepwater Habitats – Cowardin (print)	
1 – Hydric soils in Alaska (print)	

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	

APPENDIX C – QA/QC CHECKLIST

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	

Wetland Determination Data Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: _____ Field Target: _____ Date: _____

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☐ Site description, site parameters and summary of findings are complete?
- ☐ A detailed site sketch is included?

2. Vegetation

- ☐ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☐ Vegetation names are entered legibly for all strata present?
- ☐ Cover calculations are complete and correct?
- ☐ All dominant species have been determined and recorded per strata?
- ☐ Indicator status is correct for each species?
- ☐ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☐ Soil profile is complete?
- ☐ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☐ Appropriate hydrology indicators are marked?
- ☐ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☐ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☐ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	

- ☐ Each logbook page is initialed and dated?

7. Maps

- ☐ Wetland boundaries have been corrected if necessary?
☐ Maps are initialed and dated?

8. Photos

- ☐ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Wetland Scientist (print)

X

Signature / Date

X


Field Crew Chief (print)

X

Signature / Date

ALASKA LNG	WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAKE-UR-SPFLD-00-0008 APRIL 2014 REVISION: 2
	CONCEPT INFORMATION - CONFIDENTIAL	

APPENDIX D – FIELD STUDIES EXECUTION

	2014 WETLAND STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	

**APPENDIX C – 2014 WETLANDS FIELD DATA SUMMARY TABLE AND U.S. ARMY
CORPS OF ENGINEERS ALASKA DISTRICT WETLAND DETERMINATION FORMS**


(Provided in a Digital Format)



2015 WETLAND FIELD STUDY REPORT

USAI-P1-SRZZZ-00-000002-000

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	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0 PAGE 1 OF 35
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	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0
		PAGE 2 OF 35


REVISION MODIFICATION LOG

Revision	Section	Description
	1.2	Figure 1-1 was revised. Eastern route alternative was removed.
	1.3	Added information about sampling within both the 2000 ft and 300 ft corridors.
	2.0	Added reference information concerning USACE approval of protocols and data.
	2.1	Added FERC definitions for wetlands and waterbodies.
	2.1.3	Figure 2-1 was revised. Eastern route alternative was removed.
	2.3	Added pixel resolution to aerial imagery sources.
	2.5.2	Added references that protocols were provided to USACE and FERC
	2.8	Added statement that we received guidance from USACE.
	2.9	Added reference concerning the USACE review of our data.
	3.3	Added clarification for next steps.
	4.0	Added acronyms.
	5.0	Five references were added.
	6.0	Appendix A, C, and E were embedded in document.

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0 PAGE 3 OF 35
---	---------------------------------	---

TABLE OF CONTENTS

1.0	PURPOSE AND SCOPE.....	5
1.1	PROJECT DESCRIPTION.....	5
1.2	PURPOSE.....	5
1.3	STUDY AREA.....	7
2.0	METHODOLOGY.....	9
2.1	DEFINITIONS AND WETLAND NAMING CONVENTIONS.....	9
2.1.1	Cowardin Classification.....	10
2.1.2	Hydrogeomorphic Classes.....	11
2.1.3	Study Area Watersheds.....	13
2.2	WETLAND PARAMETERS AND INDICATORS.....	15
2.2.1	Hydrophytic Vegetation.....	15
2.2.2	Wetland Soils.....	16
2.2.3	Problematic Soils.....	16
2.2.4	Wetland Hydrology.....	16
2.3	AERIAL INTERPRETATION (PRE-MAPPING).....	16
2.4	FIELD TARGET SELECTION.....	18
2.5	WETLAND FIELD DATA COLLECTION.....	18
2.5.1	Crew Composition.....	18
2.5.2	Wetland Determination Field Protocols.....	19
2.6	QUALITY ASSURANCE / QUALITY CONTROL.....	19
2.7	WETLAND MAP REVISIONS.....	19
2.8	WETLAND FUNCTIONAL ASSESSMENT.....	20
2.9	JURISDICTIONAL DETERMINATION.....	20
3.0	RESULTS.....	22
3.1	WETLAND FIELD DATA COLLECTION.....	22
3.2	WETLAND MAPPING SUMMARY.....	23
3.3	NEXT STEPS.....	30
4.0	ACRONYMS AND ABBREVIATIONS.....	31
5.0	REFERENCES.....	32
6.0	APPENDICES.....	35
	Appendix A – 2015 Wetland Determination Field Survey Protocols	
	Appendix B – Problematic Soils	
	Appendix C – 2015 Wetland Field Data Summary Table and US Army Corps of Engineers Alaska District Wetland Determination Forms	
	Appendix D – Examples of Extrapolating Field Data to Adjacent Mapping	
	Appendix E – 2015 Wetland Delineations Maps	


	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0
		PAGE 4 OF 35

LIST OF FIGURES

Figure 1-1. Ecoregions within the 2015 Alaska LNG Study Area	6
Figure 2-1. HUC 4 Sub-regions and HUC 8 Sub-basins of the Project Area.....	14
Figure B-1. A Nine-Inch Folistic Epipedon over Low Chroma Parent Material. Permafrost Table at 16 inches. West aspect; 5% Slope. (Field Site W84LH016).	4
Figure B-2. A Field Site (formerly black spruce forest) Where the Permafrost Table may have Receded Following a Wildfire Possibly Changing the Wetland Status. 2005 North Bonanza Fire; West Aspect; 7% Slope (Field site W84AY026).	5
Figure B-3. Andic Soil Profile with High Watertable and Reducing Conditions Lacking Approved NTCHS Hydric Soil Indicators. (Field site W84TI014_OP).....	6
Figure D-1. Initial Project Mapping near Mile Post 586 of the Rev B Study Area Corridor.....	10
Figure D-2. Post Field Updated Mapping near Mile Post 586 of the Rev B Study Area Corridor.....	11
Figure D-3. W84HT003 Vegetation - Upland, White Spruce-Cottonwood Forest (I C 2).....	12
Figure D-4. W84HT003 WDF Soil Pit – Well Drained Gravelly Alluvium	12
Figure D-5. W84HT003_OP – PUB/USF Pond on a Low River Terrace.....	13
Figure D-6. W84HT004 – PSS1/EM1Cb Tall Open Willow/ Emergent Herbaceous	13
Figure D-7. W84HT004 – Soil Plug - A14 Alaska Redox	14
Figure D-8. Initial Project Mapping near Mile Post 220 Rev B Study Area Corridor.....	15
Figure D-9. Post Field Updated Mapping near Mile Post 220 of the Rev B Study Area Corridor.....	16
Figure D-10. W84AY009 – PEM1/4B – Stunted Spruce Woodland Swale	17
Figure D-11. W84AY009 – Soil Pit with Reduced Matrix and Low Chroma Colors.....	17
Figure D-12. W84AY009_OP – Upland interfluvium – White Spruce Woodland.....	18
Figure D-13. W84AY009_OP – Moderately Well Drained Alluvium on a Subtle Interfluvium	18

LIST OF TABLES

Table 2-1. Wetland and Deepwater Habitats within the Project Rev B Mapping Corridor and Off-ROW Areas	10
Table 2-2. Hydrogeomorphic Classes within the Project Rev B Mapping Corridor, and Off-ROW Areas.....	13
Table 3-1. 2015 Completed Field Targets by Ecoregion.....	22
Table 3-2. Field Plot Distributions in the Study Area	22
Table 3-3. Wetland Acreage within the Project Rev B Mapping Corridor and off-ROW Footprint, within the Alaska Range Transition Ecoregion, by HUC 8, Hydrogeomorphic and Cowardin Types.....	24
Table 3-4. Wetland Acreage within the Project Rev B Mapping Corridor and off-ROW Footprint, within the Intermontane Boreal Ecoregion, by HUC 8, Hydrogeomorphic and Cowardin Types.....	26
Table 3-5. Wetland Acreage within the Project Rev B Mapping Corridor and off-ROW Footprint, within the Arctic Tundra Ecoregion*, by HUC 8, Hydrogeomorphic and Cowardin Types.....	28
Table 3-6. Preliminary Stream Crossings, Along the Project Route, by Ecoregion	30

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0 PAGE 5 OF 35
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1.0 PURPOSE AND SCOPE

This 2015 Wetland Field Study Report provides a review of the wetlands that were mapped and field surveyed for the Alaska Liquefied Natural Gas (LNG) Project (Project) during the 2015 field season. The 2015 field verification data was combined with field data collected in 2010, 2011, and 2014, and was used to further refine the wetland mapping. The area that was surveyed in 2015 includes the proposed Project's Revision (Rev) B route from Nikiski milepost (MP) 804, northwest across Cook Inlet to Beluga (MP 764) then continuing north along the Rev B route into the Brooks Range foothills where the northern extent of field data collection occurred (approximately milepost, MP, 86) (Figure 1-1). Results presented in this report include the entire Rev B route and off right-of-way (ROW) roads and facilities. It is anticipated that the 2016 Wetland and Vegetation Field Study Report will provide results for the final route, including data on additional off-ROW areas.

1.1 PROJECT DESCRIPTION

The Alaska Gasline Development Corporation, BP Alaska LNG LLC, ConocoPhillips Alaska LNG Company, and ExxonMobil Alaska LNG LLC, (Applicants) plan to construct one integrated LNG Project (Project) with interdependent facilities for the purpose of liquefying supplies of natural gas from Alaska, in particular the Point Thomson Unit (PTU) and Prudhoe Bay Unit (PBU) production fields on the Alaska North Slope (North Slope), for export in foreign commerce and opportunity for in-state deliveries of natural gas.

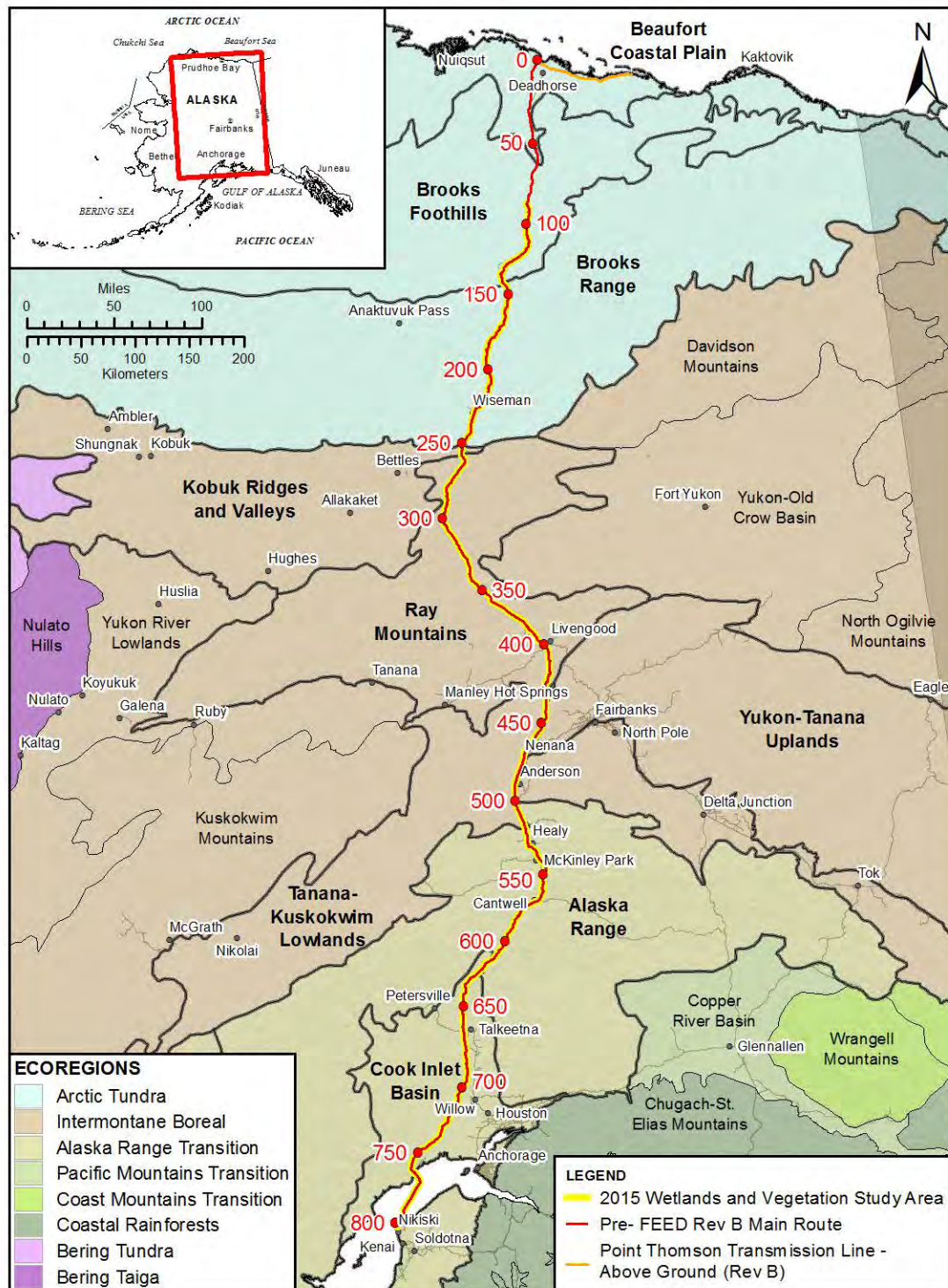
The Natural Gas Act (NGA), 15 U.S.C. § 717a(11) (2006), and Federal Energy Regulatory Commission (FERC) regulations, 18 C.F.R. § 153.2(d) (2014), define "LNG terminal" to include "all natural gas facilities located onshore or in State waters that are used to receive, unload, load, store, transport, gasify, liquefy, or process natural gas that is ... exported to a foreign country from the United States." With respect to this Project, the "LNG terminal" includes the following: a liquefaction facility (Liquefaction Facility) in Southcentral Alaska; an approximately 800-mile, large diameter gas pipeline (Mainline); a gas treatment plant (GTP) on the North Slope; a gas transmission line connecting the GTP to the PTU gas production facility (PTU Gas Transmission Line or PTTL); and a gas transmission line connecting the GTP to the PBU gas production facility (PBU Gas Transmission Line or PBTL). All of these facilities are essential to export natural gas in foreign commerce.


1.2 PURPOSE

The purpose of wetlands and waterbodies mapping is to identify on aerial imagery potential "Waters of the United States (U.S.), including wetlands," that are regulated by the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act (40 Code of Federal Regulations [CFR] Part 230) and Section 10 of the Rivers and Harbors Act (33 CFR Part 328.3[b]) that may be impacted by the Project. As part of the Section 404 permitting process, all projects must avoid impacts to wetlands whenever possible, minimize impacts to wetlands to the maximum extent practicable, and compensate for all unavoidable wetland impacts.

Field surveys were conducted in 2015 to verify the accuracy of wetland types and boundaries as determined in pre-field mapping using aerial photo interpretation. Field data will be used to improve the accuracy of future Project wetland mapping efforts. This information is required for the National Environmental Policy Act (NEPA) process as expected to be administered by FERC and for Section 404 and Section 10 permits administered by the USACE. Additionally, this data will constitute baseline information for the FERC's Resource Report No. 2 and to comply with requirements in FERC's Wetland and Waterbody Construction and Mitigation Procedures (FERC 2013).

Figure 1-1. Ecoregions within the 2015 Alaska LNG Study Area



	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0
		PAGE 7 OF 35

1.3 STUDY AREA


The 2015 field season focused on the Project's proposed Rev B route, which contains numerous centerline modifications from what was reported in the 2014 Wetland Field Study Report (Rev A 90% confidence route). Field verification during the 2015 season occurred from the southern terminus of the route at Nikiski, Alaska, (MP 804) to Cook Inlet at MP 792, then from the west side of Cook Inlet (MP 764), along the Rev B route to the Brooks Range foothills near MP 86.

The Project route passes through three ecoregions with nine sub-ecoregions (Figure 1-1), as described by Nowacki et al. (2001):

- Alaska Range Transition Ecoregion
 - Cook Inlet Basin Sub-Ecoregion
 - Alaska Range Sub-Ecoregion
- Intermontane Boreal Ecoregion
 - Tanana-Kuskokwim Lowlands Sub-Ecoregion
 - Yukon-Tanana Uplands Sub-Ecoregion
 - Ray Mountains Sub-Ecoregion
 - Kobuk Ridges and Valleys Sub-Ecoregion
- Arctic Tundra Ecoregion
 - Brooks Range Sub-Ecoregion
 - Brooks Foothills Sub-Ecoregion
 - Beaufort Coastal Plain Sub-Ecoregion


Ecoregions are defined as a unit of land or water with a geographically distinct compilation of species, communities, and environmental conditions (World Wildlife Fund 2015). The Alaska LNG corridor studied during the 2015 field season begins in the Cook Inlet Basin, continues through the Alaska Range, and then continues through the Tanana-Kuskokwim Lowlands, Yukon-Tanana Uplands, Ray Mountains, Kobuk Ridges and Valleys, then up through the Brooks Range before ending in the Brooks Foothills (near MP 86). No field work was completed north of the Brooks Foothills ecoregion in 2015, since data was previously collected in this area. However, the study area corridor continues north into the Beaufort Coastal Plain reaching Deadhorse, Alaska before bearing east to Point Thompson and the PTU production fields. Ecoregion descriptions are presented in the 2015 Vegetation Study Report (Alaska LNG 2015).

The wetlands survey area was divided into two corridors: a wetland mapping corridor and a field survey corridor. The mapping corridor was 2,000 feet wide (1,000 feet on either side of the proposed centerline). All wetlands and waterbodies were mapped within the mapping corridor using aerial photograph interpretation. The smaller field survey corridor was 300 feet wide (150 feet on each side of the proposed centerline) and centered within the mapping corridor. Field work was primarily concentrated within the field survey corridor, ensuring that the wetland field work occurred near areas most likely to be disturbed by the proposed Project, while representative of the wider corridor. If specific wetland signatures on aerial photos or unique wetlands types occurred outside of the 300-foot field survey corridor, field targets would be established and sampled. Approximately 35 percent of the sampling occurred outside of the 300-foot field survey corridor. Proposed off-ROW access roads and facilities footprints (those added to the route prior to September 9, 2015) were also included in the field survey and mapping. The distribution of field plots collected in the two corridors during the 2015 field season is summarized in Section 3.1 of this report.

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0
		PAGE 8 OF 35

While the 2015 field data is organized and analysed by ecoregion in this report, the field survey area was also divided into eight geographic areas or spreads for planning purposes. Field identification numbers (plot numbers) include a two letter code identifying the geographical spread where a field point is located. Field identification numbers begin with the field team identifier (e.g., W84) followed by the two letter geographical spread code (e.g., TI) and concludes with a field plot number (e.g., 001). The geographical spreads and two letter codes are summarized by project milepost below:

- Cook Inlet to Nikiski (IN), Mainline MP 792-804;
- Trapper Creek to Cook Inlet (TI), MP 664.5-765;
- Healy to Trapper Creek (HT), MP 525-664.5;
- Livengood to Healy (LH), MP 403.5-525;
- Yukon River to Livengood (YL), MP 357-403.5;
- Atigun Pass to Yukon River (AY), MP 169-357;
- Prudhoe Bay to Atigun Pass (PA), MP 0-169; and
- Point Thomson to Prudhoe Bay (PP), PT Pipeline milepost (MP) 0-58.

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0 PAGE 9 OF 35
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2.0 METHODOLOGY

Wetland Determination Field Survey Protocols (**Appendix A**) were prepared by experienced wetland scientists prior to the 2015 field season. These protocols have been provided to the USACE and FERC, and have been approved by the USACE (USACE 2010). The protocols, summarized below, follow standard methods used to delineate wetlands for large linear projects in Alaska. The protocols comprise a three-phased iterative approach, including: 1) wetland pre-mapping relying primarily on aerial photo interpretation; 2) collection of ground reference data at pre-determined field targets; and 3) revision of the wetland pre-mapping based on the results of the field efforts.

Pre-mapping was completed in 2013, 2014 and early 2015 for the Mainline corridor from Nikiski, across Cook Inlet and north to Livengood. In addition, pre-mapping was also completed in 2015 for numerous Rev B route adjustments and off-ROW access roads and facility sites from Livengood to the Brooks Range foothills. This 2015 Wetland Field Study Report summarizes the pre-mapping effort and focuses on results of the field data collection in 2015. Since data from the Wetland Field Study and the Vegetation Field Study were collected at the same time, some of the vegetation classification data are presented in the appendices of this report. All information and methodology used for the Vegetation Study is provided in the 2015 Vegetation Field Study Report (Alaska LNG 2015). The goal of the Vegetation Study was to identify vegetation cover types according to the Alaska Vegetation Classification System (Viereck et al. 1992).

The 2015 field data will be shared with the USACE for approval. The USACE has already reviewed and approved the 2014 field data north of Livengood (USACE 2015).

2.1 DEFINITIONS AND WETLAND NAMING CONVENTIONS

The USACE defines wetlands as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.” Most wetlands are considered to be Waters of the U.S. and are within the jurisdiction of the USACE (33 CFR Part 328.3[b]). Jurisdictional status is based on connectivity to Traditional Navigable Waters (TNW). Wetlands are considered jurisdictional “if the wetland, either alone or in combination with similarly situated lands in the region, significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as ‘navigable.’” (Rapanos v. United States and Carabell v. United States [33 U.S. Code §1251 et seq.]) (Stonestreet et al. 2009). Other aquatic habitats under the jurisdiction of the USACE, include deepwater aquatic habitats, unvegetated ponds, river channels, and other special aquatic sites as described by the USACE (See Section. 2.9).

For projects under FERC’s authority, the definitions for waterbodies and wetlands are further clarified in the FERC’s *Wetland and Waterbody Construction and Mitigation Procedures* (FERC 2013) as follows:

- “Waterbody” includes any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes:
 - “minor waterbody” includes all waterbodies less than or equal to 10 feet wide at the water’s edge at the time of crossing;
 - “intermediate waterbody” includes all waterbodies greater than 10 feet wide but less than or equal to 100 feet wide at the water’s edge at the time of crossing; and

- “major waterbody” includes all waterbodies greater than 100 feet wide at the water’s edge at the time of crossing.
- “Wetland” includes any area that is not in actively cultivated or rotated cropland and that satisfies the requirements of the current federal methodology for identifying and delineating wetlands.

2.1.1 Cowardin Classification

All wetlands and other Waters of the U.S. in the wetland mapping corridor were classified using the “Classification of Wetlands and Deepwater Habitats of the United States” (Cowardin et al., 1979), commonly referred to as the Cowardin classification system. Cowardin classifies wetlands and aquatic habitats by system, subsystem, class, subclass, and water regime and is based on hydrologic setting (riverine, lacustrine, estuarine, palustrine), vegetation structure (forested, scrub-shrub, emergent, aquatic bed), and water regime (saturated, seasonally flooded, semi-permanently flooded, etc.).

The Cowardin classifications are used as the standard codes in the National Wetland Inventory (NWI), and are required by the FERC’s Wetlands and Waterbody Construction and Mitigation Procedures (FERC 2013). The NWI Program has mapped many of the wetlands across the U.S., including many in the Project’s mapping corridor (at a smaller scale than the Alaska LNG mapping). It was developed largely for mapping based on interpretation of high-altitude aerial photography. Table 2-1 lists the most common Cowardin classifications found in the 2015 field survey corridor.

Table 2-1. Wetland and Deepwater Habitats within the Project Rev B Mapping Corridor and Off-ROW Areas

Cowardin Wetland and Other Aquatic Habitat Types	Description	Example
Estuarine Subtidal (E1)	Permanently flooded deepwater brackish or saline tidal habitats typically semi-enclosed by land. Water salinity exceeds 0.5 ppt. and typically does not exceed 30 ppt.	Cook Inlet*
Estuarine Intertidal (E2)	Aquatic habitats with substrates that are exposed at low tide and flooded at high tide with less than 30% of the surface covered with vegetation; includes the splash zone. Water salinity exceeds 0.5 ppt and typically does not exceed 30 ppt.	Salt marsh, Cook Inlet mud flats
Riverine Freshwater Tidal Unconsolidated Bottom (R1UB)	Low-gradient freshwater tidal rivers with water velocity dependent on tidal fluctuations	Coastal Rivers
Riverine Lower Perennial Unconsolidated Shoreline/Unconsolidated Bottom (R2US/UB)	Low-gradient rivers/streams with slow water velocity	Valley bottom streams*
Riverine Upper Perennial Rock Bottom (R3RB)	High-gradient river/stream with substrate dominated by stones, boulders, or bedrock	Mountain Streams*
Riverine Upper Perennial Unconsolidated Shoreline/Unconsolidated Bottom (R3US/UB)	High-gradient rivers/streams with fast water velocity	Mountain streams*
Riverine Intermittent Streambed (R4SB)	Channels containing flowing water only part of the year	Intermittent streams*
Lacustrine Limnetic (L1)	Unvegetated deepwater habitats within the lacustrine system	Deepwater lakes*

Lacustrine Littoral (L2)	Vegetated habitats within the lacustrine system, or shoreward bound to 2 meters below annual low water	Lake fringes with unvegetated shallow water, or submerged or floating vegetation
Palustrine Unconsolidated Bottom (PUB)	Potential aquatic habitats and deepwater habitats that are inundated throughout the year in most years. These ponded depressions are less than 20 acres in size and typically have a depth less than 2 meters at annual low water. Substrates have at least 25% cover of particles smaller than stones, and less than 30% vegetative cover	Ponds with unvegetated shallow water, or submerged or floating vegetation
Palustrine Unconsolidated Shore (PUS)	Potential aquatic habitats with less than 30% vegetative cover that are inundated for only a portion of the growing season in most years	Unvegetated seasonally flooded ponds
Palustrine Aquatic Bed (PAB)	Potential aquatic habitats that have a predominance of rooted vascular aquatic plants growing on or below the water surface	Ponds with submerged or floating vegetation such as pondweeds, water lilies
Palustrine Emergent (PEM)	Habitats dominated by erect, rooted, herbaceous species	Emergent wetlands with grasses, sedges, rushes
Palustrine Moss-Lichen (PML)	Moss or lichen dominated wetlands with less than 30% cover vascular vegetation.	Wetlands dominated by mosses or lichens
Palustrine Scrub-Shrub (PSS)	Habitats dominated by woody vegetation less than 6 meter tall/3-inch diameter at breast height (DBH)	Scrub-shrub wetlands with willow or alder thickets, mixed shrub-tussock tundra, ericaceous bogs
Palustrine Forested (PFO)	Habitats dominated by woody tree species greater than 6 meter tall/3-inch DBH	Forested wetlands with black spruce, tamarack
Upland (U) (non-wetland)	Habitats that do not contain criteria diagnostic of wetlands	Non-wetland communities, ranging from closed spruce forest, mixed woodlands, shrublands to alpine tundra
Disturbed (D) (non-wetland)	Gravel-filled, excavated or previously graded areas, man-made structures	Roads, pads, buildings*


* Unvegetated areas

2.1.2 Hydrogeomorphic Classes

Wetlands within the Project mapping corridor were also assigned a hydrogeomorphic (HGM) classification (Smith et al., 1995; and Brinson, 1993) during the mapping process. The HGM classification of wetlands comprises three components: 1) landscape setting; 2) water source (precipitation, surface flow, or groundwater discharge); and 3) hydrodynamics (direction and strength of flow). The three components of the HGM classes are largely responsible for determining a wetland's ecosystem function. The HGM classes in the 2015 field survey corridor are defined below per Smith et al. (1995) and are summarized in Table 2-2.

Riverine – Riverine wetlands occur in floodplains and riparian corridors in association with stream channels. Dominant water sources are often overbank flow from the channel or subsurface hydraulic connections between the stream channel and wetlands; however, sources may be interflow and return flow from adjacent uplands, occasional overland flow from adjacent uplands, tributary inflow, and precipitation. At their headwaters, riverine wetlands often are replaced by slope or depressional wetlands where the channel morphology may disappear. They may intergrade with poorly drained flats or uplands. Perennial flow in the channel is not a requirement.

Depressional – Depressional wetlands occur in topographic depressions. Dominant water sources are precipitation, groundwater discharge, and both interflow and overland flow from adjacent uplands. The direction of flow is normally from the surrounding uplands toward the

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0
		PAGE 12 OF 35

center of the depression. Elevation contours are closed, thus allowing the accumulation of surface water. Depressional wetlands may have a combination of inlets and outlets or lack them completely. Dominant hydrodynamics are vertical fluctuations, primarily seasonal. Depressional wetlands may lose water through intermittent or perennial drainage from an outlet, by evapotranspiration, and, if they are not receiving groundwater discharge, may slowly contribute to groundwater. Peat deposits may develop in depressional wetlands.

Slope – Slope wetlands normally are found where there is a discharge of groundwater to the land surface. They normally occur on sloping land; elevation gradients may range from steep hillsides to slight slopes. Slope wetlands are usually incapable of depressional storage because they lack the necessary closed contours. Principal water sources are usually groundwater return flow and interflow from surrounding uplands, as well as precipitation. Hydrodynamics are dominated by downslope unidirectional water flow. Slope wetlands can occur in nearly flat landscapes if groundwater discharge is a dominant source to the wetland surface. Slope wetlands lose water primarily by saturation, subsurface and surface flows, and by evapotranspiration. Slope wetlands may develop channels, but the channels serve only to convey water away from the slope wetland. Fens are a common example of slope wetlands.

Flat – There are two types of “flat” wetlands: mineral soil flats and organic soil flats. Mineral soil flats are most common on interfluvies, extensive relic lake bottoms, or large floodplain terraces where the main source of water is precipitation. They receive virtually no groundwater discharge which distinguishes them from depressions and slopes. Dominant hydrodynamics are vertical fluctuations. They lose water by evapotranspiration, saturation overland flow, and seepage to underlying groundwater. They are distinguished from flat upland areas by their poor vertical drainage, often due to spodic horizons and hardpans, and low lateral drainage, usually due to low hydraulic gradients. Mineral soil flats that accumulate peat can eventually become organic soil flats.

Organic soil flats differ from mineral soil flats, in part, because their elevation and topography are controlled by vertical accretion of organic matter. They occur commonly on flat interfluvies, but may also be located where depressions have become filled with peat to form a relatively large flat surface. Water source is dominated by precipitation, while water loss is by saturation, overland flow, and seepage to underlying groundwater. Raised bogs share many of these characteristics, but may be considered a separate class because of their convex upward form and distinct edaphic conditions for plants. Organic flats wetlands over permafrost soils are common in Interior Alaska. These flats can and often occur on slopes up to 20 percent.

Lacustrine Fringe – Lacustrine fringe wetlands are adjacent to lakes where the water elevation of the lake maintains the water table in the wetland. In some cases, these wetlands consist of a floating mat attached to land. Additional sources of water are precipitation and groundwater discharge, the latter dominating where lacustrine fringe wetlands intergrade with uplands or slope wetlands. Surface water flow is bidirectional, usually controlled by water-level fluctuations such as seiches (oscillating standing waves) in the adjoining lake. Lacustrine fringe wetlands are indistinguishable from depressional wetlands where the size of the lake becomes so small relative to fringe wetlands that the lake is incapable of stabilizing water tables. Lacustrine fringe wetlands lose water by flow returning to the lake after flooding, by saturation surface flow, and by evapotranspiration. Organic matter normally accumulates in areas sufficiently protected from shoreline wave erosion.

Table 2-2. Hydrogeomorphic Classes within the Project Rev B Mapping Corridor, and Off-ROW Areas

Hydrogeomorphic Class	Dominant Water Source	Dominant Hydrodynamics	Examples
Riverine	Overbank flow from channel	Unidirectional, horizontal	Riparian scrub-shrub wetlands
Depressional	Groundwater	Vertical	Kettle wetlands
Slope	Groundwater	Unidirectional, horizontal	Avalanche chutes
Flat	Precipitation	Vertical	Peat bogs
Lacustrine Fringe	Overbank flow from lake	Bidirectional, horizontal	Emergent lake edge wetlands

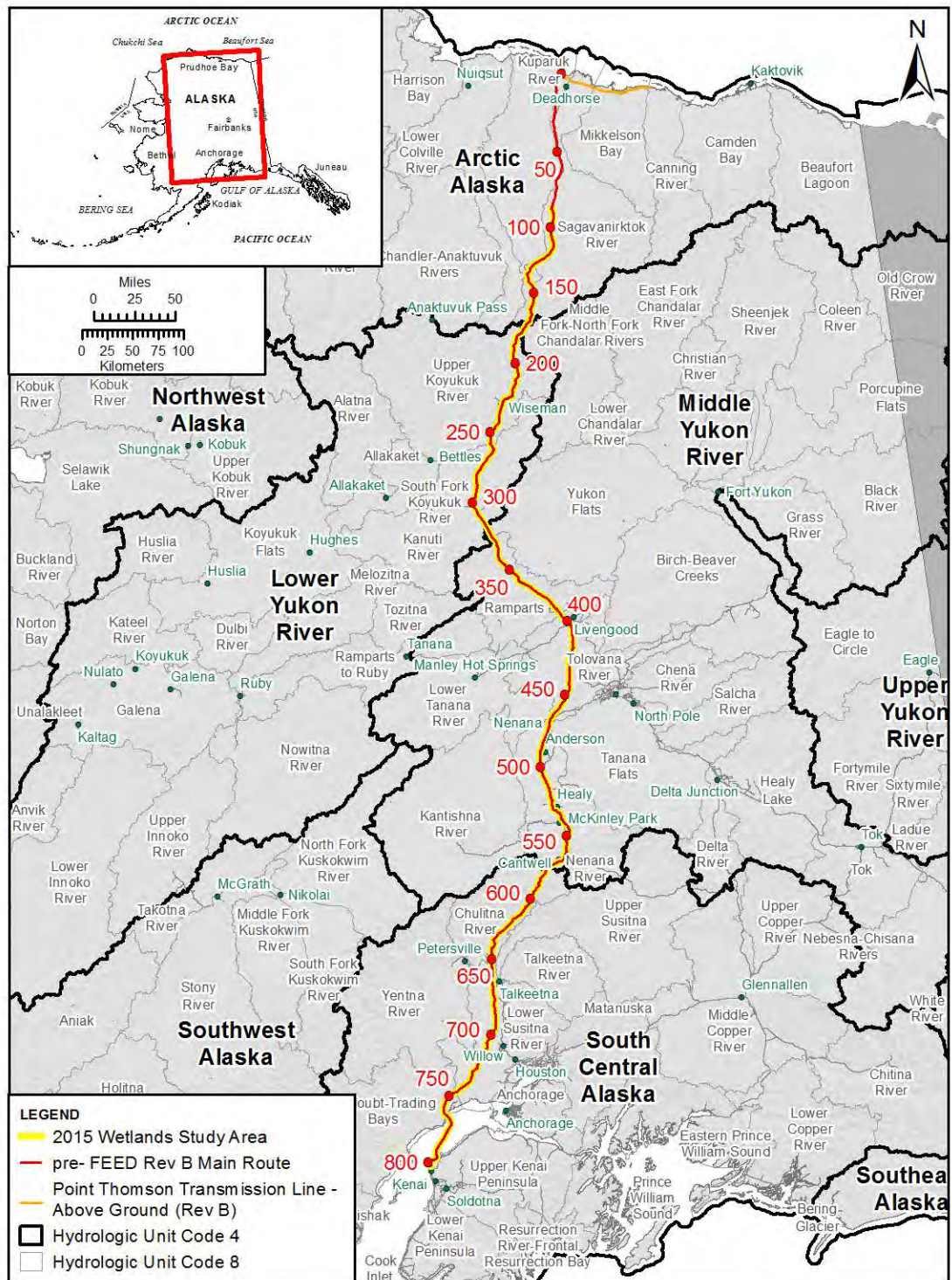
These HGM classes of wetlands have the potential to perform the following eight functions (Magee and Hollands 1998):


1. Modification of groundwater discharge: The capacity of a wetland to influence the amount of water moving from the groundwater to surface water.
2. Modification of groundwater recharge: The capacity of a wetland to influence the amount of water moving from surface water to groundwater.
3. Storm and flood-water storage: The storage of inflowing water from storm or flooding events, resulting in detention and retention of water on the wetland surface.
4. Modification of stream flow: The modification of inflow hydrology by the wetland to produce the outlet stream's hydrology.
5. Modification of water quality: Removal of suspended and dissolved solids from surface water and dissolved solids from groundwater and conversion into other forms, plant or animal biomass, or gases. Wetlands with a low slope-angle or location in depressions provide a high level of this function.
6. Export of detritus: Export of organic detritus from the wetland to adjacent and downstream aquatic ecosystems.
7. Contribution to abundance and diversity of wetland vegetation: The capacity of a wetland to produce an abundance and diversity of hydrophytic plant species individually or as part of a group of wetlands in a local landscape (Tiner 1984).
8. Contribution to abundance and diversity of wetland fauna: The capacity of a wetland to support large and/or diverse populations of animal species that spend part or all of their lifecycle in wetlands, individually, or as part of a mosaic of wetlands in a local landscape.

2.1.3 Study Area Watersheds

The U.S. Geological Survey (USGS) has mapped hydrologic units (drainage basins and watersheds) throughout the study area. Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of two to twelve digits based on the six levels of classification in the hydrologic unit system (USGS, 2015). Alaska falls into hydrologic unit region 19 (2 digit HUC) comprising 8 Sub-regions (4 digit HUC), 38 Basins (6 digit HUC), 159 Sub-basins (8 digit HUC), 20,345 Watersheds (10 digit HUC) and 13,921 Sub-watersheds (12 digit HUC). The project study area crosses 20 "HUC 4" Sub-regions (4 digit HUC), and four "HUC 8" Sub-basins (8 digit HUC). In this report, project analysis accounting for wetland acreages is based on HUC 8 Sub-basins. HUC 4 Sub-regions and HUC 8 Sub-basins of the project area are shown below (Figure 2-1).

Figure 2-1. HUC 4 Sub-regions and HUC 8 Sub-basins of the Project Area



	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0 PAGE 15 OF 35
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2.2 WETLAND PARAMETERS AND INDICATORS

Wetland determinations were made according to the USACE accepted methods in Alaska, as described in the “Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region” (Regional Supplement) (USACE, 2007a), and the “USACE Wetlands Delineation Manual” (USACE Manual) (USACE, 1987). These methods require a three-parameter approach, of which the three essential characteristics of a wetland (hydrophytic vegetation, hydric soils, and wetland hydrology) must be present to have a positive wetland determination.

Wetland indicators are field verifiable and measurable characteristics of vegetation, soil, and hydrology that generally indicate that the parameter in question is present. The absence of an indicator, however, does not always mean that a parameter is not met, or that a wetland is not present. For these “problematic” situations, the Regional Supplement provides procedures to determine if a parameter is present or not. These generally rely on an understanding of the hydrogeomorphology of a site, and the best professional judgment of the wetland scientist. Each parameter, along with select Alaska-specific indicators, is described below.

2.2.1 Hydrophytic Vegetation


Hydrophytic vegetation, or a community dominated by plants with special adaptations to survive saturated or anaerobic conditions, is required for a positive wetland determination. The U.S. Fish and Wildlife Service (USFWS) prepared the “National List of Vascular Plant Species That Occur in Wetlands” in 1988 (Reed, 1988), which categorizes species based on their estimated probability of occurring in a wetland. USACE took over the task of updating this plant list (Lichvar, and Gillrich 2011, Lichvar et al. 2014). The USACE 2014 updated wetlands plant list was used for field data collection in 2015. Indicator ratings and their descriptions are as follows:

- OBL (obligate wetland) – almost always found in wetlands, rarely in uplands;
- FACW (facultative wetland) – usually found in wetlands but occasionally found in uplands;
- FAC (facultative) – commonly occurs in either wetlands or uplands;
- FACU (facultative upland) – occasionally found in wetlands, but usually occurs in uplands;
- UPL (obligate upland) – rarely found in wetlands, almost always in uplands.

Plant species with an indicator status of OBL, FACW, or FAC are considered adapted for life in saturated or anaerobic soil conditions. Such species are referred to as hydrophytic vegetation, or hydrophytes.

The presence of hydrophytic vegetation is determined by satisfying either a Dominance Test or a Prevalence Index. The Dominance Test is generally a quick way to characterize the vegetative community, however, communities with a large number of low cover species are more accurately characterized by the Prevalence Index, a weighted average of the wetland indicator status of all plant species in the community. Both methods were used when collecting field data.

If both of these indicators fail, yet the site exhibits both hydric soil and wetland hydrology (see description below), wetland scientists may examine FACU vegetation within the community for morphological adaptations indicating that it is indeed acting as a hydrophyte. Typical morphological adaptations observed in Alaska wetlands include white spruce (*Picea glauca*) with a narrow growth form, widely spaced needles, and less bushy branching; or Alaska paper birch (*Betula neoalaskana*) with multiple trunks, an “apple tree” like growth, smaller size, and a rotten core in the tree trunk. If these morphological adaptations were observed, the species may be considered FAC at the site in question, and the dominance test recalculated.

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0 PAGE 16 OF 35
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2.2.2 Wetland Soils

Hydric soils are also required for a positive wetland determination. The National Resources Conservation Service (NRCS) has defined a hydric soil as "a soil that in its undrained condition is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation" The criteria for hydric soils includes certain soil taxonomic groups that are poorly drained during the growing season, or soils that are frequently ponded or frequently flooded for long or very long durations during the growing season.

Due to anaerobic conditions, hydric soils exhibit certain characteristics that can be observed in the field. These characteristics may include the following:

- High organic content representing accumulation and slow decomposition in anaerobic conditions;
- Reduction of ferric (Fe³⁺) to ferrous iron (Fe²⁺) and consequent leaching from the soil profile, causing a greenish- or bluish-gray color (gley formation);
- Generation of hydrogen sulfide, noted by characteristic odor;
- Spots or blotches of different color interspersed with the matrix, or dominant color (mottling); and
- Dark soil colors (low chroma).

Indicators have been established by USACE to assist with identification of hydric soils. These indicators are found in the Regional Supplement and the "Field Indicators of Hydric Soils in the United States" (USDA, NRCS 2010). The absence of listed indicators, however, does not preclude the soil from being hydric. If indicators of hydrophytic vegetation and wetland hydrology are present, but hydric soils are not evident, the procedure outlined in the Regional Supplement for problematic hydric soils was followed.

2.2.3 Problematic Soils


Procedures for dealing with problematic hydric soils, that are encountered while conducting field surveys, are described in Chapter 5 of the Regional Supplement (USACE, 2007a). Few potentially problematic hydric soils were encountered within the study area. These situations are discussed in **Appendix B** of the report. This section describes instances where problems may be encountered.

2.2.4 Wetland Hydrology

Wetland hydrology is the third parameter required for a positive wetland determination. The most ephemeral of the three parameters, surface water or saturation, need not be present throughout the entire year to meet the definition of wetland hydrology. According to the USACE Manual (1987), wetland hydrology is present when there is inundation or soil saturation to the surface continuously for at least five percent of the growing season in most years. Indicators of wetland hydrology include observing ponding or soil saturation, as well as evidence of previous inundation, such as dry algae on bare soil, watermarks on soils or leaves, and drainage patterns. Where positive indicators were observed, it was assumed that wetland hydrology occurs for a sufficient period of the growing season.

2.3 AERIAL INTERPRETATION (PRE-MAPPING)

Wetland boundaries for the mapping corridor were delineated on digital ortho-rectified and geo-referenced true color aerial imagery with 1.6-foot pixel resolution using the following aerial imagery:


	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0
		PAGE 17 OF 35

- Alaska LNG Imagery. (0.5-foot resolution) (Paragon 2013);
- Nikiski Area Aerial Orthophoto. (2.5-foot resolution) (Kenai Peninsula Borough 2006);
- Kenai Peninsula Borough Aerial Imagery. (2.5-foot resolution) (Kenai Peninsula Borough 2013);
- Point MacKenzie Aerial Orthophoto (0.5-meter resolution) (Matanuska Susitna Borough, MSB 2011d);
- Willow Aerial Orthophoto (1.0-foot resolution) (MSB 2011c);
- Caswell Aerial Orthophoto (1.0-foot resolution) (MSB 2011b);
- Talkeetna Aerial Orthophoto (1.0-foot resolution) (MSB 2011a);
- Healy Area Orthophoto (1.0-meter resolution) (U.S. Census Bureau 2006);
- Digital Orthophoto Quarter Quadrangles - Anderson Area (0.6-meter resolution) (NRCS 2006);
- Southern Corridor Ortho Mosaic (1.6-foot resolution) (Digital Globe 2013b);
- Northern Central Corridor Ortho Mosaic (Digital Globe 2013a);
- Quantum Aerial Imagery. (1.6-foot resolution) (Quantum Spatial 2014);
- iCubed Satellite Imagery. (1.0-meter resolution) (iCubed 2014);
- ExxonMobil aerial imagery for the Alaska Pipeline Project (0.5-meter pixel resolution; summer 2008, 2009, 2010, and 2011) (ExxonMobil 2008, ExxonMobil 2009b, ExxonMobil 2011);
- BP Exploration Alaska Inc. aerial imagery for Prudhoe Bay, Endicott, and Badami (1.0-foot pixel resolution; July 2012) (BPX 2012a, BPX 2012b, BPX 2012c); and
- ExxonMobil aerial imagery for Point Thomson (2.0 and 0.5-foot pixel resolution; July 2001/2006, and July 2009) (ExxonMobil 2001-6, ExxonMobil 2009a).

Data from the following sources was also used during the mapping process:

- USFWS, NWI digital datasets and hardcopy maps;
- Kenai Watershed Forum – Cook Inlet Wetlands for the Kenai Peninsula and the Matanuska Susitna Boroughs (Gracz 2011);
- NRCS Soil Survey digital datasets and hardcopy maps;
- Light Detection and Ranging generated topographic contours (TransCanada 2011, MSB 2011d);
- Pertinent previous studies, such as Terrestrial and Aquatic Habitat Mapping Along the Alaska Natural Gas Pipeline System (USFWS 1980), the Denali Pipeline Project, the instate Alaska Stand Alone Pipeline Project, and the Alaska Pipeline Project;
- USGS Digital Raster Graphics (e.g., topographic maps);
- Point Thomson Project wetlands mapping between Point Thomson and Badami (USACE 2012);
- Existing Geographic Information System (GIS) layers including waterbodies, contours, and roads; and
- Existing Land Status GIS layers including: State of Alaska, U.S. Bureau of Land Management, and Native allotments.

All wetland mapping was created in a GIS platform, using a “heads-up” digitizing effort. This “heads-up” process applies aerial image interpretation to delineate vector polygons of ground features. This is the generally accepted wetland and deepwater habitat mapping technique employed by the USFWS personnel as part of the NWI program (Dahl et al. 2009). Data sources were overlaid on aerial photography and wetland, non-wetland, and areas of uncertain wetland

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0
		PAGE 18 OF 35

status were identified by interpreting color, texture, and landscape position, among other elements. Aerial photography clues can include dwarf or stunted trees, topography characteristics (such as swales, toe slopes and depressions), and obvious signs of inundation.

All wetlands were mapped at a scale of 1:2,400 (1 inch to 200 feet) or finer. Lakes, ponds and rivers were mapped at a scale of 1:1,200 (1 inch to 100 feet). Larger rivers and streams were delineated as polygons. Smaller streams, those with bankfull widths of approximately 10 feet or less, were mapped as lines.

2.4 FIELD TARGET SELECTION

Field targets (FTs) were selected from the pre-mapping based on changes in the wetlands types, aerial vegetation signatures, Cowardin classification, and NRCS soil classification. The primary focus of the pre-selected FTs was to characterize specific wetland types which represent all similar wetland types in the region and to identify wetland/upland boundaries by selecting paired plots. Field targets were used to confirm areas where wetland subject matter experts had high confidence in their aerial interpretation, and were used to confirm or correct wetland boundary locations. Field targets were also placed in low-confidence areas to provide field data where the photo signatures or landscape features were not clearly indicative of wetland or upland. Field targets spanned the full range of Cowardin and HGM classes within the Project mapping corridor.

Field targets were evaluated during the field season provided there was land access. If a FT could not be accessed, a new FT was located on a nearby accessible parcel in an area with similar aerial photography vegetation signatures and site conditions as the original FT.

2.5 WETLAND FIELD DATA COLLECTION

The 2015 wetland field study was conducted from early June through mid-September, and focused on field targets from Nikiski (MP 804) to the northern most field target (MP 86) in the Brooks Range foothills.


2.5.1 Crew Composition

Two three-person crews collected data in 2015. Each crew consisted of a field crew chief, an assistant wetland scientist / Global Positioning System (GPS) technician, and a wilderness safety specialist. Each position had defined roles and responsibilities in the field and required a specific level of technical expertise.

Field crew chiefs were required to have proven field experience and a strong familiarity with wetland science. They were in charge of the field crews and ultimately responsible for data collection quantity and quality; daily reporting; crew health and safety; and data submittal on a daily or near-daily basis. Field crew chiefs also planned the workday for the crew, coordinated with Project management, and addressed any technical issues.

Wetland scientists / GPS technicians were required to be experienced in field work, familiar with wetland science principles, and to have attended a wetland delineation training course. They assisted in the wetland field survey with appropriate supervision by the field crew chief. The wetland scientist / GPS technician was also responsible for electronic data collection at each site using a Panasonic tablet with Trimble R1 GPS receiver. They worked closely with field crew chiefs to verify that the data was accurate and complete, and were also responsible for the maintenance and care of the GPS equipment, managing the crew's electronic data, and ensuring data files were uploaded to the Project's SharePoint site on a daily or near-daily basis.

Wilderness safety specialists were professionally trained in firearms proficiency, Alaska wilderness survival, and first aid / cardiopulmonary resuscitation. They were responsible for

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0 PAGE 19 OF 35
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protecting the field crew from aggressive wildlife encounters, and assisting the field crew chief in the communication of and compliance with all Project health and safety policies.

2.5.2 Wetland Determination Field Protocols

Wetland Determination Field Survey Protocols (**Appendix A**) have been developed and were provided to the USACE and the FERC (USACE 2010, FERC 2015). As described in the protocols, data was collected as a Determination Point (DP), where a hard copy Wetland Determination Form (WDF) was completed, or an Observation Point (OP), in which notes and photographs were used to describe wetland status and the community. All wetlands and waterbodies were classified using Cowardin codes.

The field crew chief examined vegetation and topography to determine appropriate sampling location(s) at each FT. Although FTs were used to guide the location of field crews, field crew chiefs were allowed discretion in the number, type (DP or OP), and final location of data points. This flexible approach allowed scientists to collect data in locations that best described the target community, allowed them to collect additional data as field conditions warranted, and enhanced efficiency by allowing scientists to collect observational data if a similar community was thoroughly described nearby. Wetland scientists used their best professional judgment and collected appropriate field data to adequately revise the wetland pre-mapping.

Field crew chiefs maintained field logbooks and hardcopy field maps with aerial photography, field targets, and pre-mapped wetland boundaries and classifications. The wetland scientist / GPS technician entered some of the data into electronic data forms specific to DPs and OPs. Daily field quality assurance/quality control (QA/QC) procedures are described in Section 2.6. Hardcopy and electronic data forms, field notes, maps, GPS data, and site photos were uploaded daily to the Project SharePoint website.

2.6 QUALITY ASSURANCE / QUALITY CONTROL

Each crew member was responsible for collecting and recording clear and accurate data. The field crew chief reviewed all hardcopy and electronic data forms and completed a QA/QC checklist before leaving each site.


The field crew manager ensured that all data files were uploaded to the Project website. These transmitted files were then downloaded and reviewed by office-based data management staff. A wetland subject matter expert checked each hardcopy data sheet and electronic data form for quality and consistency, as it was received. If problems arose, the field crew was notified promptly to ensure that any data quality issues were corrected immediately.

Wetland mapping was also reviewed by experienced wetland scientists both after the initial pre-mapping, and after map revisions were complete.

2.7 WETLAND MAP REVISIONS

The wetland pre-mapping was updated based on field reference data collected throughout the 2015 field season. Map revisions included refinement of wetland boundaries and classifications (HGM, Cowardin, Viereck, Inlet/outlet) following procedures outlined in the 2015 Wetland Determination Field Survey Protocols (**Appendix A**). Map updates referenced 2015 GPS data (field plot locations), Wetland Determination Data Forms, Vegetation Classification Data Forms (for upland sites), site photographs, logbook field notes, and notated field maps as primary data sources. Map revisions were made with post-processed GPS data to ensure positional accuracy of the field data and field data forms that passed the QA/QC process (Section 2.6).

Generally, the wetland pre-mapping revision process involved:

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0 PAGE 20 OF 35
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- Overlaying exported spatial data for all field reference data points on an ortho-rectified photographic base layer in the GIS environment;
- Compiling electronic copies of all field notes, sketches, and photographs associated with above points; and
- Using this data to update polygon attributes (wetland/non-wetland classifications) and refine map delineations as needed in the GIS environment. This process is described in detail in Section 3.2 of the 2015 Wetland Determination Field Survey Protocols (**Appendix A**).

In the process of incorporating field reference data into the wetlands mapping, updates were not necessarily limited to the polygon intersected by the field reference data point. Rather, field data were used to “recalibrate” the mapper’s understanding of photo signatures in context with landscape position in that portion of the map (generally within one half mile of the data collection site). Extrapolating field reference data to adjacent areas is a process that incorporates information derived from field notes (concerning the surrounding area) in addition to a recalibration of the mapper’s eye to a particular spectral signature (combination of color, tone, shadow, texture, etc.) when viewed in context with contour data and landscape position.

Examples of extrapolating field reference data to adjacent areas in the wetlands mapping are included in **Appendix D**.

2.8 WETLAND FUNCTIONAL ASSESSMENT


Wetlands are known to provide a variety of ecological functions depending on the location and type of wetland. At sites determined to be wetland, an Aquatic Site Assessment (ASA) Data Form was collected. Information from this data sheet will be incorporated into the functional models described in *A Rapid Procedure for Assessing Wetland Functional Capacity* (Magee and Hollands 1998). On May 14, 2015, Alaska LNG wetland scientists met with the USACE and USFWS representatives to discuss field data collection methods for the ASA. In July, 2015, the USACE provided comments on wetland delineation and functional assessment protocols, and guidance for submitting data (USACE 2015b). The Project will incorporate agency guidance into the ASA.

Hydrogeomorphic (HGM) classes of wetlands and the eight wetland functions identified by Magee and Hollands are described in Section 2.1.2 and in the Wetland Determination Field Survey Protocols (**Appendix A**). The functional assessment models provide a Functional Capacity Index for each wetland function. The Functional Capacity Index indicates the potential degree to which the wetland performs the function and is only comparable to other wetlands within the same HGM class and region. The results from the models will be extrapolated to the applicable wetlands within the mapping corridor. This information will potentially serve as the basis to determine appropriate compensatory mitigation approaches for the unavoidable impacts of the Project. Wetland functional assessment data will be reported in 2016, after all field data is collected.

2.9 JURISDICTIONAL DETERMINATION

The USACE regulates wetlands and other Waters of the U.S. that are under their jurisdiction. Jurisdictional status is based on connectivity to Traditional Navigable Waters (TNW) (*Rapanos v. United States* and *Carabell v. United States* [33 U.S. Code §1251 et seq.]).

The Project, similar to other large pipeline and energy projects permitted by the USACE, will assume that all delineated wetlands fall under USACE jurisdiction; because the FERC requires that the Project adhere to certain construction requirements in all wetlands, it will be assumed that all wetlands fall within USACE jurisdiction for purposes of planning, permitting, mitigation, and construction methods.

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0
		PAGE 21 OF 35

In January, 2015, the USACE reviewed the Project's identification and delineation of Waters of the U.S. from Point Thompson to Prudhoe Bay to Livengood, Alaska, and determined that there were no obvious errors in the methodology or determinations (USACE 2015).

3.0 RESULTS

3.1 WETLAND FIELD DATA COLLECTION

A total of 333 FTs were selected for the 2015 field season to investigate a representative assemblage of wetlands, non-wetlands and areas of uncertainty. Criteria used in the selection of FTs are discussed in section 2.4. Due to land access issues, 23 of the FTs were deleted while others were moved to accommodate land access restrictions as needed. A total of 310 FTs were surveyed during the 2015 field season. Table 3-1 shows the number of FTs completed within each of the sub-ecoregions. The 2015 Wetland Determination Data Forms and the Wetland and Vegetation Field Data Summary Table are provided in **Appendix C**.

Table 3-1. 2015 Completed Field Targets by Ecoregion


Ecoregion	Sub-Ecoregion	Milepost	Total Number of Field Targets Completed
Alaska Range Transition	Cook Inlet Basin	804-616	103
	Alaska Range	616-516	59
Intermontane Boreal	Tanana-Kuskokwim Lowlands	516-455, 443-430	66
	Yukon-Tanana Uplands	455-443	11
	Ray Mountains	430-257	39
	Kobuk Ridges and Valleys	257-252	1
Arctic Tundra	Brooks Range	252-143	16
	Brooks Foothills	143-62	15
	Beaufort Coastal Plain	62-0	0
Total:			310

A total of 456 field reference data points were sampled at or near the pre-selected field targets during the 2015 field season. Table 3-2 summarizes the distribution of field plots sampled in the 300 foot construction corridor, 2000 foot mainline study area and off-ROW areas outside the 2000 foot study area corridor.

Table 3-2. Field Plot Distributions in the Study Area

Plot Type	300 ft Corridor	2000 ft Corridor	Off-ROW*	Total Number of Field Plots Completed
Wetland Determination Data Form Plot	185	73	46	304
Observation Point (no data form)	62	58	23	143
Vegetation Classification Data Form Plot	6	3	0	9
Total	253	134	69	456

*Off-ROW targets outside of the 2000 foot mainline corridor.

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0 PAGE 23 OF 35
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3.2 WETLAND MAPPING SUMMARY

The wetland delineation pre-mapping was revised according to the criteria summarized in Section 2.7 of this report. The 2015 final wetland delineation maps are included as **Appendix E**. A summary of wetland acreage per ecoregion within the 2000 foot Rev B mapping corridor and off-ROW footprint is presented in Tables 3-3 to 3-5. These tables present all the wetland acreages within the 2000 foot Rev B mapping corridor from 2010 to 2015. Wetland acreages are organized by HUC 8 Sub-basins, HGM (Brinson, 1993) and Cowardin (Cowardin et al. 1979) classifications. Of the approximate 217,364 acres in the 2000 foot mapping corridor and off-ROW footprint, wetlands and other Waters of the U.S comprise 120,334 acres or 55 percent of the total.

Within the Alaska Range Transition Ecoregion approximately 34% of the Project corridor is wetland and Waters of the U.S. About 50% of these wetlands have been classified as palustrine scrub-shrub (PSS) and palustrine forested (PFO) wetlands. In this ecoregion, about 31% of the wetlands were identified as having a depressional HGM, 17% as flat, 15% as slope and 4% riverine. Waters of the U.S. and Potential Waters of the U.S comprised approximately 32% of the wetlands habitat mapped in the 2000 foot study area corridor and off-ROW footprints in the Alaska Range Transition Ecoregion.


Within the Intermontane Boreal Ecoregion about 43% of the Project corridor is wetland and Waters of the U.S. This ecoregion supports a large component of precipitation driven wetlands (flat HGM) associated with shallow permafrost (about 83% of all wetlands within this ecoregion). Approximately 6% of the Project corridor in this ecoregion has been classified as having riverine HGM while nearly 6% of the wetlands were identified as depressional. Palustrine scrub-shrub (PSS) and forested (PFO) wetlands comprise approximately 83% of the wetlands and Waters of the U.S. in this ecoregion. Waters of the U.S. and Potential Waters of the U.S accounted for approximately 2% of the wetlands habitat mapped in the 2000 foot study area corridor and off-ROW footprints in the Intermontane Boreal Ecoregion.

About 84% of the Project corridor in the Arctic Tundra Ecoregion is wetland and Waters of the U.S. Approximately 77% of all wetlands in the Arctic Tundra Ecoregion are classified as having flat HGM while about 9% are classified as depressional, and nearly 8% identified as riverine. Nearly 90% of all wetlands in this ecoregion are classified as palustrine scrub-shrub (PSS) or emergent herbaceous (PEM). About 6% of the ecoregion was classified as Waters of the U.S. or Potential Waters of the U.S in the 2000 foot study area corridor and off-ROW footprints in the Arctic Tundra Ecoregion.

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0
		PAGE 24 OF 35

Table 3-3. Wetland Acreage within the Project Rev B Mapping Corridor and off-ROW Footprint, within the Alaska Range Transition Ecoregion, by HUC 8, Hydrogeomorphic and Cowardin Types

HGM and Cowardin Classification	Hydrologic Unit Code (HUC) 8 Name							
	Upper Kenai Peninsula (acres)	Cook Inlet (acres)	Redoubt Trading Bays (acres)	Lower Susitna River (acres)	Yentna River (acres)	Chulitna River (acres)	Nenana River (acres)	Grand Total (acres)
Flat								
PFO	-	-	126.6	269.9	-	149.9	3.4	549.9
PFO/SS	-	-	67.0	232.8	-	0.9	192.0	492.7
PSS/FO	-	-	8.2	305.4	-	1.2	79.8	394.5
PSS	-	-	63.6	175.1	-	20.2	1,675.9	1,934.8
PSS/EM	-	-	4.8	130.6	-	3.3	578.4	717.0
PEM/SS	-	-	-	6.0	-	19.6	70.9	96.5
PEM	-	-	-	-	-	-	0.2	0.2
Depressional								
PFO	13.6	-	11.1	249.0	-	69.8	21.8	365.3
PFO/SS	1.3	-	-	221.0	-	35.8	0.7	258.8
PFO/EM	-	-	-	0.2	-	0.6	-	0.9
PSS/FO	-	-	-	447.7	-	29.7	8.5	485.9
PSS	2.3	-	69.8	831.7	-	715.8	362.7	1,982.4
PSS/EM	34.1	-	158.8	727.0	-	302.2	59.1	1,281.2
PSS/ML	-	-	-	4.3	-	-	-	4.3
PEM/SS	5.8	-	44.7	578.9	-	470.4	38.0	1,137.8
PEM	57.6	-	19.1	301.1	4.4	829.1	160.4	1,371.7
PEM/ML	-	-	-	-	-	6.7	-	6.7
PAB/EM	-	-	-	11.4	-	-	-	11.4
PAB	2.2	-	10.2	188.0	-	77.2	29.1	306.7
PUB/AB	-	-	1.6	8.9	-	0.4	-	10.8
PUB/EM	-	-	-	-	-	1.4	0.3	1.7
PUB	121.1	-	3.2	100.7	-	74.7	48.5	348.2
Slope								
PFO	-	-	347.1	643.7	-	58.7	0.1	1,049.5
PFO/SS	-	-	-	461.9	-	114.1	-	575.9
PFO/EM	-	-	5.1	77.2	-	-	-	82.2
PSS/FO	-	-	-	109.3	-	26.3	192.0	327.6
PSS	-	-	6.7	284.0	-	376.9	60.5	728.1
PSS/EM	-	-	-	345.2	-	53.3	344.5	742.9
PEM/FO	-	-	-	32.8	4.7	-	-	37.5
PEM/SS	-	-	-	59.5	-	105.9	-	165.3
PEM	-	-	-	9.0	-	16.9	7.0	32.9
PUB	-	-	-	-	-	0.7	-	0.7
Lacustrine Fringe								
PEM	5.6	-	0.7	-	-	-	-	6.2
PAB	1.2	-	-	1.9	-	0.8	-	3.9
Riverine								
PFO	-	-	11.3	15.4	-	1.0	5.2	32.9
PFO/SS	-	-	12.1	15.9	-	12.7	14.1	54.8

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0
		PAGE 25 OF 35

HGM and Cowardin Classification	Hydrologic Unit Code (HUC) 8 Name							
	Upper Kenai Peninsula (acres)	Cook Inlet (acres)	Redoubt Trading Bays (acres)	Lower Susitna River (acres)	Yentna River (acres)	Chulitna River (acres)	Nenana River (acres)	Grand Total (acres)
PSS/FO	-	-	-	1.7	-	1.6	-	3.3
PSS	0.8	-	4.1	90.0	-	132.2	210.6	437.6
PSS/EM	-	-	43.7	111.9	-	28.9	73.4	257.8
PSS/US	-	-	-	-	-	-	11.1	11.1
PEM/FO	-	-	-	5.6	-	-	-	5.6
PEM/SS	-	-	-	60.6	-	23.7	33.7	118.0
PEM	0.2	-	0.9	35.4	-	18.2	5.1	59.8
PEM/AB	-	-	-	0.2	-	-	-	0.2
PAB	-	-	-	1.4	-	-	-	1.4
PAB/UB	-	-	-	-	-	1.8	-	1.8
PUB/EM	-	-	-	-	-	-	4.4	4.4
PUB	-	-	-	3.7	-	9.7	23.7	37.1
PUB/US	-	-	-	-	-	1.0	-	1.0
Wetlands Total Area	245.6	0.0	1,020.2	7,155.7	9.0	3,793.3	4,315.2	16,539.0
Waters and Potential Waters of the U.S.								
L1UB	40.8	-	47.6	-	-	21.9	77.0	187.2
L2UB	-	-	-	-	-	9.3	-	9.3
E1UB	133.8	6,361.1	-	-	-	-	-	6,494.9
E2US	126.5	47.2	212.8	-	-	-	-	386.5
R2UB	-	-	25.0	28.2	46.8	68.5	-	168.4
R2US	-	-	19.0	15.9	17.1	22.3	0.9	75.2
R3UB	-	-	3.9	6.7	-	45.2	243.6	299.4
R3US	-	-	-	-	-	21.6	52.3	73.9
R3UB/US	-	-	16.3	28.9	-	6.9	-	52.1
R4SB	-	-	2.3	-	-	1.2	34.6	38.1
Waters Total Area	301.1	6,408.3	326.8	79.7	63.9	196.8	408.4	7,784.9
No HGM								
Disturbed	332.4	-	66.5	118.1	-	507.3	426.3	1,450.6
Upland	2,157.7	-	3,408.9	13,434.0	253.6	15,514.5	10,334.1	45,102.8
No HGM Total Area	2,490.1	0.0	3,475.4	13,552.1	253.6	16,021.9	10,760.4	46,553.4
Grand Total Area (acres)	3,036.8	6,408.3	4,822.3	20,787.5	326.5	20,012.1	15,484.0	70,877.4

Table 3-4. Wetland Acreage within the Project Rev B Mapping Corridor and off-ROW Footprint, within the Intermontane Boreal Ecoregion, by HUC 8, Hydrogeomorphic and Cowardin Types

HGM and Cowardin Classification	Hydrologic Unit Code (HUC) 8 Name								
	Nenana River (acres)	Lower Tanana River (acres)	Tolovana River (acres)	Ramparts (acres)	Yukon Flats (acres)	Kanuti River (acres)	South Fork Koyukuk River (acres)	Upper Koyukuk River (acres)	Grand Total (acres)
Flat									
PFO	85.8	21.3	274.5	11.8	10.7	-	62.2	4.5	470.8
PFO/SS	1,309.3	9.1	2,183.6	510.9	473.0	1.3	92.3	-	4,579.5
PSS/FO	548.5	5.5	934.5	-	-	-	-	-	1,488.4
PSS	1,418.7	30.2	1,635.8	2,250.2	907.7	141.0	3,918.7	523.6	10,825.9
PSS/EM	664.7	166.4	689.4	576.8	62.3	1,120.2	1,909.2	290.7	5,479.7
PEM/SS	1.4	7.7	15.6	16.7	0.6	110.6	871.9	315.5	1,340.0
PEM	1.2	15.7	4.5	27.1	-	-	10.2	1.5	60.3
Depressional									
PFO	-	13.0	0.8	-	-	-	-	-	13.7
PFO/SS	-	0.4	-	2.0	-	-	1.4	-	3.9
PFO/EM	-	0.5	-	-	-	-	-	-	0.5
PSS/FO	2.2	-	0.3	-	-	-	-	-	2.5
PSS	15.4	15.3	98.8	59.6	6.2	27.1	86.6	0.3	309.4
PSS/EM	108.3	18.0	81.7	258.2	15.7	-	75.8	3.8	561.4
PEM/FO	-	0.4	-	-	-	-	-	-	0.4
PEM/SS	51.6	20.6	85.6	58.7	-	-	69.6	55.1	341.2
PEM	12.2	26.1	190.7	44.0	1.9	0.4	34.7	15.9	325.8
PEM/ML	-	-	0.2	-	-	-	-	-	0.2
PAB	-	-	0.1	12.3	-	-	0.4	0.5	13.3
PUB/EM	-	0.9	-	-	-	-	-	-	0.9
PUB/AB	-	4.3	7.4	-	-	-	-	-	11.7
PUB	4.5	10.2	37.2	8.6	0.1	0.2	25.6	13.3	99.9
PUS	-	-	-	-	-	-	4.4	-	4.4
Slope									
PFO	3.1	0.1	0.3	-	-	-	-	-	3.5
PFO/SS	4.3	92.2	38.1	-	-	-	-	-	134.6
PSS/FO	17.9	14.9	6.0	-	9.5	-	-	-	48.2
PSS	99.4	38.9	75.2	-	-	-	-	-	213.5
PSS/EM	111.7	64.0	24.4	-	-	-	24.7	-	224.8
PEM/SS	61.4	12.7	40.3	6.4	-	-	-	-	120.8
PEM	-	29.9	7.4	-	-	-	-	-	37.3

HGM and Cowardin Classification	Hydrologic Unit Code (HUC) 8 Name								
	Nenana River (acres)	Lower Tanana River (acres)	Tolovana River (acres)	Ramparts (acres)	Yukon Flats (acres)	Kanuti River (acres)	South Fork Koyukuk River (acres)	Upper Koyukuk River (acres)	Grand Total (acres)
PAB	-	20.5	-	-	-	-	-	-	20.5
PUB/AB	-	-	0.4	-	-	-	-	-	0.4
PUB	0.9	0.1	-	-	-	-	-	-	1.0
Lacustrine Fringe									
PEM	-	-	5.9	7.3	-	-	0.5	-	13.7
PAB	-	-	-	0.8	-	-	-	-	0.8
Riverine									
PFO	12.2	-	-	3.4	-	-	13.7	-	29.3
PFO/SS	51.3	-	51.7	40.7	-	-	10.4	-	154.0
PSS/FO	20.8	-	-	-	-	-	-	-	20.8
PSS	184.7	8.3	30.5	280.3	78.1	57.2	216.6	13.6	869.3
PSS/EM	108.8	15.3	12.9	101.9	4.7	5.2	133.1	36.7	418.6
PSS/U	-	-	-	3.0	-	-	-	-	3.0
PEM/SS	24.6	0.7	6.0	67.0	27.5	-	18.9	3.6	148.4
PEM	6.4	18.2	11.9	37.1	0.4	-	5.3	2.3	81.6
PEM/U	-	-	-	3.9	-	-	-	-	3.9
PUB/EM	1.2	-	-	-	-	-	-	-	1.2
PUB/AB	-	1.2	0.1	-	-	-	-	-	1.4
PUB	7.8	-	4.4	1.9	-	-	6.4	0.9	21.3
PUS	2.8	-	-	-	-	-	-	-	2.8
Wetlands Total Area	4,943.1	682.7	6,556.1	4,390.7	1,598.3	1,463.3	7,592.8	1,281.8	28,508.6
Waters and Potential Waters of the U.S.									
L1UB	-	-	-	-	-	-	16.7	-	16.7
L2UB	-	-	8.3	25.9	-	-	-	-	34.2
R2UB	49.1	123.6	25.9	97.4	-	-	-	-	296.0
R2US	2.8	2.5	-	-	-	0.3	-	-	5.6
R3UB	60.3	-	12.5	13.0	-	5.3	32.1	-	123.2
R3US	9.5	-	2.2	7.4	-	-	29.7	-	48.8
R4SB	20.3	-	1.0	-	-	-	2.8	-	24.1
Waters Total Area	142.0	126.1	50.0	143.7	0.0	5.6	81.2	0.0	548.6
No HGM									
Disturbed	113.4	53.2	297.7	917.2	129.2	204.8	458.6	108.2	2,282.4
Upland	5,399.6	788.9	12,302.6	11,641.8	589.5	1,230.1	3,391.0	169.3	35,512.7
No HGM Total Area	5,512.9	842.1	12,600.3	12,559.0	718.7	1,434.9	3,849.6	277.5	37,795.1
Grand Total Area (acres)	10,598.0	1,651.0	19,206.4	17,093.3	2,317.0	2,903.7	11,523.7	1,559.3	66,852.4

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0
		PAGE 28 OF 35

Table 3-5. Wetland Acreage within the Project Rev B Mapping Corridor and off-ROW Footprint, within the Arctic Tundra Ecoregion*, by HUC 8, Hydrogeomorphic and Cowardin Types

HGM and Cowardin Classification	Hydrologic Unit Code (HUC) 8 Name							
	Upper Koyukuk River (acres)	Middle Fork-North Fork Chandalar River (acres)	Sagavanirktok River (acres)	Lower Colville River (acres)	Kuparuk River (acres)	Mikkelson Bay (acres)	Canning River (acres)	Grand Total (acres)
Flat								
PFO	67.1	-	-	-	-	-	-	67.1
PFO/SS	496.3	-	-	-	-	-	-	496.3
PSS/FO	46.9	-	-	-	-	-	-	46.9
PSS	6,306.5	35.8	510.4	-	152.4	0.3	-	7,005.3
PSS/EM	1,968.8	310.5	5,503.6	143.7	2,784.8	39.2	12.3	10,762.9
PSS/ML	-	8.5	-	-	-	-	-	8.5
PEM/SS	259.0	60.3	15,891.9	69.3	8,448.7	6,145.3	165.8	31,040.3
PEM	67.6	-	988.0	-	844.0	269.7	8.6	2,177.9
PEM/UB	-	-	-	-	5.5	-	-	5.5
Depressional								
PSS	113.2	-	3.4	-	-	-	-	116.6
PSS/EM	121.4	-	278.3	-	87.9	-	-	487.6
PEM/SS	78.4	0.1	529.2	-	217.6	21.1	-	846.3
PEM	35.5	0.1	765.7	0.3	849.0	644.7	22.2	2,317.4
PEM/UB	-	-	-	-	0.6	1.5	-	2.1
PAB	-	-	89.8	-	557.0	40.6	-	687.4
PUB/EM	-	-	-	-	-	2.0	-	2.0
PUB	88.9	0.1	546.3	0.0	233.2	560.8	50.1	1,479.4
PUS	-	-	-	-	1.1	-	-	1.1
Slope								
PSS	1.5	-	15.4	-	-	-	-	16.9
PSS/EM	48.0	2.7	12.9	2.3	-	-	-	65.9
PSS/US	4.6	-	-	-	-	-	-	4.6
PEM/SS	-	-	184.3	-	-	-	-	184.3
PEM	14.7	3.1	109.3	-	2.5	-	-	129.5
PAB	0.5	-	-	-	-	-	-	0.5
Lacustrine Fringe								
PEM/SS	2.5	-	1.0	-	1.4	-	-	4.9
PEM	1.7	-	89.1	-	49.3	45.8	-	185.9
PAB	-	-	-	-	1.0	8.7	-	9.7
PUB	-	-	2.3	-	0.5	-	-	2.8
Riverine								
PFO	58.3	-	-	-	-	-	-	58.3
PFO/SS	86.0	-	-	-	-	-	-	86.0
PSS/FO	2.2	-	-	-	-	-	-	2.2
PSS	541.1	88.9	742.8	-	49.3	30.4	-	1,452.5
PSS/EM	143.7	196.6	1,208.4	2.0	125.4	32.6	-	1,708.7
PEM/SS	13.3	0.2	802.7	4.9	98.0	75.1	-	994.2
PEM	17.5	-	426.3	-	16.4	94.6	0.7	555.5

HGM and Cowardin Classification	Hydrologic Unit Code (HUC) 8 Name							
	Upper Koyukuk River (acres)	Middle Fork-North Fork Chandalar River (acres)	Sagavanirktok River (acres)	Lower Colville River (acres)	Kuparuk River (acres)	Mikkelsen Bay (acres)	Canning River (acres)	Grand Total (acres)
PEM/UB	-	-	16.0	-	-	0.6	-	16.6
PEM/U	-	-	71.5	-	-	-	-	71.5
PAB	-	-	2.9	-	-	-	-	2.9
PUB	0.5	-	48.5	-	2.6	7.4	-	59.0
PUS	-	-	0.2	-	-	-	-	0.2
Wetlands Total Area	10,585.5	706.9	28,840.0	222.6	14,528.3	8,020.4	259.7	63,163.3
Waters and Potential Waters of the U.S.								
E1UB	-	-	-	-	181.0	-	-	181.0
E2SB	-	-	3.6	-	-	-	-	3.6
E2US	-	-	-	-	13.1	-	35.5	48.7
L1UB	34.3	-	360.7	-	409.7	189.4	0.1	994.2
L2UB	10.2	-	104.0	-	52.0	0.0	-	166.2
R1UB	-	-	2.4	-	20.7	1.0	-	24.1
R2UB	-	-	111.6	-	22.4	46.6	1.2	181.9
R2UB/US	-	-	2.3	-	-	2.5	-	4.9
R2US	0.2	-	330.6	-	29.7	82.7	-	443.1
R2US/UB	-	-	-	-	-	42.9	-	42.9
R3UB	12.4	-	25.4	-	3.9	-	-	41.7
R3UB/US	936.8	90.9	170.0	-	-	-	-	1,197.7
R3US	19.5	-	0.9	-	0.5	-	-	20.9
R3US/UB	-	-	127.2	-	-	-	-	127.2
R4SB	75.3	25.8	196.9	-	2.1	11.1	-	311.2
Waters Total Area	1,088.8	116.7	1,435.6	0.0	735.1	376.3	36.8	3,789.3
No HGM								
Disturbed	781.3	121.6	1,292.8	4.7	416.4	4.0	-	2,620.8
Upland	5,728.6	865.9	3,059.5	18.2	308.5	79.6	-	10,060.3
No HGM Total Area	6,509.9	987.5	4,352.3	22.9	725.0	83.6	0.0	12,681.1
Grand Total Area (acres)	18,184.1	1,811.1	34,627.9	245.5	15,988.3	8,480.3	296.5	79,633.8

*Acreages presented in the Arctic Tundra Ecoregion include the Rev B Prudhoe to Point Thomson corridor.

Waterbody crossings occurring along the Project Rev B centerline are presented in Table 3-6, organized by ecoregion and HUC 8 Sub-basin name. A total of 1,344 tidal, intermittent, lower perennial, and upper perennial stream and river crossings were mapped within the approximately 804 mile length of the Project route.

Table 3-6. Preliminary Stream Crossings, Along the Project Route, by Ecoregion


Ecoregion/HUC 8 Name	Total Number of Streams by Stream Classification			
	Tidal (R1) Crossing	Lower Perennial (R2) Crossing	Upper Perennial (R3) Crossing	Intermittent (R4) Crossing
Alaska Range Transition Ecoregion				
Upper Kenai Peninsula	1	0	0	7
Redoubt-Trading Bays	0	3	9	27
Lower Susitna River	0	10	23	98
Yentna River	0	1	0	4
Chulitna River	0	3	59	86
Nenana River	0	0	57	66
Intermontane Boreal Ecoregion				
Nenana River	0	5	35	53
Lower Tanana River	0	2	0	0
Tolovana River	0	8	4	77
Ramparts	0	2	11	198
Yukon Flats	0	0	1	17
Kanuti River	0	0	2	11
South Fork Koyukuk River	0	0	15	44
Upper Koyukuk River	0	0	0	10
Arctic Tundra Ecoregion				
Upper Koyukuk River	0	0	32	94
Middle Fork-North Fork Chandalar Rivers	0	0	10	13
Sagavanirktok River	1	11	32	138
Lower Colville River	0	0	0	1
Kuparuk River	2	5	1	21
Mikkelsen Bay	0	11	0	21
Canning River	0	2	0	0
Total:	4	63	291	986
Grand Total:	1,344			

3.3 NEXT STEPS

Any changes or additions to the Rev B Project corridor or off-ROW areas made after the 2015 field season will be reviewed and field verified if necessary in 2016. Off-ROW areas presented in this report include areas added to the route prior to September 9, 2015, but not all of the areas added have been field verified. A total of 100 field targets located in off-ROW areas are planned for field verification in 2016.


4.0 ACRONYMS AND ABBREVIATIONS

ASA	Aquatic Site Assessment
CFR	Code of Federal Regulations
DP	Determination Point
FAC	Facultative
FACU	Facultative upland
FACW	Facultative wetland
FERC	Federal Energy Regulatory Commission
FT	Field Target
GIS	Geographic Information System
GPS	Global Positioning System
GTP	Gas Treatment Plant
HGM	Hydrogeomorphic
HUC	Hydrologic Unit Code
LNG	Liquefied Natural Gas
MP	Milepost
MSB	Matanuska Susitna Borough
NRCS	National Resources Conservation Service
NTCHS	National Technical Committee for Hydric Soils
NWI	National Wetland Inventory
OBL	Obligate wetland
OP	Observation Point
Project	Alaska LNG
PBU	Prudhoe Bay Unit
PEM	Palustrine emergent
PFO	Palustrine forested
PSS	Palustrine scrub shrub
PTU	Point Thompson Unit
QA/QC	Quality Assurance/Quality Control
Rev	Revision
ROW	Right-of-Way
TNW	Traditional Navigable Water
U.S.	United States
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDF	Wetland Determination Form

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0
		PAGE 32 OF 35

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	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0
		PAGE 33 OF 35

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		PAGE 34 OF 35

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	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0
		PAGE 35 OF 35

6.0 APPENDICES

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0

APPENDIX A – 2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS



2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS

USAI-UR-SPFLD-00-000002-000

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	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0
		PAGE i OF iii

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	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0
		PAGE iii OF iii


TABLE OF CONTENTS

1.0	PURPOSE AND SCOPE.....	1
1.1	PROJECT DESCRIPTION	1
2.0	INTRODUCTION.....	3
2.1	OBJECTIVES.....	3
2.2	PROJECT AREA.....	3
3.0	METHODS.....	5
3.1	OVERVIEW.....	5
3.2	WETLAND PRE-MAPPING.....	5
3.3	FIELD TARGET SELECTION.....	6
3.4	WETLAND FIELD DATA COLLECTION.....	7
3.5	MAP REVISIONS.....	7
3.6	WETLAND FUNCTIONAL ASSESSMENT.....	8
3.7	JURISDICTIONAL DETERMINATION.....	9
3.8	DATA RECORDING AND PROCESSING	9
3.9	QUALITY ASSURANCE / QUALITY CONTROL.....	9
3.10	REPORTING	10
4.0	FIELD STUDIES EXECUTION.....	11
5.0	ACRONYMS AND ABBREVIATIONS	12
6.0	REFERENCES.....	13
7.0	APPENDICES.....	15
	Appendix A – Wetland Determination Data Form – Alaska Region	
	Appendix B – Wetland Survey Gear List	
	Appendix C – QA/QA Checklist	

LIST OF FIGURES

Figure 1: Proposed Alaska LNG Route Rev B Alignment (Released 2/25/15).....	2
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Note – All pipeline routing and/or facility siting information described in this document should be considered preliminary and subject to change.

	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0
		PAGE 1 OF 15

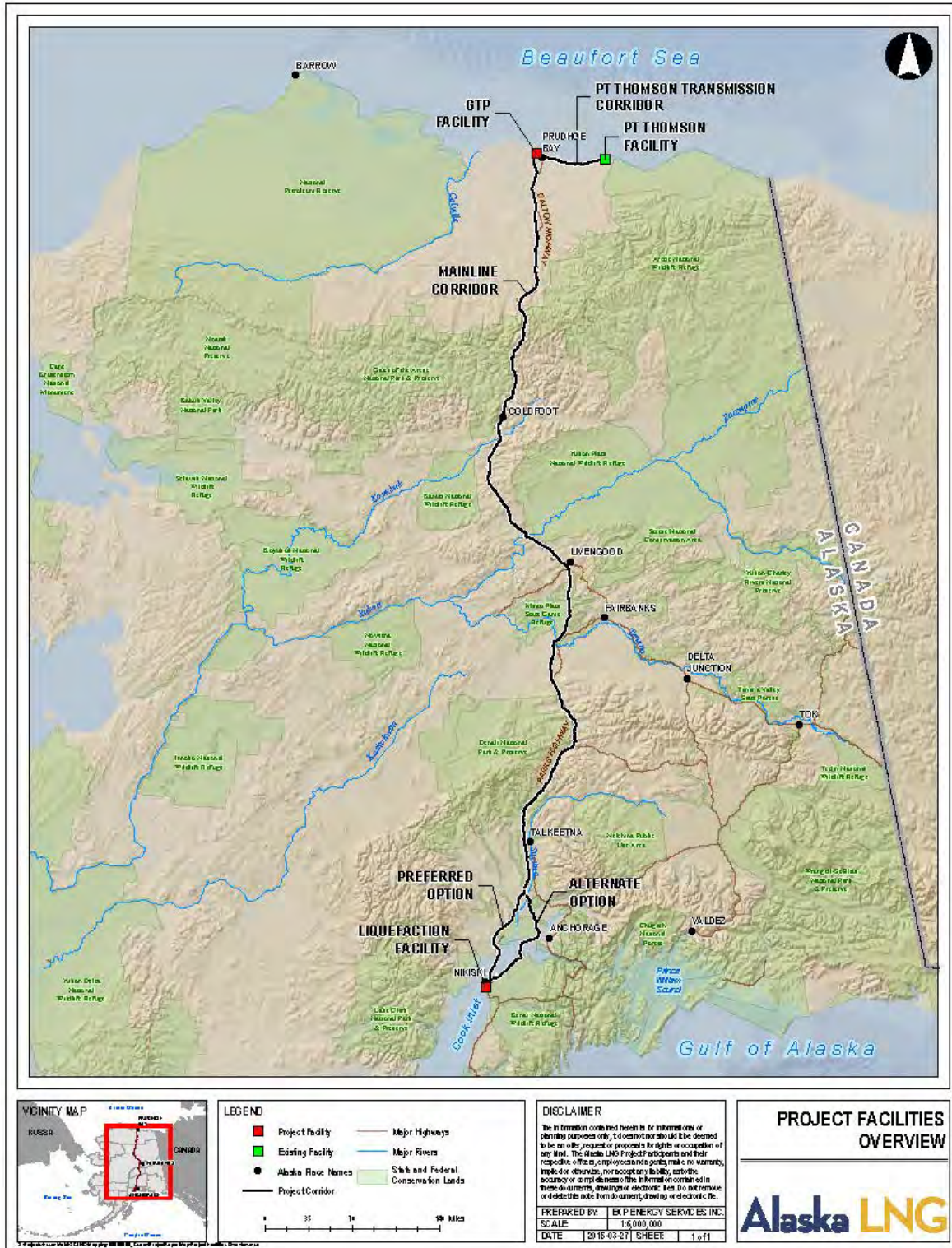
1.0 PURPOSE AND SCOPE


1.1 PROJECT DESCRIPTION

The Alaska Gasline Development Corporation, BP Alaska LNG LLC, ConocoPhillips Alaska LNG Company, ExxonMobil Alaska LNG LLC, and TransCanada Alaska Midstream LP (Applicants) plan to construct one integrated LNG Project (Project) with interdependent facilities for the purpose of liquefying supplies of natural gas from Alaska, in particular the Point Thomson Unit (PTU) and Prudhoe Bay Unit (PBU) production fields on the Alaska North Slope (North Slope), for export in foreign commerce and opportunity for in-state deliveries of natural gas.

The Natural Gas Act (NGA), 15 U.S.C. § 717a(11) (2006), and FERC regulations, 18 C.F.R. § 153.2(d) (2014), define “LNG terminal” to include “all natural gas facilities located onshore or in State waters that are used to receive, unload, load, store, transport, gasify, liquefy, or process natural gas that is ... exported to a foreign country from the United States.” With respect to this Project, the “LNG terminal” includes the following: a liquefaction facility (Liquefaction Facility) in Southcentral Alaska; an approximately 800-mile, large diameter gas pipeline (Mainline); a gas treatment plant (GTP) on the North Slope; a gas transmission line connecting the GTP to the PTU gas production facility (PTU Gas Transmission Line or PTTL); and a gas transmission line connecting the GTP to the PBU gas production facility (PBU Gas Transmission Line or PBTL). All of these facilities are essential to export natural gas in foreign commerce.

Figure 1: Proposed Alaska LNG Route Rev B Alignment (Released 2/25/15)



	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0
		PAGE 3 OF 15

2.0 INTRODUCTION

Wetland determination surveys will be conducted for Alaska LNG to verify the pre-field mapping wetland types and boundaries of all waters of the United States (U.S.), including wetlands, within the defined corridor and in specific areas along the Project route. The 2015 field surveys will focus on rerouted sections of the Rev B alignment as well as previously unmapped or field verified areas where aerial imagery has recently been acquired. Field targets are anticipated along the entire length of the project route from Prudhoe Bay to Nikiski, Alaska.

All waters of the U.S. are regulated by the U.S. Army Corp of Engineers (USACE) under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. All projects, as part of the Section 404 permitting process, must avoid impacts to wetlands wherever possible, minimize impacts to wetlands to the maximum extent practicable, and compensate for all unavoidable wetland impacts.

Results of the wetland surveys will facilitate the eventual evaluation of project-related direct, indirect, and cumulative impacts under the Federal Energy Regulatory Commission (FERC) Resource Report 2 (Water Use and Quality), the National Environmental Policy Act (NEPA), and Section 404 and Section 10 permits administered by the USACE.

This document presents the wetland determination field survey protocols that will be used during the 2015 field season. It discusses the protocols used in both the field and office for delineating the boundaries of areas that are regulated by USACE and may be impacted by the proposed project.

2.1 OBJECTIVES

The main objectives for the Alaska LNG 2015 wetland field season are:

- Complete wetland surveys in the vicinity of the pre-selected field targets;
- Collect data at field-selected observation points and at additional wetland determination points where necessary to adequately update the field maps; and
- Update the pre-field wetland mapping based on results of the field data.

2.2 PROJECT AREA

The Alaska LNG route passes through three ecoregions with nine sub-ecoregions, as described by Nowacki et al. (2001). Ecoregions are defined as a unit of land or water with a geographically distinct compilation of species, communities, and environmental conditions.

- Arctic Tundra Ecoregion
 - Beaufort Coastal Plain Sub-Ecoregion (milepost [MP] 0 to 62) (PMP MP 0 to 58)
 - Brooks Foothills Sub-Ecoregion (MP 62 to 143)
 - Brooks Range Sub-Ecoregion (MP 143 to 252)
- Intermontane Boreal Ecoregion
 - Kobuk Ridges and Valleys (MP 252 to 257)
 - Ray Mountains Sub-Ecoregion (MP 257 to 430)
 - Tanana-Kuskokwim Lowlands Sub-Ecoregion (MP 430 to 443; 455 to 517)
 - Yukon-Tanana Uplands Sub-Ecoregion (MP 443 to 455)

	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0
		PAGE 4 OF 15

- Alaska Range Transition Ecoregion
 - Alaska Range Sub-Ecoregion (MP 517 to 616)
 - Cook Inlet Basin Sub-Ecoregion (MP 616 to 804)


The Alaska LNG corridor crosses the Beaufort Coastal Plain Sub-Ecoregion along the Point Thomson Pipeline route and the northern portion of Alaska Mainline south of Prudhoe Bay. The route then traverses the Brooks Foothills Sub-Ecoregion before it winds through the Brooks Range Sub-Ecoregion. South of the Brooks Range, the route crossed into the Intermontane Boreal Ecoregion, where it briefly traverses the Kobuk Ridges and Valleys Sub-Ecoregion; before entering into the Ray Mountains Sub-Ecoregion, continues south and passes through the Tanana-Kuskokwim Lowlands, briefly passing through the Yukon-Tanana Uplands to the Alaska Range Sub-Ecoregion. South of the Alaska Range, the route traverses through the very large Cook Inlet Basin Sub-Ecoregion south to its terminus at the LNG Facility at Nikiski, on the Kenai Peninsula.

The wetlands survey area for the Project is divided into two corridors: A wetland mapping corridor and a field survey corridor. The mapping corridor has been preliminarily established as a 2,000 foot corridor (1,000 feet on either side of the proposed alignment centerline). This mapping corridor width may be modified, with the approval of USACE, to exclude terrain features such as steep mountain slopes or lands on the far side of rivers, which are not under consideration for use. All wetlands and waterbodies will be mapped within the mapping corridor using aerial photograph interpretation. The smaller field survey corridor is 300-feet-wide (150-feet on each side of the proposed alignment centerline) and centered within the mapping corridor. Field work will be concentrated within the field survey corridor, ensuring that the wetland field work occurs near areas most likely to be disturbed by the proposed project.

The Alaska LNG field survey area is divided into eight geographic spreads for planning purposes:

- Point Thomson to Prudhoe Bay, PT Pipeline MP 0-58
- Prudhoe Bay to Atigun Pass, MP 0-170
- Atigun Pass to Yukon River, MP 170-358
- Yukon River to Livengood, MP 358-401
- Livengood to Healy, MP 401-525
- Healy to Trapper Creek, MP 525-665
- Trapper Creek to Cook Inlet, MP 665-764
- Cook Inlet to Nikiski, MP 764-804

The 2015 field season will focus on areas along the Project route from Prudhoe Bay to Nikiski, Alaska.

	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0
		PAGE 5 OF 15

3.0 METHODS

3.1 OVERVIEW

The USACE defines wetlands as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.” Wetlands are considered jurisdictional “if the wetland, either alone or in combination with similarly situated lands in the region, significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as ‘navigable.’” (Rapanos v. United States and Carabell v. United States [33 U.S. Code §1251 et seq.]) (Stonestreet et al. 2009). Other non-wetland waters of the U.S. under the jurisdiction of the USACE include deepwater aquatic habitats, unvegetated ponds, river channels, and other special aquatic sites as described by the USACE. Uplands are non-wetland areas that are neither deepwater aquatic habitats, nor other special aquatic sites.

All wetlands and other waters of the U.S. in the preliminary Alaska LNG corridor will be delineated and classified using standard National Wetland Inventory (NWI) codes as described in Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979). Cowardin classifies wetlands and aquatic habitats by system, subsystem, class, subclass, and water regime and is based on hydrologic setting (riverine, lacustrine, estuarine, palustrine), vegetation structure (forested, scrub-shrub, emergent, aquatic bed), and water regime (saturated, temporarily flooded, seasonally flooded, semi-permanently flooded, etc.).


One deviation from standard NWI protocols for this project will be the use of two non-wetland categories. One category will include all vegetated uplands. The other will be labeled “Disturbed/Fill” and include uplands that have been impacted by human development, including all roads, gravel pads, buildings, and farmland.

Standard methods are used to delineate wetlands for large linear projects in Alaska. The protocols comprise a three-phased iterative approach, including: 1) wetland pre-mapping relying primarily on aerial photo interpretation; 2) collection of ground reference data at pre-determined field targets; and 3) revision of wetland pre-mapping based on results of field efforts.

3.2 WETLAND PRE-MAPPING

The wetland pre-mapping has been completed for the preliminary Alaska LNG route corridor. Wetland boundaries were delineated on digital ortho-rectified and geo-referenced true color aerial photography with 1.6-foot pixel resolution using the following aerial imagery:

- BP Exploration Alaska Inc. aerial imagery for Prudhoe Bay, Endicott, and Badami (1.0-foot pixel resolution; July 2012) (BPX 2012a, BPX 2012b, BPX 2012c);
- ExxonMobil aerial imagery for Point Thomson (2.0 and 0.5-foot pixel resolution; July 2001/2006, and July 2009) (ExxonMobil 2001-6, ExxonMobil 2009a);
- ExxonMobil aerial imagery for the Alaska Pipeline Project (0.5-meter pixel resolution; summer 2008, 2009, 2010, and 2011) (ExxonMobil 2008, ExxonMobil 2009b, ExxonMobil 2011);
- Healy Area Orthophoto (U.S. Census Bureau 2006);
- Digital Orthophoto Quarter Quadrangles - Anderson Area (Natural Resources Conservation Service [NRCS] 2006);
- Northern Central Corridor Ortho Mosaic (Digital Globe 2013a);

	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0
		PAGE 6 OF 15

- Southern Corridor Ortho Mosaic (Digital Globe 2013b);
- Talkeetna Aerial Orthophoto (Matanuska Susitna Borough [MSB] 2011a);
- Caswell Aerial Orthophoto (MSB 2011b);
- Willow Aerial Orthophoto (MSB 2011c);
- Point MacKenzie Aerial Orthophoto (MSB 2011d); and
- Nikiski Area Aerial Orthophoto (Kenai Peninsula Borough 2006).

Data from the following sources was also used during the mapping process:

- U.S. Fish and Wildlife Service (USFWS) NWI digital datasets and hardcopy maps;
- NRCS Soil Survey digital datasets and hardcopy maps;
- Light Detection and Ranging generated topographic contours (TransCanada 2011, MSB 2011e);
- Kenai Watershed Forum – Cook Inlet Wetlands for the Kenai Peninsula and the Matanuska Susitna Boroughs (Gracz 2011);
- Pertinent previous studies, such as Terrestrial and Aquatic Habitat Mapping Along the Alaska Natural Gas Pipeline System (USFWS 1980), the Denali Pipeline Project, the instate Alaska Stand Alone Pipeline Project, and the Alaska Pipeline Project;
- U.S. Geological Survey Digital Raster Graphics (e.g., topographic maps);
- Existing Geographic Information System (GIS) layers including waterbodies, contours, and roads; and
- Existing Land Status GIS layers including: State of Alaska, U.S. Bureau of Land Management, and Native allotments.

All wetland mapping was created in a GIS geodatabase, using a “heads-up” digitizing effort. This “heads-up” process applies aerial image interpretation to delineate vector polygons of ground features. This is the generally accepted wetland and deepwater habitat mapping technique employed by the U.S. Fish and Wildlife Service personnel as part of the NWI program (Dahl et al. 2009). Data sources were overlaid on aerial photography and wetland, non-wetland, and areas of uncertain wetland status were identified by interpreting color, texture, and landscape position, among other elements. Aerial photography clues can include dwarf or stunted trees, topography characteristics (such as swales, toe slopes, and depressions), and obvious signs of inundation.

All wetlands were mapped at a scale of 1:2,400 (1 inch to 200 feet) or finer. Lakes, ponds and rivers were mapped at a scale of 1:1,200 (1 inch to 100 feet). Larger rivers and streams were delineated as polygons. Smaller streams, those with bankfull widths of approximately 10 feet or less, were mapped as vector lines.

3.3 FIELD TARGET SELECTION

Field targets were selected from the pre-mapping based on changes in the wetlands types, aerial vegetation signatures, NWI classification, and NRCS soil classification. The primary focus of the pre-selected field targets will be to characterize specific wetland types which represent all similar wetland types in the region and to identify wetland/upland boundaries by selecting paired plots. Field targets will be used to confirm areas where wetland subject matter experts have high confidence in their aerial interpretation, and will be used to confirm or correct wetland boundary locations. Field targets were also placed in low-confidence areas to provide field data where the photo signatures or landscape features were not clearly indicative of wetland or upland. The USACE may want to review and approve the 2015 field target locations that are selected to ensure that an appropriate range of representative wetlands are sampled.

	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0
		PAGE 7 OF 15

Field targets may be re-evaluated based on the status of land access permissions. When necessary, new field targets will be located on nearby accessible parcels in areas with similar aerial photography vegetation signatures and site conditions as the original field targets.

3.4 WETLAND FIELD DATA COLLECTION

Wetland determinations will be made using the USACE *Wetlands Delineation Manual* (1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region* (Regional Supplement) (2007a).

In order for an area to be identified as a wetland, the following three parameters must be present:

1. Hydrophytic vegetation: The prevalent vegetation must be adapted to areas of saturated or inundated soils.
2. Hydric soils: The soil must be classified as hydric or possess characteristics that are associated with reducing soil conditions.
3. Wetland hydrology: The area must be inundated or saturated at some time during the growing season.

Field targets will be accessed via existing highways and secondary roads where available. A helicopter will be required to access remote sites. A Global Positioning System (GPS) device will be used to locate sites and to collect coordinates. At each field target, a USACE *Wetland Determination Data Form – Alaska Region* (**Appendix A**) will be used to determine if the site is a wetland, other water of the U.S., or upland. All wetlands and waterbodies will be delineated and classified using NWI codes. The GPS device will also be used to collect limited field data on an electronic form that will be developed for the project.


Field crews will also collect qualitative wetland data at observation points and establish additional field targets and complete *Wetland Determination Data Forms* where necessary, and will not be limited by the pre-selected field targets. The field crews will identify changes in wetland types or wetland/upland boundaries not easily identified on the aerial photography. Wetland scientists will use their best professional judgment and collect appropriate field data to adequately revise the wetland pre-mapping. A detailed wetland field survey gear list is provided in **Appendix B**.

3.5 MAP REVISIONS

As wetlands field data (i.e., GPS data, Wetland Determination Forms, Vegetation Classification Forms for upland sites, site photographs, logbooks, field maps) becomes available, the field data will be downloaded in the office and plotted on the base maps of the route. The location of each plot will be attributed with the information collected in the field. This allows the creation of a reference dataset linking an aerial photography signature to a wetland status and vegetation type. This reference dataset will be used to finalize the mapping of the 2,000-foot corridor which could include adjusting boundaries and wetland classifications such as hydrogeomorphic (HGM) and Cowardin codes.

Generally, the wetland pre-mapping revision process involves:

- Exporting spatial data for all field targets and photo points from the Alaska LNG database;
- Compiling electronic copies of all notes, sketches, and photographs associated with above points; and
- Using this data in a GIS platform to update files through heads-up digitizing, or modifying the initial map on screen as described in Section 3.2 of the Wetland Determination Field Survey Protocols.

	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0
		PAGE 8 OF 15


3.6 WETLAND FUNCTIONAL ASSESSMENT

Wetlands are known to provide a variety of ecological functions depending on the location and type of wetland. At sites determined to be wetland, functional assessment data (**Appendix A**) will be collected. Information from this data sheet will be incorporated into the functional models described in *A Rapid Procedure for Assessing Wetland Functional Capacity* (Magee and Hollands 1998). Magee and Hollands have identified five HGM classes of wetland that occur in Alaska.

1. Depressional wetlands: Depressional wetlands occur in a topographic depression. Predominant water sources are direct precipitation, surface water runoff, and groundwater (Brinson 1976).
2. Slope wetlands: Slope wetlands generally occur on a hillside and water flow is predominantly unidirectional parallel to the slope. The water source is primarily groundwater and occasionally precipitation (Brinson 1976).
3. Lacustrine fringe wetlands: A lacustrine fringe wetland borders a lake and lacks any topographic features. The water source is surface water and flow is bidirectional.
4. Flat wetlands: There are two types of flats wetlands: organic and mineral flats. Flat wetlands in Alaska are primarily organic flats. Organic flats “can occur on relatively gentle to moderate slopes up to 20% in steepness. In relatively undisturbed conditions and without significant human alteration, the dominant hydrodynamics are vertical, even on relatively gentle to moderate slopes (i.e., slopes < 20%). Specifically, the main hydrologic input to wetlands within the organic soil flat class in interior Alaska is precipitation” (ADEC/USACE 1999).
5. Riverine wetlands: Riverine wetlands are adjacent to rivers and are dominated by overbank flooding. Water flow is bidirectional locally with an overall regional flow down the river valley.

Magee and Hollands use these HGM classes to compare the functions of wetlands within a particular HGM class. Each HGM class represents a separate functional model, which is used to define the Functional Capacity Index (FCI) of eight functions. The eight functions identified by Magee and Hollands are listed below.

1. Modification of groundwater discharge: The capacity of a wetland to influence the amount of water moving from the groundwater to surface water.
2. Modification of groundwater recharge: The capacity of a wetland to influence the amount of water moving from surface water to groundwater.
3. Storm and flood-water storage: The storage of inflowing water from storm or flooding events, resulting in detention and retention of water on the wetland surface.
4. Modification of stream flow: The modification of inflow hydrology by the wetland to produce the outlet stream’s hydrology.
5. Modification of water quality: Removal of suspended and dissolved solids from surface water and dissolved solids from groundwater and conversion into other forms, plant or animal biomass, or gases. Wetlands with a low slope-angle or location in depressions provide a high level of this function.
6. Export of detritus: Export of organic detritus from the wetland to adjacent and downstream aquatic ecosystems.
7. Contribution to abundance and diversity of wetland vegetation: The capacity of a wetland to produce an abundance and diversity of hydrophytic plant species individually or as part of a group of wetlands in a local landscape (Tiner 1984).
8. Contribution to abundance and diversity of wetland fauna: The capacity of a wetland to support large and/or diverse populations of animal species that spend part or all of their lifecycle in wetlands, individually, or as part of a mosaic of wetlands in a local landscape.

	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0
		PAGE 9 OF 15

The Magee and Hollands's functional assessment method requires site-specific information to be entered into a model that will produce a FCI for each wetland function. The FCI indicates the potential degree to which the wetland performs the function and is only comparable to other wetlands within the same HGM class and region. The FCI scale is from 0.0 to 1.0. Most of the model inputs will be collected in the field, with the remaining variables taken from available GIS datasets (such as wetland size and land ownership). The results from the functional assessment models will be extrapolated to the applicable wetlands within the mapping corridor. This information will potentially serve as the basis to determine appropriate compensatory mitigation for the unavoidable impacts of the project. Wetland functional assessment data will be reported in 2016, after all field data is collected. The Wetland Determination Data Form (**Appendix A**) will be reviewed and adjusted as necessary to collect appropriate functional assessment data for the different ecoregions.

3.7 JURISDICTIONAL DETERMINATION

USACE regulates wetlands and other waters of the U.S. that are under their jurisdiction. Jurisdictional status is based on connectivity to Traditional Navigable Waters (*Rapanos v. United States* and *Carabell v. United States* [33 U.S. Code §1251 et seq.]). Field visits by USACE, the Federal Energy Regulatory Commission, the Environmental Protection Agency, and the Owner's Representative could also be conducted (with minimal notice) to observe field survey teams while they are conducting wetland delineations, and to review protocols and any data collected.

The project, similar to other large pipeline and energy projects permitted by the USACE, will assume that all wetlands found fall under USACE jurisdiction. Because the FERC requires that the Project adhere to certain construction requirements in all wetlands, regardless of jurisdiction, the Project will assume that all wetlands found will be within the USACE jurisdiction for permitting, mitigation, and construction method purposes.

3.8 DATA RECORDING AND PROCESSING

Data will be recorded on hardcopy field forms (**Appendix A**), and some of the data will be entered into an electronic data form. Electronic data files will be uploaded to a project website through an internet connection or by a satellite link, and will include GPS locations, electronic data form, site photos, site sketches, and field notes.

3.9 QUALITY ASSURANCE / QUALITY CONTROL

The wetlands technical lead will conduct quality audits during the first week of each deployment. These audits will ensure data quality and consistency between teams, and will provide an opportunity for any problems to be corrected immediately.

Each crew member is responsible for collecting clear and accurate data according to the sampling protocol. The field crew chief will review all hardcopy and electronic data forms and complete a quality assurance/quality control (QA/QC) checklist (**Appendix C**) before leaving each site.

The field crew manager will ensure that all data files, hardcopy and electronic, are uploaded to the Project website. These transmitted files will then be downloaded and reviewed by office-based data management staff. The wetlands technical lead will check each hardcopy data sheet and electronic data form for quality and consistency, as it is received. If problems arise, the field crew will be notified promptly to ensure that any data quality issues are corrected immediately.

Wetland mapping will be reviewed by experienced wetland scientists both after the initial pre-mapping, and after map revisions are complete.


	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0
		PAGE 10 OF 15

3.10 REPORTING

The results of the 2015 field work will be compiled into a field survey report at the end of the season. The report will include a GIS dataset comprised of field-verified wetland mapping, field sample locations, and data collected at each site. It will also outline the field survey methods and identify all wetland types found throughout the corridor describing common plant species, hydrology indicators, and hydric soil indicators.


After all wetland field data is finalized, a report on the Wetland Functional Assessment for all wetlands surveyed will be provided. The Wetland Functional Assessment will be submitted to USACE for review and concurrence. Once USACE concurs, the wetland boundaries delineated will be used to calculate project impacts for Section 404 permitting. The Wetland Functional Assessment will help USACE characterize the impacted wetlands to determine appropriate compensatory mitigation for the unavoidable project impacts to wetlands and other waters of the U.S.

Results of this survey will be provided in the FERC Resource Report 2.

	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0
		PAGE 11 OF 15

4.0 FIELD STUDIES EXECUTION

Field study execution details are currently in the process of being developed and will include: field crew composition, schedule and march charts, field target maps, and general project-wide permits and approvals. Field safety will also be discussed and a specific Job Safety Analysis (JSA) developed for wetland surveys will be included.

	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0
		PAGE 12 OF 15


5.0 ACRONYMS AND ABBREVIATIONS

FCI	Functional Capacity Index
FERC	Federal Energy Regulatory Commission
GIS	Geographic Information System
GPS	Global Positioning System
GTP	Gas Treatment Plant
HGM	hydrogeomorphic
JSA	Job Safety Analysis
LNG	liquefied natural gas
MP	milepost
MSB	Matanuska Susitna Borough
NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
PBU	Prudhoe Bay Unit
PTU	Point Thomson Unit
U.S.	United States
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0
		PAGE 13 OF 15

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	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0
		PAGE 14 OF 15

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	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0
		PAGE 15 OF 15

7.0 APPENDICES

	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0

APPENDIX A – WETLAND DETERMINATION DATA FORM – ALASKA REGION

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input type="checkbox"/>		Field Target: <input type="checkbox"/>	Map #: <input type="text"/> Map Date: <input type="text"/>
Date: <input type="text"/>	Project Name & No.: Alaska LNG 26221163		Feature Id: <input type="text"/>
Investigators: <input type="text"/>			Team No.: <input type="text"/>
State: Alaska	Region: Alaska	Milepost: <input type="text"/>	
Latitude: <input type="text"/>	Longitude: <input type="text"/>	Datum: <input type="text"/>	
Logbook No.: <input type="text"/>	Logbook Page No.: <input type="text"/>	Picture No.: <input type="text"/>	
SITE PARAMETERS			
Subregion: <input type="text"/>		Landform (hillslope, terrace, hummocks, etc.): <input type="text"/>	
Slope (%): <input type="text"/>		Local relief (concave, convex, none): <input type="text"/>	
Pre-mapped Alaska LNG/NWI classification: <input type="text"/>		Soil Map Unit Name: <input type="text"/>	
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input type="checkbox"/> No <input type="checkbox"/> (if no explain in Notes)		Are "Normal Circumstances" present? Yes <input type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)	
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Significantly Disturbed?		No <input type="checkbox"/> (If yes, explain in Notes)	
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Naturally Problematic?		No <input type="checkbox"/> (If yes, explain in Notes.)	
SUMMARY OF FINDINGS			
Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input type="checkbox"/>		Wetland Type: <input type="text"/>	
Hydric Soil Present? Yes <input type="checkbox"/> No <input type="checkbox"/>		Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input type="checkbox"/>	
Wetland Hydrology Present? Yes <input type="checkbox"/> No <input type="checkbox"/>			
<p>Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.</p> <div style="height: 200px; border: 1px solid black;"></div>			

	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
<u>Tree Stratum</u> (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: _____ (A) Total Number of Dominant Species Across All Strata: _____ (B) % Dominant Species that are OBL, FACW, or FAC: _____ (A/B)
1.				
2.				
3.				
4.				
Total Cover: _____ 50% of total cover: _____ 20% of total cover: _____				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species: _____ X 1 = _____ FACW species: _____ X 2 = _____ FAC species: _____ X 3 = _____ FACU species: _____ X 4 = _____ UPL species: _____ X 5 = _____ Column Totals: _____ (A) _____ (B) PI = B/A = _____
<u>Sapling/Shrub Stratum</u> (_____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
Total Cover: _____ 50% of total cover: _____ 20% of total cover: _____				

VEGETATION (use scientific names of plants)				
<u>Herb Stratum</u> (_____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Hydrophytic Vegetation Indicators: _____ Dominance Test is > 50% _____ Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
Total Cover: _____ 50% of total cover: _____ 20% of total cover: _____				_____ % Bare Ground _____ % Cover of Wetland Bryophytes _____ Total Cover of Bryophytes _____ % Cover of Water Hydrophytic Vegetation Present (Y/N): _____ Notes: (If observed, list morphological adaptations below)

WETLAND DETERMINATION DATA FORM

SOIL		Data		Feature ID		Soil Pit Required (Y/N)		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Notes
	Color (moist)	%	Color (moist)	%				
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ² Location: PL=Pore Lining, M=Matrix.								
HYDRIC SOIL INDICATORS						INDICATORS FOR PROBLEMATIC HYDRIC SOILS³		
Histosol or Histel (A1) _____			Alaska Redox (A14) _____			Alaska Color Change (TA4) ⁴ _____		
Histic Epipedon (A2) _____			Alaska Gleyed Pores (A15) _____			Alaska Alpine Swales (TA5) _____		
Hydrogen Sulfide (A4) _____						Alaska Redox with 2.5Y Hue _____		
Thick Dark Surface (A12) _____						Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____		
Alaska Gleyed (A13) _____						Other (Explain in Notes) _____		
³ One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic. ⁴ Give details of color change in Notes.								
Restrictive Layer (if present): Type: _____ Depth (inches): _____								
Hydric Soil Present (Y/N): _____								
Notes: _____								


HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Mud Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			
Surface Water Present (Y/N): _____		Depth (in): _____	
Water Table Present (Y/N): _____		Depth (in): _____	
Saturation Present (Y/N): (includes capillary fringe)		Depth (in): _____	
Notes: _____			
Wetland Hydrology Present (Y/N): _____			

WETLAND DETERMINATION DATA FORM


VEGETATION VARIABLES	
P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____	
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (>1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____	
Number of Wetland Types (M): _____	Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____	
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ N/A _____	
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____	
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____	
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches, Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____	
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____	
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____	
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____	
SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol: Fibric _____ Histosol: Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	
HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (8in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	
LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:


GPS Technician QA/QC check:

	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0


APPENDIX B – WETLAND SURVEY GEAR LIST

	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0

Wetland and Vegetation Gear	Communication
1 - Sharp shooter shovel (fiberglass, not wood handle)	1 - VHF Radio
1 - U-Dig-it (Hand shovel)	1 - charger for vhf radio
1 - Compass	1 - Iridium Satellite Phone
1 - Hand lens	1 - charger for satellite phone
1 - Leatherman/sample knife (folding) 4" serrated	Safety/Survival Pack (Need for 2 teams)
1 - Digital camera	2 - Sleeping Bags
1 - calculator	1 - Tent
1 - extra batteries for digital camera	1 - Wilderness First Aid Kit
1 - pH meter (pen kind) with storage solution	1 - Flare gun kit
1 - Pocket rod (measuring tape)	1 - Emergency procedures Manual
1 - Opaque small spray bottle filled with alpha-alpha dipyridyl	1 - Iodine Tablets/Filter
2 - packages – gallon Ziploc bags	1 - 50' Nylon Rope/Parachute cord
1 - package- pint Ziploc bags	1 - small Flashlight/headlamp (for soil pit)
Squirt Water bottle (for moistening soil to color)	2 - Space Blankets
200+ - USACE Wetland Determination Form – Alaska Region (on Rite-in-the-Rain) with functional assessment	1 - Bear Spray
1 set - Field Maps on Rite-in-the-Rain	1 - Tarp (10' x 12')
4+ - Rite-in-the-Rain Field notebooks (spiral with lines)	1 - Gloves – Work/Latex/Insulated rubber
12+ - Mechanical Pencils w/ extra lead	matches
12+ - Sharpies (red and black)	1 - Roll of duct tape
1 - Laptop Computer (for downloading data every night)	Flagging tape (1 bright color per team)
2 - Clipboards	BPA-free water jug
Extra Rite-in-the-Rain paper	Personal Gear
1 - 12 inch file (for shovel sharpening) with handle	1 - Xtratuffs
1 - scissors	1 - Felt insoles for Xtratuffs
1 - tape	1 - Blaze Orange Surveyor Field Vest
2 - post it notes	1 - Mosquito Head Net
2 - toilet paper	1 - Rain Jacket/Pants
1 - Roll of duct tape	2 - Bug Spray
1 - (see through) small dry bag for soil kit	2 - Sunblock
1 – (see through) medium dry bag for field reference materials	1 - Sun Glasses
1 – dry erase board (for pictures)	1 - Water Bottle
1 – plant press	1 - Backpack
Books	1 - Hat
1 - Munsell Soil Color charts	Cell phone and charger
1 - Flora of Alaska and Neighboring Territories – Eric Hulten	1 - umbrella
1 - Trees and Shrubs – Viereck	Boot dryers
1 - Western Boreal Forest and Aspen Parkland – MacKinnon and Pojar	
1 - Wetland Sedges of Alaska – Tande and Lipkin	
1 - Willows of Interior Alaska – Collett	
1 - National List of Plant Species that Occur in Wetlands – Alaska Region - Reed 1988 (print)	
1 - Field Guide to Alaskan Wildflowers – Verna Pratt	
1 - Wildflowers along the Alaskan Highway – Verna Pratt	
1 - Rapid Procedure for Assessing Wetland Functional Capacity: Based on HGM Classification – Hollands and Magee (print)	
1 - 1987 Wetland Delineation Manual (print)	
1 - 2007 Regional Supplement to the Corps of Engineers Wetland Delineation Manual – Alaska Region (print)	
1 - Classification of Wetlands and Deepwater Habitats – Cowardin (print)	
1 - Hydric soils in Alaska (print)	

	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0

APPENDIX C – QA/QA CHECKLIST

	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0

Wetland Determination Data Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: _____ Field Target: _____ Date: _____

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☐ Site description, site parameters and summary of findings are complete?
- ☐ A detailed site sketch is included?

2. Vegetation

- ☐ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☐ Vegetation names are entered legibly for all strata present?
- ☐ Cover calculations are complete and correct?
- ☐ All dominant species have been determined and recorded per strata?
- ☐ Indicator status is correct for each species?
- ☐ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☐ Soil profile is complete?
- ☐ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☐ Appropriate hydrology indicators are marked?
- ☐ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☐ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☐ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☐ Each logbook page is initialed and dated?

7. Maps

- ☐ Wetland boundaries have been corrected if necessary?
- ☐ Maps are initialed and dated?

	2015 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 APRIL 2015 REVISION: 0

8. Photos

- ☐ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Wetland Scientist (print)

X

Signature / Date

X


Field Crew Chief (print)

X

Signature / Date

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0

APPENDIX B – PROBLEMATIC SOILS

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0

1.1 PROBLEMATIC HYDRIC SOIL DETERMINATIONS

Few potentially problematic hydric soils were encountered within the study area. This section describes instances where problems may be encountered.

1.1.1 Low Chroma Soil Parent Material

Low chroma soil matrix colors inherited from parent materials are not uncommon in the study area. In many places in the project area, silty loess and coarse-loamy eolian deposits blanket hillsides and terraces, particularly in areas close to major rivers. Fine-textured silty loess develops into soil with relatively slow permeability and is susceptible to erosion (NRCS 2006). These soils tend to be inherently low chroma or light gray colored due to the properties of the parent material. Attention to soil horizons, landscape position, vegetation, macro and microtopography, and hydrology are needed to properly describe or classify these soils as hydric.

1.1.2 Unsaturated Thick Organic Surfaces (Folistic Epipedons)

In Interior Alaska, acidic near surface conditions, low evapotranspiration rates, and cold climate promote the formation of thick organic surfaces on imperfectly drained sites as well as well drained sites. Organic mat depths can also change rapidly over very short distances. A number of non-wetland field plots throughout the project area have organic horizons that range from 6 to 9 inches deep, while some may extend to 15 inches and more.

Black spruce forests on hillsides and higher landscape positions tend to have a dense cover of mosses, to include feather-mosses and sphagnum. In lower landscape positions sphagnum often dominates the bryophyte stratum, and the soils tend to be imperfectly drained and classified as hydric. On steeper slopes soils tend to be moderately well drained, and the feather-moss coverage tends to be much higher. On these higher hillslope positions, organic materials are more likely to be poorly decomposed (fibric) and often do not exhibit evidence of extended saturation characteristic of histic epipedons. These non-saturated thick organic surfaces are considered folistic epipedons and are not an indicator of a hydric soil (NRCS 2006).

In the example below (Figure B-1), a nine-inch organic mat showing no evidence of saturation has formed over low chroma silty loess parent material with a permafrost table at 16 inches. The soil has developed on a slightly convex interfluvium with a west aspect.


	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0

Figure B-1. A Nine-Inch Folistic Epipedon over Low Chroma Parent Material. Permafrost Table at 16 inches. West aspect; 5% Slope. (Field Site W84LH016).




Photo by Jennifer Anderson

1.1.3 Fire Affected Soils

Forest fire is an ecological factor that can have significant influence on soils in the study area—particularly in the Interior. The alteration of vegetation, hydrology and soil morphological characteristics can result in problematic wetland situations following a fire. By thinning or removing the insulating organic mat and vegetative cover, fire can significantly warm permafrost affected soils causing a thickening of the active layer and a drop in depth to permafrost. Where permafrost recedes following a fire, saturation may no longer occur within the upper part of the soil resulting in a drier soil moisture regime. This hydrological shift may effectively alter the wetland status of a site or make the identification of remaining hydric soil indicators problematic. The hydrological alteration may be permanent or, may be temporary if the permafrost table rises again in response to the reestablishment of vegetation and the insulating organic mat over time. Permafrost affected soils in warmer and drier landscape positions (southeast through southwest aspects) are most susceptible to significant changes in temperature and hydrology following a fire. Soils in colder and wetter landscape positions will often have higher soil moisture and be more resilient to major shifts in hydrology and permafrost dynamics following fire.

Common problems that may be encountered when identifying hydric soil indicators in fire affected areas include: the thinning or removal of histic epipedons; organic thicknesses of eight inches or more remain but saturation is absent or lessened in the upper part of the soil profile; and low chroma matrix colors and redoximorphic features persist but saturation is absent or lessened. Care must be taken in the delineation of fire affected areas and interpretation must be made in context with landscape position. The presence of charcoal in any soil is evidence of fire history and cause for close examination of all soil and hydrological properties.

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0

In the example below (Figure B-2), the 2005 North Bonanza Fire burned black spruce forest on a west facing slope. With seasonal frost observed at 22 inches, pronounced frost heaves, frost boils, and hummocky microtopography, this site has likely experience a subsidence of the permafrost table and subsequent loss of hydrological conditions necessary to support a wetland. The plant community hosts species commonly occurring at early successional sites following a forest fire as well as hydrophytes suggesting the plant community is transitioning from a wet phase toward a drier phase.


Figure B-2. A Field Site (formerly black spruce forest) Where the Permafrost Table may have Receded Following a Wildfire Possibly Changing the Wetland Status. 2005 North Bonanza Fire; West Aspect; 7% Slope (Field site W84AY026).



Photo by Abigail Fisher

1.1.4 Andic Parent Material

South of the Alaska Range volcanic ash becomes an increasingly common parent material in the Project area. Andic materials (volcanic ash and ejecta) have distinct chemical and morphological properties that can cause difficulties in the field identification of hydric soil indicators and aquic conditions. Andisols and andic materials in the project area tend to exhibit low bulk densities; dark, organic enriched surface horizons (umbric/mollic epipedons); and high-chroma matrix colors with hues of 10YR and redder, even in the wettest landscape positions. Andic materials contain significant quantities of vitreous material (volcanic glass) containing aluminum (Al), Silica (Si) and Iron (Fe) compounds in non-crystalline (amorphous) forms that may be largely insoluble and recalcitrant to reduction (McDaniel et al, SSSA, 1997). These amorphous Al and Fe compounds will also form chemical complexes with humic compounds (organic carbon) resulting in over thickened dark surfaces. The high organic content of these soils may mask redoximorphic features in some cases. In some areas, the influence of oxygenated shallow groundwater or periodic influxes of oxygen enriched precipitation may help foster oxyaquic conditions in these soils. Often, the only distinct indicator of hydric soils in these areas is the presence of a histic epipedon. This can be a problematic indicator because the depth of the organic mat can change significantly over very short distances.


	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0

In the example below (Figure B-3), an andisol has a high water table (2 inches) and reducing conditions (positive reaction to alpha alpha dipiridyl) but, shows no National Technical Committee on Hydric Soils (NTCHS) approved hydric soil indicators.

Figure B-3. Andic Soil Profile with High Watertable and Reducing Conditions Lacking Approved NTCHS Hydric Soil Indicators. (Field site W84TI014_OP)



Photo by Abigayle Fisher

	2015 WETLAND FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000002-000 DECEMBER 17, 2015 REVISION: 0

APPENDIX C – 2015 WETLAND FIELD DATA SUMMARY TABLE AND US ARMY CORPS OF ENGINEERS ALASKA DISTRICT WETLAND DETERMINATION FORMS

(Provided in a Digital Format)

ALASKA LNG PROJECT	DOCKET NO. CP17-____-000 RESOURCE REPORT NO. 2 APPENDIX G – WETLAND FIELD SURVEY REPORTS	DOC NO: USAI-EX-SRREG-00- 000004-000 DATE: APRIL 14, 2017 REVISION: 0
	PRIVILEGED AND CONFIDENTIAL	

**APPENDIX G.3 2016 WETLAND AND VEGETATION FIELD STUDY
REPORT
(USAI-P1-SRZZZ-00-000016-000)**



2016 WETLAND AND VEGETATION FIELD STUDY REPORT

USAI-P1-SRZZZ-00-000016-000

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	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0 PAGE 1 OF 40
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[illegible]

TABLE OF CONTENTS

1.0	PURPOSE AND SCOPE.....	5
1.1	PROJECT DESCRIPTION	5
1.2	PURPOSE.....	5
1.3	STUDY AREA.....	8
1.3.1	Alaska Range Transition Ecoregion	9
1.3.2	Intermontane Boreal Ecoregion.....	10
1.3.3	Arctic Tundra Ecoregion.....	13
2.0	METHODOLOGY.....	15
2.1	DEFINITIONS AND WETLAND NAMING CONVENTIONS.....	15
2.1.1	Cowardin Classification.....	16
2.1.2	Hydrogeomorphic Classes.....	17
2.1.3	Study Area Watersheds	19
2.2	WETLAND PARAMETERS AND INDICATORS.....	21
2.2.1	Hydrophytic Vegetation.....	21
2.2.2	Wetland Soils	22
2.2.3	Problematic Soils	22
2.2.4	Wetland Hydrology.....	22
2.3	AERIAL INTERPRETATION (PRE-MAPPING).....	22
2.4	FIELD TARGET SELECTION.....	24
2.5	WETLAND AND VEGETATION FIELD DATA COLLECTION.....	24
2.5.1	Crew Composition.....	24
2.5.2	Wetland and Vegetation Field Protocols	25
2.6	QUALITY ASSURANCE / QUALITY CONTROL.....	26
2.7	MAP REVISIONS.....	26
2.8	JURISDICTIONAL DETERMINATION.....	27
3.0	RESULTS	28
3.1	WETLAND AND VEGETATION FIELD DATA COLLECTION.....	28
3.2	WETLAND AND VEGETATION MAPPING SUMMARY.....	29
4.0	ACRONYMS AND ABBREVIATIONS	35
5.0	REFERENCES.....	36
6.0	APPENDICES.....	40
	Appendix A – 2016 Wetland Determination Field Survey Protocols	
	Appendix B – 2016 Vegetation Field Study Protocols	
	Appendix C – 2016 Wetland Field Data Summary Table and US Army Corps of Engineers Alaska District Wetland Determination Forms	
	Appendix D – 2016 Wetland Delineations Maps	
	Appendix E – 2016 Vegetation Classification Maps	

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 4 OF 40

LIST OF FIGURES

Figure 1-1. Ecoregions within the 2016 Alaska LNG Study Area	7
Figure 2-1. HUC 4 Sub-regions and HUC 8 Sub-basins of the Project Area.....	20

LIST OF TABLES

Table 2-1. Wetland and Deepwater Habitats within the Project Rev C Mapping Corridor and Off-ROW Areas	16
Table 2-2. Hydrogeomorphic Classes within the Project Rev C Mapping Corridor, and Off-ROW Areas.....	19
Table 3-1. 2016 Completed Field Targets by Ecoregion.....	28
Table 3-2. Field Plot Distributions in the Study Area	28
Table 3-3. Wetlands and Waters of the U.S. by Ecoregion	29
Table 3-4. Vegetation Cover Types by Ecoregion.....	29
Table 3-5. Vegetation Cover Types Occurring within the Study Area.....	30
Table 3-6. Preliminary Stream Crossings, Along the Project Route, by Ecoregion	34

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 5 OF 40

1.0 PURPOSE AND SCOPE

This 2016 Wetland and Vegetation Field Study Report provides a review of the wetlands and vegetation that were mapped and field surveyed for the Alaska Liquefied Natural Gas (LNG) Project (Project) during the 2016 field season. The 2016 field verification data was combined with field data collected in 2010, 2011, 2014, and 2015, and was used to further refine the wetland and vegetation mapping. The area that was surveyed in 2016 includes the proposed Project's Revision (Rev) C route from the west side of Cook Inlet (MP 760) to the Beaufort Coastal Plain where the northern extent of field data collection occurred (approximately milepost, MP, 56) (Figure 1-1). Results presented in this report include the entire Rev C route and off right-of-way (ROW) roads and facilities.

1.1 PROJECT DESCRIPTION

The Alaska Gasline Development Corporation (AGDC), BP Alaska LNG LLC, ConocoPhillips Alaska LNG Company, and ExxonMobil Alaska LNG LLC (Applicants) plan to construct one integrated liquefied natural gas (LNG) Project (Project) with interdependent facilities for the purpose of liquefying supplies of natural gas from Alaska, in particular from the Point Thomson Unit (PTU) and Prudhoe Bay Unit (PBU) production fields on the Alaska North Slope (North Slope), for export in foreign commerce and for in-state deliveries of natural gas.

The Natural Gas Act (NGA), 15 U.S.C. § 717a(11) (2006), and Federal Energy Regulatory Commission (FERC) regulations, 18 C.F.R. § 153.2(d) (2014), define "LNG terminal" to include "all natural gas facilities located onshore or in State waters that are used to receive, unload, load, store, transport, gasify, liquefy, or process natural gas that is ... exported to a foreign country from the United States." With respect to this Project, the "LNG terminal" includes the following: a liquefaction facility (Liquefaction Facility) in Southcentral Alaska; an approximately 804-mile gas pipeline (Mainline); a gas treatment plant (GTP) within the PBU on the North Slope; an approximately 62-mile gas transmission line connecting the GTP to the PTU gas production facility (PTU Gas Transmission Line or PTTL); and an approximately 1-mile gas transmission line connecting the GTP to the PBU gas production facility (PBU Gas Transmission Line or PBTL). All of these facilities are essential to export natural gas in foreign commerce and will have a nominal design life of 30 years.

1.2 PURPOSE

The purpose of wetlands and waterbodies mapping is to identify on aerial imagery potential "Waters of the United States (U.S.), including wetlands," that are regulated by the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act (40 Code of Federal Regulations [CFR] Part 230) and Section 10 of the Rivers and Harbors Act (33 CFR Part 328.3[b]) that may be impacted by the Project. As part of the Section 404 permitting process, all projects must avoid impacts to wetlands whenever possible, minimize impacts to wetlands to the maximum extent practicable, and compensate for all unavoidable wetland impacts.

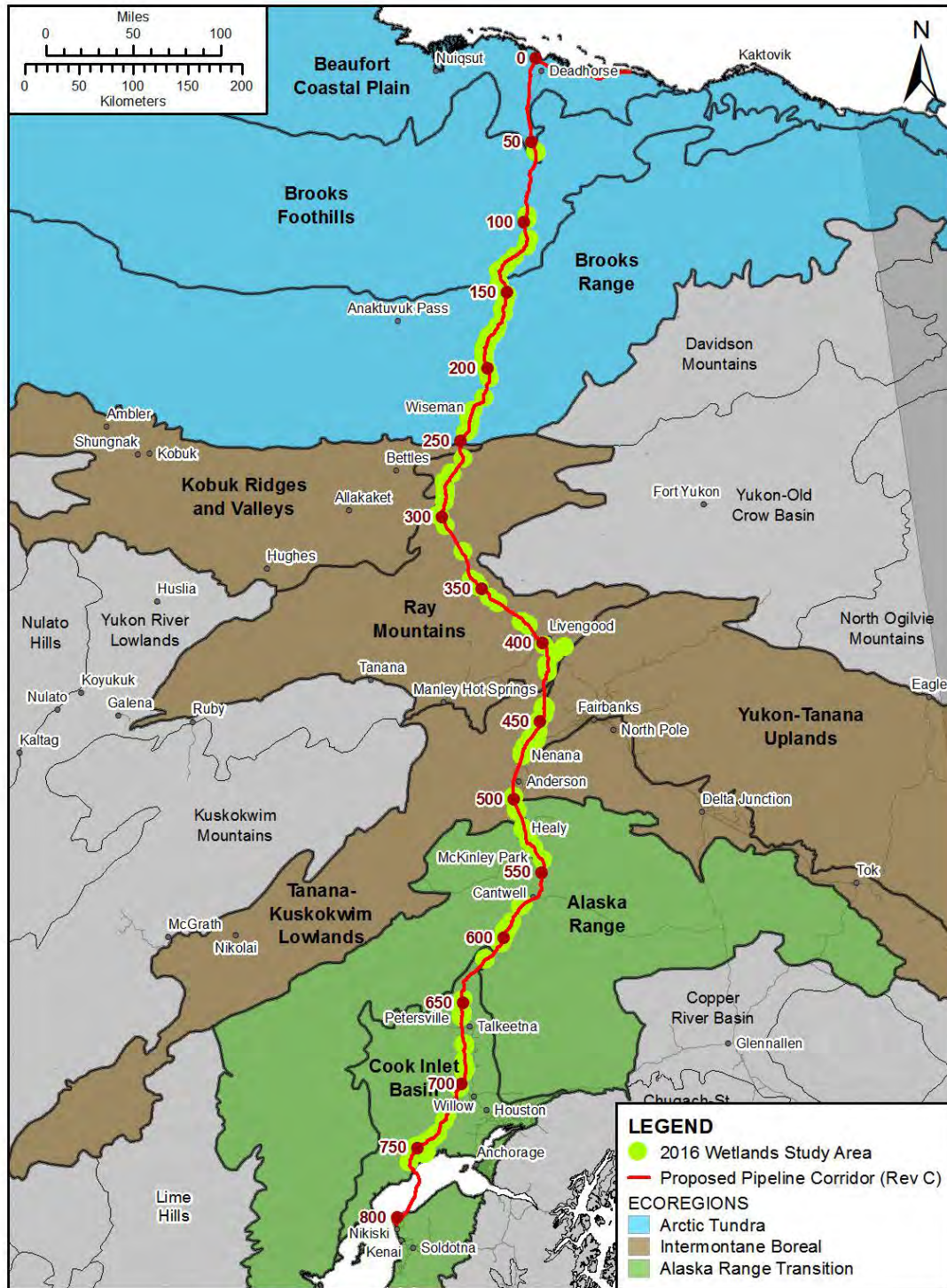
Pre-field mapping, using aerial photo interpretation, was completed in 2013, 2014, 2015, and 2016 for the Project's Mainline corridor from Nikiski, across Cook Inlet and north to Livengood, and for numerous route adjustments and off-ROW access roads and facility sites from Livengood to the Beaufort Coastal Plain. Approximately 223,100 acres have been mapped along the Project corridor for the current alignment. This 2016 Wetland and Vegetation Field Study Report summarizes the pre-mapping effort and focuses on results of the field data collection in 2016.

Field surveys were conducted in 2016 to verify the accuracy of wetland and vegetation cover types and boundaries as determined in the pre-mapping. Field data are used to improve the

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 6 OF 40

accuracy of Project wetland and vegetation mapping efforts. This information is required for the National Environmental Policy Act (NEPA) process as expected to be administered by FERC and for Section 404 and Section 10 permits administered by the USACE. Additionally, these data will constitute baseline information for the FERC's Resource Reports No. 2 and No. 3.

Figure 1-1. Ecoregions within the 2016 Alaska LNG Study Area



	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 8 OF 40

1.3 STUDY AREA

The 2016 field season focused on the Project's proposed Rev C off-ROW areas and pipeline route adjustments. Field verification during the 2016 season occurred from the west side of Cook Inlet (MP 760), north along the Rev C route to the Beaufort Coastal Plain near MP 56.

The wetlands and vegetation survey area was divided into two corridors: a mapping corridor and a field survey corridor. The mapping corridor was 2,000 feet wide (1,000 feet on either side of the proposed centerline). All wetlands and waterbodies, and vegetation were mapped within the mapping corridor using aerial photograph interpretation. The smaller field survey corridor was 300 feet wide (150 feet on each side of the proposed centerline) and centered within the mapping corridor. Previous field work has primarily been concentrated within the field survey corridor, ensuring that the wetland and vegetation field work occurred near areas most likely to be disturbed by the proposed Project, while representative of the wider corridor. If unique wetland and vegetation signatures on aerial photos occurred outside of the 300-foot field survey corridor, field targets would be established and sampled. In 2016, approximately 75 percent of the sampling occurred outside of the 300-foot field survey corridor. Proposed off-ROW access roads and facilities footprints were included in the field survey and mapping efforts. The distribution of field plots collected in the two corridors during the 2016 field season is summarized in Section 3.1 of this report.

While the 2016 field data is organized and analysed by ecoregion in this report, the field survey area was also divided into eight geographic areas for planning purposes. Field identification numbers (plot numbers) include a two letter code identifying the geographical area where a field point is located. Field identification numbers begin with the field team identifier (e.g., W84) followed by the two letter geographical area code (e.g., TI) and concludes with a field plot number (e.g., 001). The geographical areas and two letter codes are summarized by project milepost below:

- Cook Inlet to Nikiski (IN), Mainline MP 792-804;
- Trapper Creek to Cook Inlet (TI), MP 664.5-765;
- Healy to Trapper Creek (HT), MP 525-664.5;
- Livengood to Healy (LH), MP 403.5-525;
- Yukon River to Livengood (YL), MP 357-403.5;
- Atigun Pass to Yukon River (AY), MP 169-357;
- Prudhoe Bay to Atigun Pass (PA), MP 0-169; and
- Point Thomson to Prudhoe Bay (PP), PT Pipeline milepost (MP) 0-58.

The Project route passes through three ecoregions with nine sub-ecoregions (Figure 1-1), as described by Nowacki et al. (2001):

- Alaska Range Transition Ecoregion
 - Cook Inlet Basin Sub-Ecoregion
 - Alaska Range Sub-Ecoregion
- Intermontane Boreal Ecoregion
 - Tanana-Kuskokwim Lowlands Sub-Ecoregion
 - Yukon-Tanana Uplands Sub-Ecoregion
 - Ray Mountains Sub-Ecoregion
 - Kobuk Ridges and Valleys Sub-Ecoregion

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 9 OF 40

- Arctic Tundra Ecoregion
 - Brooks Range Sub-Ecoregion
 - Brooks Foothills Sub-Ecoregion
 - Beaufort Coastal Plain Sub-Ecoregion

Ecoregions are defined as a unit of land or water with a geographically distinct compilation of species, communities, and environmental conditions (World Wildlife Fund 2015). The Alaska LNG corridor studied during the 2016 field season begins in the Cook Inlet Basin, continues north through the Alaska Range, and then continues through the Tanana-Kuskokwim Lowlands, Yukon-Tanana Uplands, Ray Mountains, Kobuk Ridges and Valleys, then north through the Brooks Range and Brooks Foothills, before ending in the Beaufort Coastal Plain (near MP 56). No field work was completed north MP 56 in 2016, since data was previously collected in this area. However, the study area corridor continues north through the Beaufort Coastal Plain reaching Deadhorse, Alaska before bearing east to Point Thomson and the PTU production fields. Each ecoregion is described below.

1.3.1 Alaska Range Transition Ecoregion

The mountains of the Alaska Range are very high and steep. Much of the area on steep mountain slopes is barren of vegetation, but high elevation valley bottoms contain dwarf scrub communities on windswept sites. The Alaska Range has a cold subarctic continental climate. With elevations ranging from 2000 feet to 13,000 feet, and some peaks as high as 20,000 feet, the area experiences a wide range of climatic conditions. The region was heavily glaciated in the late Pleistocene, and glaciers still occupy many valleys. Streams are generally glacial fed, swift and braided with heavy sediment loads. Dwarf and low scrub communities are common and open needleleaf forests and woodlands occur primarily on well drained sites at lower elevations.

1.3.1.1 Cook Inlet Basin Sub-Ecoregion

The Cook Inlet Basin Sub-Ecoregion is located in Southcentral Alaska, adjacent to Cook Inlet. The project begins within the Cook Inlet Basin at Nikiski (MP 804) and exits this sub-ecoregion at MP 616.5 in Denali State Park. The area is dominated primarily by spruce and birch, with cottonwood and willow along riparian habitats and thick alder on upland slopes. The terrain is level to rolling with an elevation range from sea level to 2,000 feet. The basin is generally permafrost free.

According to Gallant et al. (1995), needleleaf forests are widespread and dominated by white spruce (*Picea glauca*), black spruce (*P. mariana*), and Sitka spruce (*P. sitchensis*). Broadleaf forests are dominated by quaking aspen (*Populus tremuloides*), balsam poplar (*P. balsamifera*), black cottonwood (*P. trichocarpa*), and Alaska paper birch (*Betula neoalaskana*). Mixed forests are co-dominated by combinations of these needle-leaf and broadleaf tree species with alders (*Alnus spp.*) often providing a tall shrub layer under the forest canopy. Low growing shrubs commonly include resin birch (*Betula glandulosa*), dwarf birch (*B. nana*), prickly rose (*Rosa acicularis*), willow (*Salix spp.*), bog Labrador-tea (*Rhododendrum groenlandicum*), and other ericaceous species. Dry to mesic sites support a variety of grasses including rough fescue (*Festuca altaica*), red fescue (*F. rubra*), Bering's tufted hairgrass (*Deschampsia beringensis*), large-flower blue grass (*Poa eminens*), and purple reedgrass (*Calamagrostis purpurascens*). Forbs associated with these dry to mesic sites include larkspur-leaf monkshood (*Aconitum delphinifolium*) and tall bluebells (*Mertensia paniculata*) with low shrubs such as lingonberry (*Vaccinium vitis-idaea*), black crowberry (*Empetrum nigrum*), net-vein willow (*Salix reticulata*) and woolly willow (*S. lanata*). Feathermosses (*Pleurozium schreberi* and *Hylocomium splendens*) sometimes form a patchy to continuous moss layer. Sphagnum mosses may occur. Mesic to moist sites support graminoid communities dominated by bluejoint grass (*C. Canadensis*), with

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 10 OF 40

herbs such as narrow-leaf fireweed (*Chamerion angustifolium*), seacoast angelica (*Angelica lucida*), western lady fern (*Athyrium cyclosorum*), field horsetail (*Equisetum arvense*) and water horsetail (*E. fluviatile*).

1.3.1.2 Alaska Range Sub-Ecoregion

The corridor enters the Alaska Range Sub-Ecoregion at approximately MP 616.5 in Denali State Park and exits to the north at MP 516 north of Healy. Nowacki et al. (2001) states that because of the Alaska Range's high elevation, "a cold continental climate prevails and much of the area is barren of vegetation". However, the corridor passes through valley bottoms in this sub-ecoregion that are typically dominated by willow, shrub birch (*Betula spp.*), and alder communities. According to Gallant et al. (1995) dwarf scrub communities are most common where vegetation does occur, growing on well drained, windswept sites. More protected slopes provide moist to mesic conditions that support low or tall scrub communities. Open needleleaf forests and woodlands occur primarily on well drained sites in the lower valleys along the route, and on lower hillslopes. Dwarf scrub communities are typically dominated by mountain-avens (*Dryas spp.*), ericaceous species (such as, lingonberry, bog blueberry (*V. uliginosum*), white arctic mountain-heather (*Cassiope tetragona*), black torpedoberry (*Arctous alpina*), and red topedoberry (*A. rubra*), or combinations of these species. Graminoid species, such as Canadian single-spike sedge (*Carex scirpoidea*) and Bigelow's sedge (*C. bigelowii*) and alpine holygrass (*Anthoxanthum monticola*), may be present and may even codominate with shrubs. Low scrub communities are dominated by resin and dwarf birch, and ericaceous shrubs or by willows. Common herbs are rough fescue, alpine holygrass, Bigelow's sedge, arctic sweet coltsfoot (*Petasites frigidus*), and arctic wormwood (*Artemisia norvegica*). Tall scrub communities occur at the altitudinal treeline, along streambanks, in drainages, and on floodplains. These communities are dominated by felt-leaf willow (*S. alaxensis*), little-tree willow (*S. arbusculoides*), diamond-leaf willow (*S. pulchra*), and woolly willow, alder, a mixture of willow and alder, or a mixture of willow and shrub birch. Low shrubs, such as Alaska bog willow (*S. fuscescens*), Beauverd spirea (*Spiraea stevenii*), narrow-leaf Labrador-tea (*R. decumbens*), and bog blueberry, occur in the more open stands.

1.3.2 Intermontane Boreal Ecoregion

The vegetation of the Intermontane Boreal Forest Ecoregion is a complex array of plant communities shaped by fire, soil temperature, drainage, aspect and exposure (Alaska Department of Natural Resources [ADNR], 2011). Throughout this ecoregion, expanses of boreal forests of both needleleaf and deciduous species are dissected by broad, flat river floodplains and a diversity of wetlands. This ecoregion spans most of the central portion of the state, east to the border (Nowacki et al., 2001).

A continental subarctic climate prevails, marked by short, warm summers and long, cold winters (Wiken et al., 2011). The mean annual temperature for the area is approximately 10.4°F, with a summer and winter mean temperature of 50.9°F and -9.4°F, respectively. The frost-free period ranges from 20 to 70 days. The western part of the region is generally wetter; there, mean annual precipitation ranges from between 11.8 to 35.4 inches on the higher mountains (Wiken et al., 2011).

1.3.2.1 Tanana-Kuskokwim Lowlands Sub-Ecoregion

The route enters the Tanana-Kuskokwim Lowlands north of Healy (MP 516) and approaches the boundary with the Yukon-Tanana Uplands near MP 454.8 where it weaves along the boundary, in and out until MP 430.2. The route passes through a large alluvial plain along the Tanana and Nenana rivers and tributaries, and extends through the lower-lying areas north of Nenana to Livengood. In this area, undifferentiated sediments of fluvial and glaciofluvial origin are capped by varying thicknesses of eolian silts and organic soils (Nowacki et al., 2001). Surface moisture is rather abundant due to the gentle topography, patches of impermeable shallow permafrost, and

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 11 OF 40

poor soil drainage in fine textured eolian deposits. Permafrost is thin and discontinuous, and temperatures are near the melting point. Collapse-scar bogs and fens caused by subsiding permafrost are frequent (Nowacki et al., 2001).

The region has a dry sub-arctic, continental-influenced climate, marked by cool to mild summers and long, cold winters. Summer temperatures can be relatively warm. The mean annual temperature for the area is approximately 14.5°F, with a summer and winter mean temperature of 45.5°F and -14.8°F, respectively. Mean annual precipitation ranges between 7.9 to 31.5 inches and mostly occurs during summer convective storms (Wiken et al., 2011).

Boreal forest communities of needleleaf, deciduous, and mixed forest occur as a result of the interplay of permafrost, surface water, fire, local elevation relief, and hill slope aspect. Lightning fires are very frequent. Black spruce woodland and dwarf tree communities occur in bogs, with tamarack (*Larix laricina*) in low, wet areas. White spruce and balsam poplar are common along rivers. Active floodplains and river bars support stands of tall alders and willows. South-facing slopes support stands of white spruce, Alaska paper birch, and aspen (Nowacki et al., 2001). The coldest, wettest areas tend to occur on permafrost flats that support birch, ericaceous shrubs and sedge (*Carex spp.*) and tussock cottongrass (*Eriophorum vaginatum*). Wet sedge meadows and aquatic vegetation occur in sloughs and oxbow ponds. Tall willow, resin birch, and alder communities are scattered throughout (Nowacki et al., 2001).

1.3.2.2 Yukon-Tanana Uplands Sub-Ecoregion

A small section of the Project (MP 454.8 to 442.2) passes through the Yukon-Tanana Uplands. Within this region, the hillsides adjacent to the Tanana River are within the Yukon-Tanana Uplands, whereas the lower elevations along the Tanana River are within the Tanana-Kuskokwim Lowlands. Several acres of off-corridor access routes identified east of the route are also within the Yukon-Tanana Uplands.

The vegetation is dominated by black spruce woodlands, especially on north-facing slopes, while white spruce, Alaska paper birch, and aspen usually are restricted to warm, south-facing slopes. Black spruce grows in muskegs, lowlands, and on north-facing slopes where the annual thaw is shallow and permafrost is close to the surface (Nowacki et al., 2001). The largest black spruce trees generally reach diameters of seven inches at breast height and heights of 56 feet, but many are no larger than four inches diameter at breast height and 30 feet tall (ADNR, 2011). Black spruce stands are the most widespread of all stand types in the interior, and some stands contain tamarack and Alaska paper birch. The black spruce trees in muskegs and woodlands are typically scattered and stunted, and the understory is dominated by mosses, sedges, the tussock-forming cottongrass, ericaceous shrubs, and herbs such as roundleaf sundew (*Drosera rotundifolia*) (ADNR, 2011). Bogs, fens, shrub swamps, and other wetlands are also common in this region. Scrub-graminoid herbaceous communities, including willow, dwarf birch, Labrador-tea, and shrubby cinquefoil (*Dasiphora fruticosa*) occupy lowland bogs and other very wet areas (ADNR, 2011).

Floodplains are dominated by white spruce, balsam poplar, alders, and willows (Nowacki et al., 2001). Resin birch and Dryas-lichen tundra prevail at higher elevations. Black spruce woodlands, sedge-tussock communities, and scrub bogs are common in valley bottoms. Above the tree line, dwarf birch, ericaceous shrubs, and Dryas-lichen tundra are the dominants. The highest elevations are mostly barren (Nowacki et al., 2001).

This region has one of the highest incidences of lightning strikes in Alaska and wildfires are common (Nowacki et al., 2001).

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 12 OF 40

1.3.2.3 Ray Mountains Sub-Ecoregion

The route enters the Ray Mountains about 25 miles south of Livengood (MP 430.2) and exits the sub-ecoregion at MP 256.7, which is about four miles north of the South Fork Koyukuk River. This sub-ecoregion consists of an overlapping series of compact, east-west trending ranges underlain by the Ruby terrane that includes low hills both north and south of the Yukon River. The Ray Mountains consist of metamorphic bedrock usually covered with rubble, and soils are subsequently shallow and rocky. Permafrost is generally discontinuous and ranges from thin to moderately thick (Nowacki et al., 2001). The climate is strongly continental, with dry, cold winters and somewhat moist, warm summers. Precipitation increases with elevation (Wiken et al., 2011).

The vegetation throughout this region is dominated by black spruce woodlands and dwarf tree communities, while closed and open mixed needleleaf and deciduous forests of white spruce, Alaska paper birch, and aspen usually are restricted to warm, south-facing slopes (Nowacki et al. 2001). Floodplains are dominated by white spruce, balsam poplar, alders, and willows. Forest understory varies greatly with stand density and the amount of moisture on the forest floor. Common tall shrubs found in various mixtures in white spruce forests include green alder (*Alnus viridis* ssp. *fruticosa*) and Bebb willow (*Salix bebbiana*), common low shrubs include narrowed-leaved Labrador-tea (*Rhododendrum tomentosum*), bog blueberry, and especially lingonberry. In mixed forest stands on floodplains, horsetail (*Equisetum* spp.) is a major ground cover, with feathermosses and foliose lichens prominent in the moist habitats (Nowacki et al., 2001). Resin birch and Dryas-lichen tundra prevail at higher elevations. Forest fires only occasionally occur in the summer in the Ray Mountains Sub-Ecoregion (Nowacki et al., 2001).

1.3.2.4 Kobuk Ridges and Valleys Sub-Ecoregion

The route passes briefly through the east tip of the Kobuk Ridges and Valleys (MP 256.7 to 251.5). Forests and woodlands dominate much of the valley bottoms and mountainsides of the Kobuk Ridges and Valleys Sub-Ecoregion with black spruce in wetland bogs, white spruce and balsam poplar along rivers, and white spruce, Alaska paper birch, and aspen on well-drained uplands. Tall and short shrublands of willow, birch, and alder communities occur on ridges. Trees become increasingly sparse, less robust, and restricted to lower elevations in the west – here forests are slowly invading along rivers and streams (e.g., lower Noatak River) (Nowacki et al., 2001).

Needleleaf, broadleaf, and mixed forests occur over a variety of sites. Tall shrub communities which may include felt-leaf willow (*S. alaxensis*), gray-leaf willow (*S. glauca*), woolly willow, green alder (*Alnus viridis* ssp. *fruticosa*), and Sitka alder (*Alnus viridis* ssp. *sinuata*) grow in areas of newly exposed alluvium, such as floodplains, streambanks, drainageways, and lake margins, on burned or otherwise disturbed areas, and near timberline. Low scrub communities (gray-leaf willow, diamond-leaf willow, woolly willow, resin birch, dwarf birch, green alder, high-bush cranberry (*Viburnum edule*), *Vaccinium* spp., *Arctous* spp., and *Rhododendrum* spp.) occur in moist areas and on north-facing slopes. The wettest sites support tall scrub swamps (thin-leaf alder (*Alnus incana* ssp. *tenuifolia*), green alder, diamond-leaf willow and woolly willow), low scrub bogs (leatherleaf (*Chamaedaphne calyculata*), sweet gale (*Myrica gale*), and Beauverd spirea), or scrub-graminoid communities (diamond-leaf willow, net-vein willow, Barclay's willow (*S. barclayi*), under-green willow (*S. commutata*), Alaska bog willow, resin birch, dwarf birch, Labrador-tea, bog blueberry, lingonberry, small cranberry (*V. oxycoccos*), shrubby cinquefoil, sweet gale, thin-leaf alder, and bog rosemary (*Andromeda polifolia*), with tussock cottongrass, Bigelow's sedge, water sedge (*C. aquatilis*), several flower sedge (*C. pluriflora*) and bluejoint grass). Recently burned areas display a succession of recovery stages that include mesic forb herbaceous communities (narrow-leaf fireweed), mesic graminoid herbaceous communities (bluejoint grass), scrub communities (little-tree willow, Barclay's willow, Bebb willow, and Scouler's willow (*S. scouleriana*) and broadleaf, needleleaf, and mixed forests (Gallant et al. 1995).

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 13 OF 40

1.3.3 Arctic Tundra Ecoregion

As the northernmost ecoregion in Alaska, the Arctic Tundra Ecoregion is bounded by the Arctic Ocean to the north and includes the Brooks Range to the south. The poorly drained, treeless coastal plain rises very gradually from sea level across the Arctic Coastal Plain, to the Brooks Range Foothills and then abruptly into the Brooks Range. The region has an arctic climate, and the entire area is underlain by thick permafrost. Because of poor soil drainage, wet graminoid herbaceous communities are the predominant vegetation cover, and numerous thaw lakes dot the region (Gallant et al. 1995).

The Ecoregion has very low mean annual temperatures (average winter low of -22°F and average summer maximum of 46.4°F) and very low annual precipitation (5.5 inches annually). Winds are generally persistent and strong (Gallant et al. 1995).

1.3.3.1 Brooks Range Sub-Ecoregion

Entering the Brooks Range at MP 251.5 the route exits this sub-ecoregion at MP 143. The dry polar climate of the Brooks Range Sub-Ecoregion has short, cool summers and long, cold winters; and air temperatures decrease rapidly with rising elevation. Valleys and lower mountain slopes on the north side of the range are covered by mixed shrub-sedge tussock tundra with willow thickets along rivers and streams. Alpine tundra and barrens dominate at higher elevations along the entire crest of the range. On the south side, lower mountain slopes and valleys possess sedge tussocks and shrubs. The arctic tree line skirts across the range in Canada and is restricted to the south side of the range in Alaska. Here, sparse conifer-birch forests and tall shrublands occur in larger valleys (Nowacki et al., 2001).

Because of the shallow soils, high winds, and harsh climate in this ecoregion, vegetation cover is sparse and generally limited to valleys and lower hillslopes. Drier sites support dwarf scrub communities. Wet to mesic sites support mesic graminoid herbaceous communities. Dwarf scrub communities are dominated by ericaceous species (e.g., black torpedoberry, red torpedoberry, *Vaccinium spp.*, narrow-leaf Labrador-tea, black crowberry, and white arctic mountain-heather), mountain-avens, and willow (round-leaf willow (*S. rotundifolia*), arctic willow (*S. arctica*), and polar willow (*S. polaris*)). Herbaceous species (*Carex spp.*) and fruticose lichens (*Cladina spp.* and *Cetraria spp.*) may co-dominate with shrubs in some areas. Graminoid herbaceous communities are dominated by sedges (water sedge and Bigelow's sedge) and willows (diamond-leaf willow and woolly willow). Mosses (*Tomenthyphnum nitens*, *Distichium capillaceum*, *Drepanocladus spp.*, and *Campylium stellatum*) are often abundant (Gallant et al. 1995).

1.3.3.2 Brooks Range Foothills Sub-Ecoregion

Entering the Brooks Range Foothills at MP 143 the route passes through mesic graminoid herbaceous and dwarf scrub communities, before entering the Beaufort Coastal Plain at MP 62. (Gallant et al. 1995). Open low scrub occurs along drainages. Mesic graminoid herbaceous communities dominated by tussock-forming sedges are widespread. Typical species are tussock cottongrass and Bigelow's sedge. Low shrubs, such as dwarf birch, black crowberry, narrow-leaf Labrador-tea, and lingonberry often occur and may co-dominate with sedges. Mosses (e.g., *Hylocomium splendens* and *Sphagnum spp.*), and lichens (e.g., *Cetraria cucullata*, *Cladonia spp.*, and *Cladina rangiferina*) are common between tussocks. Dwarf scrub communities (*Vaccinium spp.*) are dominated by mat-forming mountain-avens, white arctic mountain-heather, and *Arctous spp.* accompanied by ericaceous species and prostrate willows (net-vein willow and skeleton-leaf willow [*S. phlebophylla*]). Open low scrub communities are co-dominated by alders and willows (e.g., woolly willow, diamond-leaf willow, and gray-leaf willow). Mosses (e.g., *Tomenthyphnum nitens* and *Drepanocladus spp.*) are usually abundant (Gallant et al. 1995).

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 14 OF 40

1.3.3.3 Beaufort Coastal Plain Sub-Ecoregion

Leaving the Brooks Range Foothills at MP 62 the route enters the Beaufort Coastal Plain. Vegetation within the Beaufort Coastal Plain is dominated by wet sedge tundra in drained lake basins, swales, and floodplains, and by tussock tundra and sedge-*Dryas* tundra on gentle ridges. Low willow thickets grow on well-drained riverbanks (Nowacki et al. 2001).

Gallant et al. 1995 describes the distribution of vegetation communities in relation to microtopographic features that affect soil drainage. Sedge communities are generally dominated by water sedge and tall cottongrass (*E. angustifolium*). Mosses (usually *Scorpidium spp.* or *Drepanocladus spp.*) are common. Grass communities are generally dominated by Fisher's tundra grass (*Dupontia fischeri*) and alpine meadow-foxtail (*Alopecurus alpinus*), but pendantgrass (*Arctophila fulva*) dominates where surface water is 6 to 79 inches deep. Dwarf scrub communities are common, which include entireleaf mountain-avens (*Dryas integrifolia*), lingonberry, white arctic mountain-heather, black torpedoberry and red torpedoberry, and net-vein willow and skeleton-leaf willow.

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 15 OF 40

2.0 METHODOLOGY

Wetland Determination Field Survey Protocols (**Appendix A**) and Vegetation Field Study Protocols (**Appendix B**) were prepared by experienced scientists prior to the 2016 field season. These protocols have been provided to the USACE and FERC, and have been approved by the USACE (USACE 2010). The protocols, summarized below, follow standard methods used to delineate wetlands and vegetation for large linear projects in Alaska. The protocols comprise a three-phased iterative approach, including: 1) wetland and vegetation pre-mapping relying primarily on aerial photo interpretation; 2) collection of ground reference data at pre-determined field targets; and 3) revision of the wetland and vegetation pre-mapping based on the results of the field efforts.

The goal of the Vegetation Study was to identify vegetation cover types according to the Alaska Vegetation Classification System (Viereck et al. 1992). Vegetation was classified using Level I, II, and III of the hierarchical Alaska Vegetation Classification System (Viereck et al. 1992). Level I classifies vegetation using the dominant growth form, as either forest (tree), scrub, or herbaceous. Level II further classifies vegetation based on vegetation type (e.g., needleleaf, broadleaf, graminoid, forb) and vegetation height (e.g., tall or low scrub). The most detailed level of classification for this study, Level III, classifies the canopy cover of the community into either woodland with 10-25% canopy cover, open forest with 25-60% cover or closed with a canopy cover between 60-100%. Level III can also be used to classify a community's composition (e.g., ericaceous or willow dwarf scrub). Classification to Level III of the Viereck system provides the detail necessary to characterize plant communities for the purpose of assessing habitat type.

The 2016 field data will be shared with the USACE. The USACE has already reviewed the 2014 field data north of Livengood (USACE 2015), and is in the process of reviewing the 2015 data.

2.1 DEFINITIONS AND WETLAND NAMING CONVENTIONS

The USACE defines wetlands as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.” Most wetlands are considered to be Waters of the U.S. and are within the jurisdiction of the USACE (33 CFR Part 328.3[b]). Jurisdictional status is based on connectivity to Traditional Navigable Waters (TNW). Wetlands are considered jurisdictional “if the wetland, either alone or in combination with similarly situated lands in the region, significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as ‘navigable.’” (Rapanos v. United States and Carabell v. United States [33 U.S. Code §1251 et seq.]) (Stonestreet et al. 2009). Other aquatic habitats under the jurisdiction of the USACE, include deepwater aquatic habitats, unvegetated ponds, river channels, and other special aquatic sites as described by the USACE (See Section. 2.9).

For projects under FERC's authority, the definitions for waterbodies and wetlands are further clarified in the FERC's *Wetland and Waterbody Construction and Mitigation Procedures* (FERC 2013) as follows:

- “Waterbody” includes any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes:
 - “minor waterbody” includes all waterbodies less than or equal to 10 feet wide at the water's edge at the time of crossing;
 - “intermediate waterbody” includes all waterbodies greater than 10 feet wide but less than or equal to 100 feet wide at the water's edge at the time of crossing; and

- “major waterbody” includes all waterbodies greater than 100 feet wide at the water’s edge at the time of crossing.
- “Wetland” includes any area that is not in actively cultivated or rotated cropland and that satisfies the requirements of the current federal methodology for identifying and delineating wetlands.

2.1.1 Cowardin Classification

All wetlands and other Waters of the U.S. in the wetland mapping corridor were classified using the “Classification of Wetlands and Deepwater Habitats of the United States” (Cowardin et al., 1979), commonly referred to as the Cowardin classification system. Cowardin classifies wetlands and aquatic habitats by system, subsystem, class, subclass, and water regime and is based on hydrologic setting (riverine, lacustrine, estuarine, palustrine), vegetation structure (forested, scrub-shrub, emergent, aquatic bed), and water regime (saturated, seasonally flooded, semi-permanently flooded, etc.).

The Cowardin classifications are used as the standard codes in the National Wetland Inventory (NWI), and are required by the FERC’s Wetlands and Waterbody Construction and Mitigation Procedures (FERC 2013). The NWI Program has mapped many of the wetlands across the U.S., including many in the Project’s mapping corridor (at a smaller scale than the Alaska LNG mapping). It was developed largely for mapping based on interpretation of high-altitude aerial photography. Table 2-1 lists the most common Cowardin classifications found in the 2016 field survey corridor.

Table 2-1. Wetland and Deepwater Habitats within the Project Rev C Mapping Corridor and Off-ROW Areas

Cowardin Wetland and Other Aquatic Habitat Types	Description	Example
Estuarine Subtidal (E1)	Permanently flooded deepwater brackish or saline tidal habitats typically semi-enclosed by land. Water salinity exceeds 0.5 ppt. and typically does not exceed 30 ppt.	Cook Inlet*
Estuarine Intertidal (E2)	Aquatic habitats with substrates that are exposed at low tide and flooded at high tide with less than 30% of the surface covered with vegetation; includes the splash zone. Water salinity exceeds 0.5 ppt and typically does not exceed 30 ppt.	Salt marsh, Cook Inlet mud flats
Riverine Freshwater Tidal Unconsolidated Bottom (R1UB)	Low-gradient freshwater tidal rivers with water velocity dependent on tidal fluctuations	Coastal Rivers
Riverine Lower Perennial Unconsolidated Shoreline/Unconsolidated Bottom (R2US/UB)	Low-gradient rivers/streams with slow water velocity	Valley bottom streams*
Riverine Upper Perennial Rock Bottom (R3RB)	High-gradient river/stream with substrate dominated by stones, boulders, or bedrock	Mountain Streams*
Riverine Upper Perennial Unconsolidated Shoreline/Unconsolidated Bottom (R3US/UB)	High-gradient rivers/streams with fast water velocity	Mountain streams*
Riverine Intermittent Streambed (R4SB)	Channels containing flowing water only part of the year	Intermittent streams*
Lacustrine Limnetic (L1)	Unvegetated deepwater habitats within the lacustrine system	Deepwater lakes*

Lacustrine Littoral (L2)	Vegetated habitats within the lacustrine system, or shoreward bound to 2 meters below annual low water	Lake fringes with unvegetated shallow water, or submerged or floating vegetation
Palustrine Unconsolidated Bottom (PUB)	Potential aquatic habitats and deepwater habitats that are inundated throughout the year in most years. These ponded depressions are less than 20 acres in size and typically have a depth less than 2 meters at annual low water. Substrates have at least 25% cover of particles smaller than stones, and less than 30% vegetative cover	Ponds with unvegetated shallow water, or submerged or floating vegetation
Palustrine Unconsolidated Shore (PUS)	Potential aquatic habitats with less than 30% vegetative cover that are inundated for only a portion of the growing season in most years	Unvegetated seasonally flooded ponds
Palustrine Aquatic Bed (PAB)	Potential aquatic habitats that have a predominance of rooted vascular aquatic plants growing on or below the water surface	Ponds with submerged or floating vegetation such as pondweeds, water lilies
Palustrine Emergent (PEM)	Habitats dominated by erect, rooted, herbaceous species	Emergent wetlands with grasses, sedges, rushes
Palustrine Moss-Lichen (PML)	Moss or lichen dominated wetlands with less than 30% cover vascular vegetation.	Wetlands dominated by mosses or lichens
Palustrine Scrub-Shrub (PSS)	Habitats dominated by woody vegetation less than 6 meter tall/3-inch diameter at breast height (DBH)	Scrub-shrub wetlands with willow or alder thickets, mixed shrub-tussock tundra, ericaceous bogs
Palustrine Forested (PFO)	Habitats dominated by woody tree species greater than 6 meter tall/3-inch DBH	Forested wetlands with black spruce, tamarack
Upland (U) (non-wetland)	Habitats that do not contain criteria diagnostic of wetlands	Non-wetland communities, ranging from closed spruce forest, mixed woodlands, shrublands to alpine tundra
Disturbed (D) (non-wetland)	Gravel-filled, excavated or previously graded areas, man-made structures	Roads, pads, buildings*

* Unvegetated areas

2.1.2 Hydrogeomorphic Classes

Wetlands within the Project mapping corridor were also assigned a hydrogeomorphic (HGM) classification (Smith et al., 1995; and Brinson, 1993) during the mapping process. The HGM classification of wetlands comprises three components: 1) landscape setting; 2) water source (precipitation, surface flow, or groundwater discharge); and 3) hydrodynamics (direction and strength of flow). The three components of the HGM classes are largely responsible for determining a wetland's ecosystem function. The HGM classes in the 2016 field survey corridor are defined below per Smith et al. (1995) and are summarized in Table 2-2.

Riverine – Riverine wetlands occur in floodplains and riparian corridors in association with stream channels. Dominant water sources are often overbank flow from the channel or subsurface hydraulic connections between the stream channel and wetlands; however, sources may be interflow and return flow from adjacent uplands, occasional overland flow from adjacent uplands, tributary inflow, and precipitation. At their headwaters, riverine wetlands often are replaced by slope or depressional wetlands where the channel morphology may disappear. They may intergrade with poorly drained flats or uplands. Perennial flow in the channel is not a requirement.

Depressional – Depressional wetlands occur in topographic depressions. Dominant water sources are precipitation, groundwater discharge, and both interflow and overland flow from adjacent uplands. The direction of flow is normally from the surrounding uplands toward the

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 18 OF 40

center of the depression. Elevation contours are closed, thus allowing the accumulation of surface water. Depressional wetlands may have a combination of inlets and outlets or lack them completely. Dominant hydrodynamics are vertical fluctuations, primarily seasonal. Depressional wetlands may lose water through intermittent or perennial drainage from an outlet, by evapotranspiration, and, if they are not receiving groundwater discharge, may slowly contribute to groundwater. Peat deposits may develop in depressional wetlands.

Slope – Slope wetlands normally are found where there is a discharge of groundwater to the land surface. They normally occur on sloping land; elevation gradients may range from steep hillsides to slight slopes. Slope wetlands are usually incapable of depressional storage because they lack the necessary closed contours. Principal water sources are usually groundwater return flow and interflow from surrounding uplands, as well as precipitation. Hydrodynamics are dominated by downslope unidirectional water flow. Slope wetlands can occur in nearly flat landscapes if groundwater discharge is a dominant source to the wetland surface. Slope wetlands lose water primarily by saturation, subsurface and surface flows, and by evapotranspiration. Slope wetlands may develop channels, but the channels serve only to convey water away from the slope wetland. Fens are a common example of slope wetlands.

Flat – There are two types of “flat” wetlands: mineral soil flats and organic soil flats. Mineral soil flats are most common on interfluvies, extensive relic lake bottoms, or large floodplain terraces where the main source of water is precipitation. They receive virtually no groundwater discharge which distinguishes them from depressions and slopes. Dominant hydrodynamics are vertical fluctuations. They lose water by evapotranspiration, saturation overland flow, and seepage to underlying groundwater. They are distinguished from flat upland areas by their poor vertical drainage, often due to spodic horizons and hardpans, and low lateral drainage, usually due to low hydraulic gradients. Mineral soil flats that accumulate peat can eventually become organic soil flats.

Organic soil flats differ from mineral soil flats, in part, because their elevation and topography are controlled by vertical accretion of organic matter. They occur commonly on flat interfluvies, but may also be located where depressions have become filled with peat to form a relatively large flat surface. Water source is dominated by precipitation, while water loss is by saturation, overland flow, and seepage to underlying groundwater. Raised bogs share many of these characteristics, but may be considered a separate class because of their convex upward form and distinct edaphic conditions for plants. Organic flats wetlands over permafrost soils are common in Interior Alaska. These flats can and often occur on slopes up to 20 percent.

Estuarine Fringe – estuarine fringe wetlands occur along coasts and estuaries and are under the influence of sea level. They intergrade landward with riverine wetlands where tidal currents diminish and river flow becomes the dominant water source. Additional water sources may be groundwater discharge and precipitation. The interface between the estuarine fringe and riverine classes is where bidirectional flows from tides dominate over unidirectional ones controlled by floodplain slope of riverine wetlands. Because they frequently flood and water table elevations are controlled mainly by sea surface elevation, estuarine fringe wetlands seldom dry for significant periods. Estuarine fringe wetlands lose water by tidal exchange, by saturation overland flow to tidal creek channels, and by evapotranspiration. Organic matter normally accumulates in higher elevation marsh areas where flooding is less frequent and they are isolated from shoreline wave erosion by intervening areas of low marsh.

Lacustrine Fringe – Lacustrine fringe wetlands are adjacent to lakes where the water elevation of the lake maintains the water table in the wetland. In some cases, these wetlands consist of a floating mat attached to land. Additional sources of water are precipitation and groundwater discharge, the latter dominating where lacustrine fringe wetlands intergrade with uplands or slope wetlands. Surface water flow is bidirectional, usually controlled by water-level fluctuations such as seiches (oscillating standing waves) in the adjoining lake. Lacustrine fringe wetlands are indistinguishable from depressional wetlands where the size of the lake becomes so small

relative to fringe wetlands that the lake is incapable of stabilizing water tables. Lacustrine fringe wetlands lose water by flow returning to the lake after flooding, by saturation surface flow, and by evapotranspiration. Organic matter normally accumulates in areas sufficiently protected from shoreline wave erosion.

Table 2-2. Hydrogeomorphic Classes within the Project Rev C Mapping Corridor, and Off-ROW Areas

Hydrogeomorphic Class	Dominant Water Source	Dominant Hydrodynamics	Examples
Riverine	Overbank flow from channel	Unidirectional, horizontal	Riparian scrub-shrub wetlands
Depressional	Groundwater	Vertical	Kettle wetlands
Slope	Groundwater	Unidirectional, horizontal	Avalanche chutes
Flat	Precipitation	Vertical	Peat bogs
Estuarine Fringe	Overbank flow from estuary	Bidirectional, horizontal	Salt-tolerant coastal marshes
Lacustrine Fringe	Overbank flow from lake	Bidirectional, horizontal	Emergent lake edge wetlands

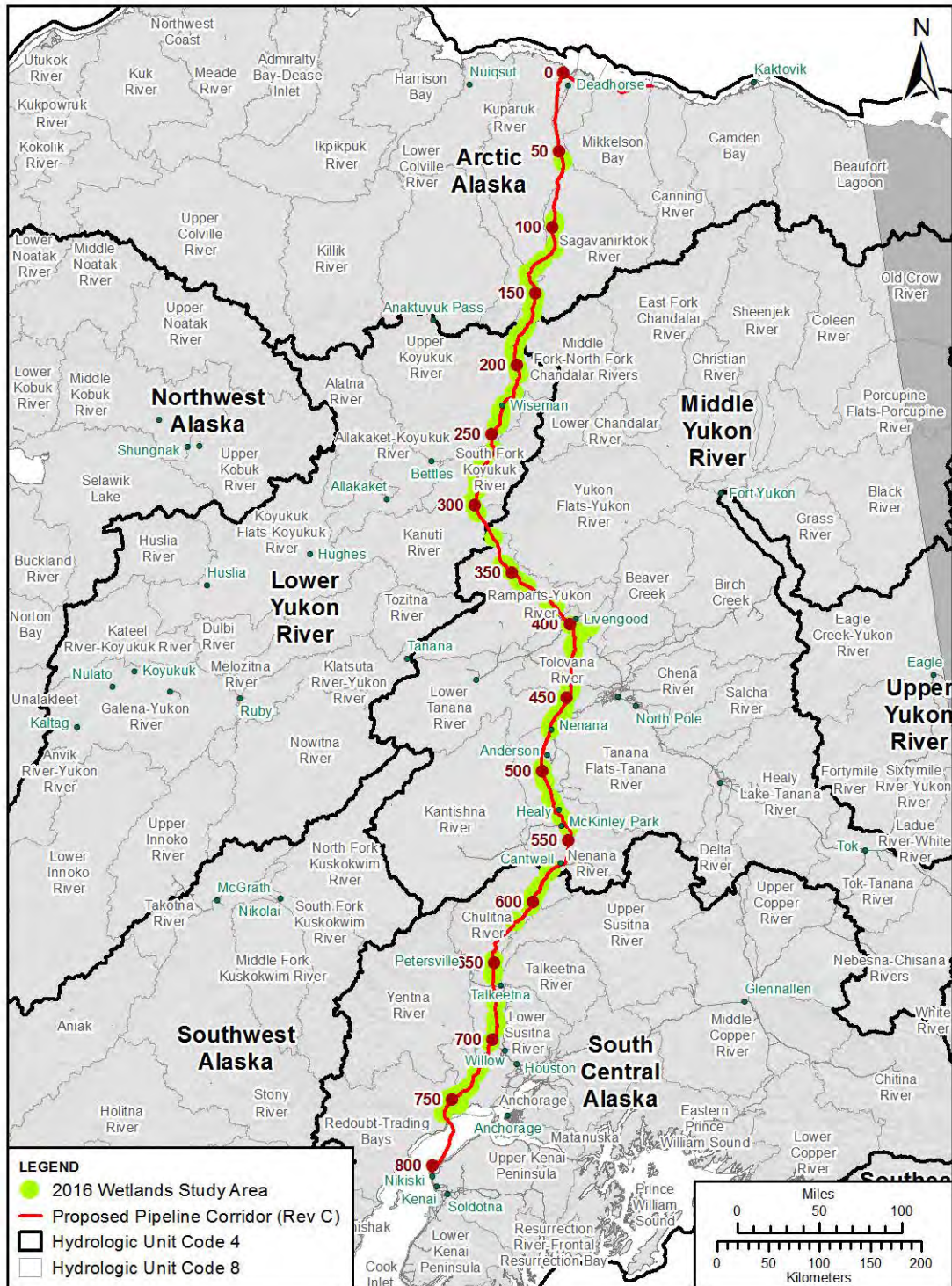
These HGM classes of wetlands have the potential to perform the following eight functions (Magee and Hollands 1998):

1. Modification of groundwater discharge: The capacity of a wetland to influence the amount of water moving from the groundwater to surface water.
2. Modification of groundwater recharge: The capacity of a wetland to influence the amount of water moving from surface water to groundwater.
3. Storm and flood-water storage: The storage of inflowing water from storm or flooding events, resulting in detention and retention of water on the wetland surface.
4. Modification of stream flow: The modification of inflow hydrology by the wetland to produce the outlet stream's hydrology.
5. Modification of water quality: Removal of suspended and dissolved solids from surface water and dissolved solids from groundwater and conversion into other forms, plant or animal biomass, or gases. Wetlands with a low slope-angle or location in depressions provide a high level of this function.
6. Export of detritus: Export of organic detritus from the wetland to adjacent and downstream aquatic ecosystems.
7. Contribution to abundance and diversity of wetland vegetation: The capacity of a wetland to produce an abundance and diversity of hydrophytic plant species individually or as part of a group of wetlands in a local landscape (Tiner 1984).
8. Contribution to abundance and diversity of wetland fauna: The capacity of a wetland to support large and/or diverse populations of animal species that spend part or all of their lifecycle in wetlands, individually, or as part of a mosaic of wetlands in a local landscape.

2.1.3 Study Area Watersheds

The U.S. Geological Survey (USGS) has mapped hydrologic units (drainage basins and watersheds) throughout the study area. Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of two to twelve digits based on the six levels of classification in the hydrologic unit system (USGS, 2015). Alaska falls into hydrologic unit region 19 (2 digit HUC) comprising 8 Sub-regions (4 digit HUC), 38 Basins (6 digit HUC), 159 Sub-basins (8 digit HUC), 20,345 Watersheds (10 digit HUC) and 13,921 Sub-watersheds (12 digit HUC). The project study area crosses 20 "HUC 4" Sub-regions (4 digit HUC), and four "HUC 8" Sub-basins (8 digit HUC). HUC 4 Sub-regions and HUC 8 Sub-basins of the project area are shown below (Figure 2-1).

Figure 2-1. HUC 4 Sub-regions and HUC 8 Sub-basins of the Project Area



	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0 PAGE 21 OF 40
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2.2 WETLAND PARAMETERS AND INDICATORS

Wetland determinations were made according to the USACE accepted methods in Alaska, as described in the “Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region” (Regional Supplement) (USACE, 2007a), and the “USACE Wetlands Delineation Manual” (USACE Manual) (USACE, 1987). These methods require a three-parameter approach, of which the three essential characteristics of a wetland (hydrophytic vegetation, hydric soils, and wetland hydrology) must be present to have a positive wetland determination.

Wetland indicators are field verifiable and measurable characteristics of vegetation, soil, and hydrology that generally indicate that the parameter in question is present. The absence of an indicator, however, does not always mean that a parameter is not met, or that a wetland is not present. For these “problematic” situations, the Regional Supplement provides procedures to determine if a parameter is present or not. These generally rely on an understanding of the hydrogeomorphology of a site, and the best professional judgment of the wetland scientist. Each parameter, along with select Alaska-specific indicators, is described below.

2.2.1 Hydrophytic Vegetation

Hydrophytic vegetation, or a community dominated by plants with special adaptations to survive saturated or anaerobic conditions, is required for a positive wetland determination. The U.S. Fish and Wildlife Service (USFWS) prepared the “National List of Vascular Plant Species That Occur in Wetlands” in 1988 (Reed, 1988), which categorizes species based on their estimated probability of occurring in a wetland. USACE took over the task of updating this plant list (Lichvar, and Gillrich 2011, Lichvar et al. 2014). The USACE 2014 updated wetlands plant list was used for field data collection in 2016. Indicator ratings and their descriptions are as follows:

- OBL (obligate wetland) – almost always found in wetlands, rarely in uplands;
- FACW (facultative wetland) – usually found in wetlands but occasionally found in uplands;
- FAC (facultative) – commonly occurs in either wetlands or uplands;
- FACU (facultative upland) – occasionally found in wetlands, but usually occurs in uplands;
- UPL (obligate upland) – rarely found in wetlands, almost always in uplands.

Plant species with an indicator status of OBL, FACW, or FAC are considered adapted for life in saturated or anaerobic soil conditions. Such species are referred to as hydrophytic vegetation, or hydrophytes.

The presence of hydrophytic vegetation is determined by satisfying either a Dominance Test or a Prevalence Index. The Dominance Test is generally a quick way to characterize the vegetative community, however, communities with a large number of low cover species are more accurately characterized by the Prevalence Index, a weighted average of the wetland indicator status of all plant species in the community. Both methods were used when collecting field data.

If both of these indicators fail, yet the site exhibits both hydric soil and wetland hydrology (see description below), wetland scientists may examine FACU vegetation within the community for morphological adaptations indicating that it is indeed acting as a hydrophyte. Typical morphological adaptations observed in Alaska wetlands include white spruce (*Picea glauca*) with a narrow growth form, widely spaced needles, and less bushy branching; or Alaska paper birch (*Betula neoalaskana*) with multiple trunks, an “apple tree” like growth, smaller size, and a rotten core in the tree trunk. If these morphological adaptations were observed, the species may be considered FAC at the site in question, and the dominance test recalculated.

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0 PAGE 22 OF 40
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2.2.2 Wetland Soils

Hydric soils are also required for a positive wetland determination. The National Resources Conservation Service (NRCS) has defined a hydric soil as "a soil that in its undrained condition is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation" The criteria for hydric soils includes certain soil taxonomic groups that are poorly drained during the growing season, or soils that are frequently ponded or frequently flooded for long or very long durations during the growing season.

Due to anaerobic conditions, hydric soils exhibit certain characteristics that can be observed in the field. These characteristics may include the following:

- High organic content representing accumulation and slow decomposition in anaerobic conditions;
- Reduction of ferric (Fe³⁺) to ferrous iron (Fe²⁺) and consequent leaching from the soil profile, causing a greenish- or bluish-gray color (gley formation);
- Generation of hydrogen sulfide, noted by characteristic odor;
- Spots or blotches of different color interspersed with the matrix, or dominant color (mottling); and
- Dark soil colors (low chroma).

Indicators have been established by USACE to assist with identification of hydric soils. These indicators are found in the Regional Supplement and the "Field Indicators of Hydric Soils in the United States" (USDA, NRCS 2010). The absence of listed indicators, however, does not preclude the soil from being hydric. If indicators of hydrophytic vegetation and wetland hydrology are present, but hydric soils are not evident, the procedure outlined in the Regional Supplement for problematic hydric soils was followed.

2.2.3 Problematic Soils

Procedures for dealing with problematic hydric soils, that are encountered while conducting field surveys, are described in Chapter 5 of the Regional Supplement (USACE, 2007a). Few potentially problematic hydric soils were encountered within the study area. These situations are discussed in Appendix B of the 2015 Wetland Field Study Report (Alaska LNG 2015).

2.2.4 Wetland Hydrology

Wetland hydrology is the third parameter required for a positive wetland determination. The most ephemeral of the three parameters, surface water or saturation, need not be present throughout the entire year to meet the definition of wetland hydrology. According to the USACE Manual (1987), wetland hydrology is present when there is inundation or soil saturation to the surface continuously for at least five percent of the growing season in most years. Indicators of wetland hydrology include observing ponding or soil saturation, as well as evidence of previous inundation, such as dry algae on bare soil, watermarks on soils or leaves, and drainage patterns. Where positive indicators were observed, it was assumed that wetland hydrology occurs for a sufficient period of the growing season.

2.3 AERIAL INTERPRETATION (PRE-MAPPING)

Wetland and vegetation cover type boundaries for the mapping corridor were delineated on digital ortho-rectified and geo-referenced true color aerial imagery with 1.6-foot pixel resolution using the following aerial imagery:

- Alaska LNG Imagery. (0.5-foot resolution) (Paragon 2013);

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 23 OF 40

- Nikiski Area Aerial Orthophoto. (2.5-foot resolution) (Kenai Peninsula Borough 2006);
- Kenai Peninsula Borough Aerial Imagery. (2.5-foot resolution) (Kenai Peninsula Borough 2013);
- Point MacKenzie Aerial Orthophoto (0.5-meter resolution) (Matanuska Susitna Borough, MSB 2011d);
- Willow Aerial Orthophoto (1.0-foot resolution) (MSB 2011c);
- Caswell Aerial Orthophoto (1.0-foot resolution) (MSB 2011b);
- Talkeetna Aerial Orthophoto (1.0-foot resolution) (MSB 2011a);
- Healy Area Orthophoto (1.0-meter resolution) (U.S. Census Bureau 2006);
- Digital Orthophoto Quarter Quadrangles - Anderson Area (0.6-meter resolution) (NRCS 2006);
- Southern Corridor Ortho Mosaic (1.6-foot resolution) (Digital Globe 2013b);
- Northern Central Corridor Ortho Mosaic (Digital Globe 2013a);
- Quantum Aerial Imagery. (1.6-foot resolution) (Quantum Spatial 2014);
- iCubed Satellite Imagery. (1.0-meter resolution) (iCubed 2014);
- ExxonMobil aerial imagery for the Alaska Pipeline Project (0.5-meter pixel resolution; summer 2008, 2009, 2010, and 2011) (ExxonMobil 2008, ExxonMobil 2009b, ExxonMobil 2011);
- BP Exploration Alaska Inc. aerial imagery for Prudhoe Bay, Endicott, and Badami (1.0-foot pixel resolution; July 2012) (BPX 2012a, BPX 2012b, BPX 2012c); and
- ExxonMobil aerial imagery for Point Thomson (2.0 and 0.5-foot pixel resolution; July 2001/2006, and July 2009) (ExxonMobil 2001-6, ExxonMobil 2009a).

Data from the following sources was also used during the mapping process:

- USFWS, NWI digital datasets and hardcopy maps;
- Kenai Watershed Forum – Cook Inlet Wetlands for the Kenai Peninsula and the Matanuska Susitna Boroughs (Gracz 2011);
- NRCS Soil Survey digital datasets and hardcopy maps;
- Light Detection and Ranging generated topographic contours (TransCanada 2011, MSB 2011d);
- Pertinent previous studies, such as Terrestrial and Aquatic Habitat Mapping Along the Alaska Natural Gas Pipeline System (USFWS 1980), the Denali Pipeline Project, the instate Alaska Stand Alone Pipeline Project, and the Alaska Pipeline Project;
- USGS Digital Raster Graphics (e.g., topographic maps);
- Point Thomson Project wetlands mapping between Point Thomson and Badami (USACE 2012);
- Existing Geographic Information System (GIS) layers including waterbodies, contours, and roads; and
- Existing Land Status GIS layers including: State of Alaska, U.S. Bureau of Land Management, and Native allotments.

Preliminary wetland and vegetation maps were created in a Geographic Information System (GIS) platform, using a “heads-up” digitizing effort that utilized Light Detection and Ranging (LiDAR) generated topographic contours and other ancillary data such as National Wetland Inventory (NWI) and soil survey datasets. The pre-mapping process is described further in **Appendix A**. This “heads-up” process applies aerial image interpretation to delineate vector polygons of ground features. Data sources were overlaid on aerial photography and wetland and

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 24 OF 40

vegetation cover types were identified by interpreting color, texture, and landscape position, among other elements. Aerial photography clues can include dwarf or stunted trees, topography characteristics (such as swales, toe slopes and depressions), and obvious signs of inundation. This is the generally accepted wetland and deepwater habitat mapping technique employed by the USFWS personnel as part of the NWI program (Dahl et al. 2009).

The wetland and vegetation mapping effort resulted in the classification of mapping polygons as either wetland (i.e., meeting the U.S. Army Corps of Engineers and FERC's wetland delineation criteria as a wetland), other aquatic habitats (including deepwater aquatic habitats, unvegetated ponds, river channels, and other special aquatic sites as described by USACE), or non-wetland. The dominant vegetation structure (trees, shrubs, herbaceous vegetation) in wetland polygons was classified using both the Cowardin (1979) classification system and the Alaska Vegetation Classification System (Viereck et al., 1992). Within non-wetland polygons, the vegetation was classified using only the Viereck system. Both wetland and upland polygons can have up to three Viereck codes depending on the complexity of the vegetation communities and size of the polygon. For this vegetation field study, the term "upland" refers to any non-wetland polygon. It should be noted that although a polygon was classified as "upland" during wetland mapping, that does not mean that the vegetation within the polygon is upland vegetation. Mesic vegetation communities are common in polygons that do not meet the wetland criteria, as defined by the U.S. Army Corps of Engineers methods. Upland polygon vegetation classification was done within the same 2000 foot field survey corridor used for wetland mapping.

All wetlands and vegetation were mapped at a scale of 1:2,400 (1 inch to 200 feet) or finer. Lakes, ponds and rivers were mapped at a scale of 1:1,200 (1 inch to 100 feet). Larger rivers and streams were delineated as polygons. Smaller streams, those with bankfull widths of approximately 10 feet or less, were mapped as lines.

2.4 FIELD TARGET SELECTION

Field targets (FTs) were selected from the pre-mapping based on changes in the wetlands types, aerial vegetation signatures, Cowardin classification, and NRCS soil classification. The primary focus of the pre-selected FTs was to characterize specific wetland and vegetation types which represent all similar types in the region and to identify wetland/upland boundaries by selecting paired plots. Field targets were used to confirm areas where wetland subject matter experts had high confidence in their aerial interpretation, and were used to confirm or correct wetland boundary locations. Field targets were also placed in low-confidence areas to provide field data where the photo signatures or landscape features were not clearly indicative of wetland or upland. Field targets spanned the full range of Cowardin and HGM classes within the Project mapping corridor.

Field targets were evaluated during the field season provided there was land access. If a FT could not be accessed, a new FT was located on a nearby accessible parcel in an area with similar aerial photography vegetation signatures and site conditions as the original FT.

2.5 WETLAND AND VEGETATION FIELD DATA COLLECTION

The 2016 wetland and vegetation field studies were conducted from mid-May through late July, and focused on field targets from the west side of Cook Inlet (MP 760) to the northern most field target (MP 56) in the Beaufort Coastal Plain.

2.5.1 Crew Composition

Two three-person crews collected data in 2016. Each crew consisted of a field crew chief, an assistant wetland scientist / Global Positioning System (GPS) technician, and a wilderness safety

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 25 OF 40

specialist. Each position had defined roles and responsibilities in the field and required a specific level of technical expertise.

Field crew chiefs were required to have proven field experience and a strong familiarity with wetland science. They were in charge of the field crews and ultimately responsible for data collection quantity and quality; daily reporting; crew health and safety; and data submittal on a daily or near-daily basis. Field crew chiefs also planned the workday for the crew, coordinated with Project management, and addressed any technical issues.

Wetland scientists / GPS technicians were required to be experienced in field work, familiar with wetland science principles, and to have attended a wetland delineation training course. They assisted in the wetland field survey with appropriate supervision by the field crew chief. The wetland scientist / GPS technician was also responsible for electronic data collection at each site using a Panasonic tablet with Trimble R1 GPS receiver. They worked closely with field crew chiefs to verify that the data was accurate and complete, and were also responsible for the maintenance and care of the GPS equipment, managing the crew's electronic data, and ensuring data files were uploaded to the Project's SharePoint site on a daily or near-daily basis.

Wilderness safety specialists were professionally trained in firearms proficiency, Alaska wilderness survival, and first aid / cardiopulmonary resuscitation. They were responsible for protecting the field crew from aggressive wildlife encounters, and assisting the field crew chief in the communication of and compliance with all Project health and safety policies.

2.5.2 Wetland and Vegetation Field Protocols

Wetland Determination Field Survey Protocols (**Appendix A**), and Vegetation Field Survey Protocols (**Appendix B**) have been developed and were provided to the USACE and the FERC (USACE 2010, FERC 2015). As described in the protocols, data was collected as a Determination Point (DP), where a hard copy Wetland Determination Form (WDF) was completed, or an Observation Point (OP), in which notes and photographs were used to describe wetland and vegetation status and the community. All wetlands and waterbodies were classified using Cowardin codes, and vegetation was classified using Viereck codes. Vegetation classification data (Level I, II, and III of the Alaska Vegetation Classification System, Viereck et al., 1992) were recorded on each Wetland Determination Data Form.

The field crew chief examined vegetation and topography to determine appropriate sampling location(s) at each FT. Although FTs were used to guide the location of field crews, field crew chiefs were allowed discretion in the number, type (DP or OP), and final location of data points. This flexible approach allowed scientists to collect data in locations that best described the target community, allowed them to collect additional data as field conditions warranted, and enhanced efficiency by allowing scientists to collect observational data if a similar community was thoroughly described nearby. Wetland scientists used their best professional judgment and collected appropriate field data to adequately revise the wetland and vegetation pre-mapping. Typically, a DP was completed at each pre-determined field target, and OPs, and additional DPs if needed, were completed in the surrounding area.

Field crew chiefs maintained field logbooks and hardcopy field maps with aerial photography, field targets, and pre-mapped wetland and vegetation boundaries and classifications. The wetland scientist / GPS technician entered some of the data into electronic data forms specific to DPs and OPs. Daily field quality assurance/quality control (QA/QC) procedures are described in Section 2.6. Hardcopy and electronic data forms, field notes, maps, GPS data, and site photos were uploaded daily to the Project SharePoint website.

Regional vegetation guides were used to identify plants including: Flora of Alaska and Neighboring Territories (Hulten 1968), Wetland Sedges of Alaska (Tande and Lipkin 2003), Alaska Trees and Shrubs (Viereck and Little 2007), and Willows of Interior and Southcentral Alaska (Collet 2004, 2010). Non-vascular plants (lichens, mosses, liverworts) and fungi were not

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 26 OF 40

surveyed or recorded as part of this effort. Rare and sensitive plants and invasive species were recorded when encountered, but there was no specific effort to search for them.

2.6 QUALITY ASSURANCE / QUALITY CONTROL

Each crew member was responsible for collecting and recording clear and accurate data. The field crew chief reviewed all hardcopy and electronic data forms and completed a QA/QC checklist before leaving each site.

The field crew manager ensured that all data files were uploaded to the Project website. These transmitted files were then downloaded and reviewed by office-based data management staff. A wetland and vegetation subject matter expert checked each hardcopy data sheet and electronic data form for quality and consistency, as it was received. If problems arose, the field crew was notified promptly to ensure that any data quality issues were corrected immediately.

Wetland and vegetation mapping was also reviewed by experienced scientists both after the initial pre-mapping, and after map revisions were complete.

2.7 MAP REVISIONS

The wetland and vegetation pre-mapping was updated based on field reference data collected throughout the 2016 field season. Map revisions included refinement of wetland/non-wetland boundaries and classifications (HGM, Cowardin, Viereck, Inlet/outlet) following procedures outlined in the 2016 Wetland Determination Field Survey Protocols (**Appendix A**) and Vegetation Field Survey Protocols (**Appendix B**). Map updates referenced 2016 GPS data (field plot locations), Wetland Determination Data Forms, site photographs, logbook field notes, and notated field maps as primary data sources. Map revisions were made with post-processed GPS data to ensure positional accuracy of the field data and field data forms that passed the QA/QC process (Section 2.6).

Generally, the wetland and vegetation pre-mapping revision process involved:

- Overlaying exported spatial data for all field reference data points on an ortho-rectified photographic base layer in the GIS environment;
- Compiling electronic copies of all field notes, sketches, and photographs associated with above points; and
- Using this data to update polygon attributes (wetland/non-wetland classifications) and refine map delineations as needed in the GIS environment. This process is described in detail in the 2016 Wetland and Vegetation Field Survey Protocols (**Appendix A and B**).

In the process of incorporating field reference data into the wetlands and vegetation mapping, updates were not necessarily limited to the polygon intersected by the field reference data point. Rather, field data were used to “recalibrate” the mapper’s understanding of photo signatures in context with landscape position in that portion of the map (generally within one half mile of the data collection site). Extrapolating field reference data to adjacent areas is a process that incorporates information derived from field notes (concerning the surrounding area) in addition to a recalibration of the mapper’s eye to a particular spectral signature (combination of color, tone, shadow, texture, etc.) when viewed in context with contour data and landscape position.

Examples of extrapolating field reference data to adjacent areas in the wetlands mapping are included in Appendix D of the 2015 Wetland Determination Field Study Report (Alaska LNG 2015).

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 27 OF 40

2.8 JURISDICTIONAL DETERMINATION

The USACE regulates wetlands and other Waters of the U.S. that are under their jurisdiction. Jurisdictional status is based on connectivity to Traditional Navigable Waters (TNW) (Rapanos v. United States and Carabell v. United States [33 U.S. Code §1251 et seq.]).

In January, 2015, the USACE reviewed the Project's identification and delineation of Waters of the U.S. from Point Thomson to Prudhoe Bay to Livengood, Alaska, and determined that there were no obvious errors in the methodology or determinations (USACE 2015). The USACE concurred that the wetland boundaries north of Livengood have been established in accordance with the USACE Manual (1987), and the 2007 Regional Supplement for Alaska (USACE 2007a) (J. Post, personal communication, January 30, 2015). This year, Alaska LNG will be requesting the USACE's concurrence for the wetland boundaries south of Livengood.

3.0 RESULTS

3.1 WETLAND AND VEGETATION FIELD DATA COLLECTION

A total of 155 FTs were selected for the 2016 field season to investigate a representative assemblage of wetlands, non-wetlands and areas of uncertainty. Criteria used in the selection of FTs are discussed in section 2.4. Due to land access restrictions, 3 of the FTs were deleted while others were moved to areas that did not have restricted access. An additional 2 FTs were added in the field, by a crew waiting for helicopter support. A total of 154 FTs were surveyed during the 2016 field season. Table 3-1 shows the number of FTs completed within each of the sub-ecoregions. Approximately 212 miles of the alignment are either physically inaccessible, or do not have an authorized right of entry agreement with the landowner. The 2016 Wetland Determination Data Forms and the Wetland and Vegetation Field Data Summary Table are provided in **Appendix C**. No data forms were collected for observation points.

Table 3-1. 2016 Completed Field Targets by Ecoregion

Ecoregion	Sub-Ecoregion	Milepost	Total Number of Field Targets Completed	Inaccessible/ No Right of Entry (miles)
Alaska Range Transition	Cook Inlet Basin	804-616	44	89.79
	Alaska Range	616-516	23	19.93
Intermontane Boreal	Tanana-Kuskokwim Lowlands	516-455, 443-430	13	12.40
	Yukon-Tanana Uplands	455-443	4	43.59
	Ray Mountains	430-257	29	24.95
	Kobuk Ridges and Valleys	257-252	0	0
Arctic Tundra	Brooks Range	252-143	32	0
	Brooks Foothills	143-62	8	7.12
	Beaufort Coastal Plain	62-0	1	14.57
Total:			154	212.35

A total of 346 field reference data points were sampled at or near the pre-selected field targets during the 2016 field season. Table 3-2 summarizes the distribution of field plots sampled in the 300 foot construction corridor, 2000 foot mainline study area and off-ROW areas outside the 2000 foot study area corridor.

Table 3-2. Field Plot Distributions in the Study Area

Plot Type	300 ft Corridor	2000 ft Corridor	Off-ROW ¹	Total Number of Field Plots Completed
Wetland Determination Data Form Plot ²	46	83	68	151
Observation Point (no data form)	39	108	87	195
Total	85	191	155	346

¹Off-ROW targets outside of the 2000 foot mainline corridor.

²Wetland Determination Data Forms also include vegetation classifications.

3.2 WETLAND AND VEGETATION MAPPING SUMMARY

The wetland and vegetation pre-mapping was revised according to the criteria summarized in Section 2.7 of this report. The 2016 final wetland delineation maps are included as **Appendix D**. The wetland acreages per ecoregion within the 2000 foot Rev C mapping corridor and off-ROW footprint will be presented in the FERC Resource Reports. Table 3-3 presents a summary of wetlands and uplands by ecoregion. Of the approximate 223,100 acres in the 2000 foot mapping corridor and off-ROW footprint, wetlands and other Waters of the U.S. comprise 122,599.3 acres or 55 percent of the total. Results are based on the Alaska Albers NAD 83 map projection.

Table 3-3. Wetlands and Waters of the U.S. by Ecoregion

Cover Type	Alaska Range Transition Ecoregion (acres)	Intermontane Boreal Ecoregion (acres)	Arctic Tundra Ecoregion (acres)	Total (acres)
Wetlands and Waters of the U.S.	26,279.6	29,222.5	67,097.2	122,599.3
Uplands	47,316.6	39,676.1	13,430.8	100,423.5
No Imagery	76.8	0	0	76.8
Total	73,673.0	68,898.6	80,528.0	223,099.6

Table 3-4 presents a summary of Level I Viereck cover types by ecoregion and **Appendix E** contains vegetation classification maps of the corridor.

Table 3-4. Vegetation Cover Types by Ecoregion

Cover Type	Alaska Range Transition Ecoregion (acres)	Intermontane Boreal Ecoregion (acres)	Arctic Tundra Ecoregion (acres)	Total (acres)
Forest ¹	43,677.6	33,861.6	5,301.3	82,840.5
Scrub ¹	15,919.8	27,385.2	26,104.6	69,409.5
Herbaceous ¹	4,325.5	4,754.8	40,433.1	49,513.4
No Vegetation (Disturbed ²)	1,636.6	2,200.1	2,573.2	6,409.9
No Vegetation (Water ³)	7,960.1	690.6	5,984.7	14,635.6
No Vegetation (Uplands)	76.6	6.3	131.1	214
No Imagery	76.8	0	0	76.8
Total	73,673.0	68,898.6	80,528.0	223,099.6

1 - Based on The Alaska Vegetation Classification (Viereck et al., 1992).

2 - Areas of human disturbance.

3 - Includes Waters and Probable Waters of the U.S.

The study area contains all 30 of the Level III cover types described by Viereck et al. (1992). Table 3-5 provides a summary of the cover types, including representative species.

Table 3-5. Vegetation Cover Types Occurring within the Study Area

Cover Type	Code	General Location	Representative Plants
Forest			
Closed needleleaf (conifer) forest; 60 to 100% canopy	I A 1	Closed white and black spruce forests are found on floodplain terraces and uplands throughout interior Alaska.	White spruce (<i>Picea glauca</i>) and black spruce (<i>P. mariana</i>).
Open needleleaf (conifer) forest; 25 to 60% canopy	I A 2	Open white and black spruce forest is very common in lowland and upland areas of interior Alaska. White spruce forest also occurs near the tree line in the Brooks Range.	Tamarack (<i>Larix laricina</i>), white spruce, black spruce, <i>Vaccinium</i> spp., and feathermosses.
Needleleaf (conifer) woodland; 10- to 25% canopy	I A 3	Black spruce woodland is common on floodplains, slopes, and ridges throughout interior Alaska. White spruce and mixed spruce woodland is common at the tree lines of interior Alaska and the Brooks Range.	White spruce, black spruce, Alaska paper birch (<i>Betula neoalaskana</i>), <i>Vaccinium</i> spp., and feathermoss.
Closed broadleaf forest; 60 to 100% canopy	I B 1	Typically occurs in interior Alaska. Balsam poplar communities occur frequently in the floodplains and in isolated stands on the north slope of the Brooks Range. Alaska paper birch and quaking aspen are common in uplands, especially on south-facing slopes.	Balsam poplar (<i>Populus balsamifera</i>), Alaska paper birch, and quaking aspen (<i>P. tremuloides</i>).
Open broadleaf forest; 25 to 60% canopy	I B 2	Typically occurs in interior and northern Alaska. Alaska paper birch and quaking aspen forest can be found on well-drained, steep sites. Balsam poplar occurs as open clumps near the tree line and as isolated groves on the north slope of the Brooks Range.	Alaska paper birch, quaking aspen, balsam poplar, and ericaceous shrubs.
Broadleaf woodland; 10 to 25% canopy	I B 3	Alaska paper birch woodland typically occurs on dry sites in northern interior Alaska.	Alaska paper birch.
Closed mixed forest; 60 to 100% canopy	I C 1	Typically occurs in interior Alaska. White spruce mixed forests favor warmer, dry slopes and floodplains while black spruce mixes more commonly occur in colder, wetter sites.	White spruce, black spruce, Alaska paper birch, quaking aspen, and balsam poplar.
Open mixed forest; 25 to 60% canopy	I C 2	Typically occurs in upland sites in interior Alaska.	White spruce, black spruce, and Alaska paper birch.
Mixed woodland, 10 to 25% canopy	I C 3	Occurs in dry upland sites in interior Alaska.	White spruce, black spruce, and Alaska paper birch.

Cover Type	Code	General Location	Representative Plants
Scrub			
Closed dwarf tree scrub; trees <3 meters (m) tall; 60 to 100% canopy	II A 1	Closed dwarf blackspruce scrub is uncommon but may occur in very cold and wet soils in interior Alaska.	Blackspruce.
Open dwarf tree scrub; trees <3 m tall; 25 to 60% canopy	II A 2	Dwarf blackspruce scrub is typically found in very cold and wet soils in Interior Alaska.	Blackspruce, Alaska paperbirch, bog Labrador-tea (<i>Rhododendrum groenlandicum</i>), and cloudberry (<i>Rubus chamaemorus</i>).
Dwarf tree scrub woodland; trees <3 m tall; 10 to 25% canopy	II A 3	Dwarf blackspruce scrub woodland is typically found in wet sites near tree line in Interior Alaska.	Blackspruce.
Closed tall scrub; shrubs ≥1.5 m tall at maturity with 75 to 100% canopy	II B 1	Occur throughout most of Alaska on stream banks and floodplains.	Willow (<i>Salix spp.</i>), alder (<i>Alnus spp.</i>), resin birch (<i>Betula glandulosa</i>), and soapberry (<i>Shepherdia canadensis</i>).
Open tall scrub; shrubs ≥1.5 m tall at maturity with 25 to 75% canopy	II B 2	Typically occur on floodplains, drainages, and near and above the tree line in Interior Alaska.	Willow, alder, resin birch, and soapberry.
Closed low scrub; shrubs 20 centimeters (cm) to 1.5 meter tall at maturity	II C 1	Typically occur on floodplains and river terraces and steep slopes near the tree line in Interior and northern Alaska. Low willow shrub communities also occur in moist protected drainages and around lakes and ponds on the Arctic Coastal Plain.	Willow, alder, resin birch, and dwarf birch (<i>Betula nana</i>).
Open low scrub; shrubs 20 cm to 150 cm tall at maturity	II C 2	Shrubby tussock wetlands and tundra occupy vast areas of northern Alaska and also occur in lowlands and alpine areas of the Interior. Low willow communities occur in the uplands of northern and Interior Alaska.	Willow, alder, birch (<i>Betula spp.</i>), sedge, and ericaceous shrubs.
Dryas dwarf scrub; <20 cm tall at maturity	II D 1*	Common on windswept alpine sites throughout the northern two-thirds of the state and occasionally is present on well-drained, exposed arctic lowland sites.	Willow, sedge, and lichen
Ericaceous dwarf scrub; < 20 cm tall at maturity	II D 2*	Commonly occur in alpine areas and on slopes and windswept areas of interior, northern and western Alaska.	Ericaceous shrubs such as black torpedoberry (<i>Arctous alpine</i>), lingonberry (<i>Vaccinium vitis-idaea</i>), bog blueberry (<i>V. uliginosum</i>), narrowed-leaved Labrador-tea (<i>Rhododendron tomentosum</i>), black crowberry (<i>Empetrum nigrum</i>) and white arctic mountain-heather (<i>Cassiope tetragona</i>).

Cover Type	Code	General Location	Representative Plants
Willow dwarf scrub; < 20 cm tall at maturity	II D 3*	Common in alpine areas and other windswept tundra settings throughout the state (except Southeast) occurring in habitats such as snowbeds, wet high-alpine drainage channels, gelifluction lobes, windblown high-center polygon summits, stabilized sand dunes, mesic slopes, exposed slopes and ridges.	Dwarf willows (polar willow (<i>Salix polaris</i>), net-vein willow (<i>S. reticulata</i>), skeleton-leaf willow (<i>S. phlebophylla</i>), round-leaf willow (<i>S. rotundifolia</i>), arctic seashore willow (<i>S. ovalifolia</i>), and arctic willow (<i>S. arctica</i>)) and other dwarf shrubs (black crowberry, clubmoss mountain-heather (<i>Cassiope lycopodioides</i>)), <i>Dryas</i> spp., bog blueberry, lingonberry, and narrowed-leaved Labrador-tea.
Herbaceous			
Dry graminoid herbaceous	III A 1	Typically found on dry slopes at low elevation and on sub-alpine and alpine slopes and plateaus of Interior Alaska.	Grass (<i>Festuca</i> spp., <i>Poa</i> spp.) ericaceous shrubs, and willow.
Mesic graminoid herbaceous	III A 2	Tussock tundra is widespread in the Arctic foothills and parts of the Arctic Coastal Plain and is also found along floodplains, valley bottoms, and on upland slopes throughout Alaska.	Tussock cottongrass (<i>Eriophorum vaginatum</i>), bluejoint grass (<i>Calamagrostis Canadensis</i>), sedge, alder, and willow.
Wet graminoid herbaceous (emergent); shrubs provide <25% cover	III A 3	Common on Arctic lowlands and in alpine areas.	Sedge, cottongrass (<i>Eriophorum</i> spp.), grass (<i>Festuca</i> spp., <i>Poa</i> spp.), and pendant grass (<i>Arctophila fulva</i>), willow.
Dry forb herbaceous	III B 1	Sparsely vegetated communities typically found in alpine areas and rocky, well-drained sites throughout Alaska.	Dwarf fireweed (<i>Chamerion latifolium</i>), dwarf alpine hawkbeard (<i>Crepis nana</i>), wild sweet pea (<i>Hedysarum mackenzii</i>), and <i>Saxifraga</i> spp.
Mesic forb herbaceous	III B 2	Primarily occur on rich, sheltered, well-drained sites with deep soils.	Narrow-leaf fireweed (<i>Chamerion angustifolium</i>), bellflowers (<i>Campanula</i> spp.), wild celery (<i>Angelica</i> spp.), lupin (<i>Lupinus</i> spp.), wormwood (<i>Artemisia</i> spp.), sweet pea (<i>Lathyrus</i> spp.), <i>Anemone</i> spp., larkspur (<i>Delphinium</i> spp.), and larkspur-leaf monkshood (<i>Aconitum delphinifolium</i>). Sedges, grasses, ferns and mosses also are common.
Wet forb herbaceous (emergent)	III B 3	Occurs in permanently flooded sites (usually with 15 – 100 centimeters of water), including sloughs, oxbow lakes, sluggish rivers and lake margins.	Water horsetail (<i>Equisetum fluviatile</i>), buckbean (<i>Menyanthes trifoliata</i>), purple marshlocks (<i>Comarum palustre</i>), and <i>Potamogeton</i> spp.
Mosses	III C 1	Wet bryophyte communities reportedly occur in the southern (high precipitation) part of the state, while dry bryophytes are most common on windswept coarse mineral substrates (sand dunes and gravelly slopes).	Liverworts such as <i>Gymnocolea acutiloba</i> , <i>Scapania paludosa</i> , and <i>Nardia</i> spp. and mosses such as <i>Racomitrium</i> spp.
Lichens	III C 2	Common in windblown rocky sites with little or no soil development primarily in alpine regions throughout Alaska.	Crustose lichen.

Cover Type	Code	General Location	Representative Plants
Freshwater Aquatic herbaceous	III D 1	Widely distributed throughout Alaska in ponds, sloughs, and oxbow lakes.	Pond lily (<i>Nuphar polysepalum</i>), maretail (<i>Hippuris vulgaris</i>), buttercup (<i>Ranunculus</i> spp.), burreed (<i>Sparganium</i> spp.), water milfoil (<i>Myriophyllum spicatum</i>), pondweed (<i>Potamogeton</i> spp.), and aquatic moss (<i>Fontinalis neomexicana</i>).
Brackish water aquatic herbaceous	III D 2	Common in brackish ponds in coastal marshes throughout the state.	Fourleaf maretail (<i>Hippurus tetraphylla</i>), sago pondweed (<i>Stuckenia pectinate</i>), spiral ditchgrass (<i>Ruppia cirrhosa</i>) and homed pondweed (<i>Zannichellia palustris</i>).
Marine aquatic herbaceous	III D 3	Occur in protected bays, inlets, and lagoons with clear water along the Alaska coast as far north as the Seward Peninsula.	Eelgrass and various species of marine algae.

Source: The Alaska Vegetation Classification (Viereck et al., 1992).

*In some instances, dwarf scrub vegetation could only be classified to Viereck Level II.

Waterbody crossings occurring along the Project Rev C centerline are presented in Table 3-6, organized by ecoregion and HUC 8 Sub-basin name. A total of 687 intermittent, lower perennial, and upper perennial stream and river crossings were mapped within the approximately 804 mile length of the Project route.

Table 3-6. Preliminary Stream Crossings, Along the Project Route, by Ecoregion

Ecoregion/HUC 8 Name	Total Number of Streams by Stream Classification			
	Tidal (R1) Crossing	Lower Perennial (R2) Crossing	Upper Perennial (R3) Crossing	Intermittent (R4) Crossing
Alaska Range Transition Ecoregion				
Upper Kenai Peninsula	0	0	0	5
Redoubt-Trading Bays	0	1	4	17
Lower Susitna River	0	3	21	72
Yentna River	0	1	0	3
Chulitna River	0	1	28	45
Nenana River	0	0	12	49
Intermontane Boreal Ecoregion				
Nenana River	0	1	6	12
Lower Tanana River	0	1	0	0
Tolovana River	0	4	5	31
Ramparts	0	1	4	87
Yukon Flats	0	0	1	15
Kanuti River	0	0	1	5
South Fork Koyukuk River	0	0	11	28
Upper Koyukuk River	0	0	0	6
Arctic Tundra Ecoregion				
Upper Koyukuk River	0	0	26	81
Middle Fork-North Fork Chandalar Rivers	0	0	6	7
Sagavanirktok River	0	13	6	54
Lower Colville River	0	0	0	1
Kuparuk River	0	1	1	10
Total:		27	132	528
Grand Total:				687

4.0 ACRONYMS AND ABBREVIATIONS

ADNR	Alaska Department of Natural Resources
CFR	Code of Federal Regulations
DP	Determination Point
FAC	Facultative
FACU	Facultative upland
FACW	Facultative wetland
FERC	Federal Energy Regulatory Commission
FT	Field Target
GIS	Geographic Information System
GPS	Global Positioning System
GTP	Gas Treatment Plant
HGM	Hydrogeomorphic
HUC	Hydrologic Unit Code
LIDAR	Light Detection and Ranging
LNG	Liquefied Natural Gas
MP	Milepost
MSB	Matanuska Susitna Borough
NRCS	National Resources Conservation Service
NTCHS	National Technical Committee for Hydric Soils
NWI	National Wetland Inventory
OBL	Obligate wetland
OP	Observation Point
Project	Alaska LNG
PBU	Prudhoe Bay Unit
PEM	Palustrine emergent
PFO	Palustrine forested
PSS	Palustrine scrub shrub
PTU	Point Thomson Unit
QA/QC	Quality Assurance/Quality Control
Rev	Revision
ROW	Right-of-Way
TNW	Traditional Navigable Water
U.S.	United States
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDF	Wetland Determination Form

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 36 OF 40

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	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 37 OF 40

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		PAGE 38 OF 40

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	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0 PAGE 39 OF 40
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	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
		PAGE 40 OF 40

6.0 APPENDICES

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0

APPENDIX A – 2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS

ALASKA LNG PROJECT	DOCKET NO. CP17-____-000 RESOURCE REPORT NO. 2 APPENDIX G – WETLAND FIELD SURVEY REPORTS	Doc No: USAI-EX-SRREG-00- 000004-000 DATE: APRIL 14, 2017 REVISION: 0
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**APPENDIX G.3 2016 WETLAND AND VEGETATION FIELD STUDY
REPORT
(USAI-P1-SRZZZ-00-000016-000)**



2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS

USAI-UR-SPFLD-00-000002-000

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	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1
		PAGE 1 OF 18

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TABLE OF CONTENTS

1.0	PURPOSE AND SCOPE	4
1.1	PROJECT DESCRIPTION	4
2.0	INTRODUCTION.....	5
2.1	OBJECTIVES.....	5
2.2	PROJECT AREA	5
3.0	METHODS	8
3.1	OVERVIEW	8
3.2	WETLAND PRE-MAPPING.....	8
3.3	FIELD TARGET SELECTION	10
3.4	WETLAND FIELD DATA COLLECTION	10
3.5	MAP REVISIONS	10
3.6	WETLAND FUNCTIONAL ASSESSMENT.....	11
3.7	JURISDICTIONAL DETERMINATION	12
3.8	DATA RECORDING AND PROCESSING	12
3.9	QUALITY ASSURANCE / QUALITY CONTROL	12
3.10	REPORTING.....	13
4.0	FIELD STUDIES EXECUTION	14
5.0	ACRONYMS AND ABBREVIATIONS	15
6.0	REFERENCES.....	16
7.0	APPENDICES.....	18
	Appendix A – Wetland Determination Data Form – Alaska Region	
	Appendix B – Wetland Survey Gear List	
	Appendix C – QA/QA Checklist	

LIST OF FIGURES

Figure 2-1. Ecoregions within the 2016 Alaska LNG Study Area.....	7
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Note – All pipeline routing and/or facility siting information described in this document should be considered preliminary and subject to change.

	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1
		PAGE 4 OF 18

1.0 PURPOSE AND SCOPE

1.1 PROJECT DESCRIPTION

The Alaska Gasline Development Corporation, BP Alaska LNG LLC, ConocoPhillips Alaska LNG Company, ExxonMobil Alaska LNG LLC, and TransCanada Alaska Midstream LLP (a wholly-owned affiliate of AGDC, and with AGDC, collectively referred to herein as “AGDC”) (Applicants) plan to construct one integrated liquefied natural gas (LNG) Project (Project) with interdependent facilities for the purpose of liquefying supplies of natural gas from Alaska, in particular from the Point Thomson Unit (PTU) and Prudhoe Bay Unit (PBU) production fields on the Alaska North Slope (North Slope), for export in foreign commerce and opportunities for in-state deliveries of natural gas.

In accordance with 18 CFR 157.21(f)(9), the Applicants are submitting the enclosed response to issues raised during scoping. This response covers written comments received by the Federal Energy Regulatory Commission (FERC) from March 4, 2015 to December 4, 2015 and comments made during FERC scoping meetings in October and November 2015. Due to the large number of comments received, and consistent with FERC direction and practice, the comment topics have been grouped into major themes with associated responses. The responses indicate how the Project is addressing or will address the comment themes, and provides cross references to content in Draft Resource Reports, where applicable.

Alaska LNG™	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1
		PAGE 5 OF 18

2.0 INTRODUCTION

Wetland determination surveys will be conducted for Alaska LNG to verify the pre-field mapping wetland types and boundaries of all Waters of the United States (U.S.), including wetlands, within the defined corridor and in specific areas along the Project route. The 2016 field surveys will focus on previously unmapped or field verified sections of the alignment, as well as off right-of-way (ROW) areas.

All Waters of the U.S. are regulated by the U.S. Army Corp of Engineers (USACE) under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. All projects, as part of the Section 404 permitting process, must avoid impacts to wetlands wherever possible, minimize impacts to wetlands to the maximum extent practicable, and compensate for all unavoidable wetland impacts.

Results of the wetland surveys will facilitate the eventual evaluation of project-related direct, indirect, and cumulative impacts under the Federal Energy Regulatory Commission (FERC) Resource Report 2 (Water Use and Quality), the National Environmental Policy Act (NEPA), and Section 404 and Section 10 permits administered by the USACE.

This document presents the wetland determination field survey protocols that will be used during the 2016 field season. It discusses the protocols used in both the field and office for delineating the boundaries of areas that are regulated by USACE and may be impacted by the proposed project.

2.1 OBJECTIVES


The main objectives for the Alaska LNG 2016 wetland field season are:

- Complete wetland surveys in the vicinity of the pre-selected field targets;
- Collect data at field-selected observation points and at additional wetland determination points where necessary to adequately update the field maps; and
- Update the pre-field wetland mapping based on results of the field data.

2.2 PROJECT AREA

The Alaska LNG route passes through three ecoregions with nine sub-ecoregions (Figure 2-1), as described by Nowacki et al. (2001):

- Alaska Range Transition Ecoregion
 - Cook Inlet Basin Sub-Ecoregion
 - Alaska Range Sub-Ecoregion
- Intermontane Boreal Ecoregion
 - Tanana-Kuskokwim Lowlands Sub-Ecoregion
 - Yukon-Tanana Uplands Sub-Ecoregion
 - Ray Mountains Sub-Ecoregion
 - Kobuk Ridges and Valleys Sub-Ecoregion
- Arctic Tundra Ecoregion
 - Brooks Range Sub-Ecoregion

	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1
		PAGE 6 OF 18

- Brooks Foothills Sub-Ecoregion
- Beaufort Coastal Plain Sub-Ecoregion

Ecoregions are defined as a unit of land or water with a geographically distinct compilation of species, communities, and environmental conditions (World Wildlife Fund 2015). The Alaska LNG corridor begins in the Cook Inlet Basin at the LNG Facility in Nikiski, on the Kenai Peninsula, and continues through the Alaska Range, the Tanana-Kuskokwim Lowlands, Yukon-Tanana Uplands, Ray Mountains, Kobuk Ridges and Valleys, and then up through the Brooks Range and Brooks Foothills. The study area corridor continues north into the Beaufort Coastal Plain reaching Deadhorse, Alaska before bearing east to Point Thompson and the PTU production fields. Ecoregion descriptions are presented in the 2015 Vegetation Study Report (Alaska LNG 2015).

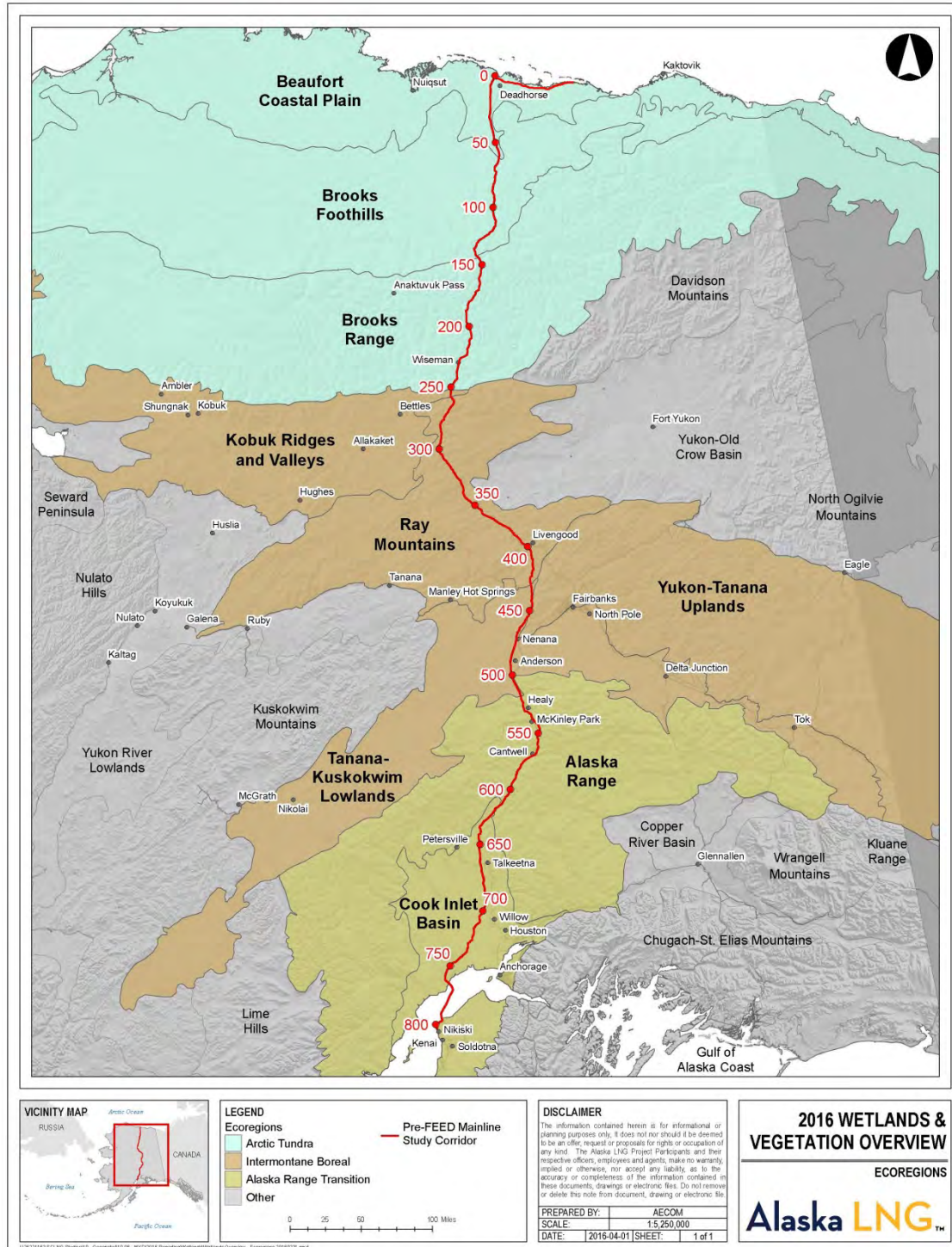
The wetlands survey area for the Project is divided into two corridors: A wetland mapping corridor and a field survey corridor. The mapping corridor has been preliminarily established as a 2,000 foot corridor (1,000 feet on either side of the proposed alignment centerline). This mapping corridor width may be modified, with the approval of USACE, to exclude terrain features such as steep mountain slopes or lands on the far side of rivers, which are not under consideration for use. All wetlands and waterbodies will be mapped within the mapping corridor using aerial photograph interpretation. The smaller field survey corridor is 300-feet-wide (150-feet on each side of the proposed alignment centerline) and centered within the mapping corridor. Field work will generally be concentrated within the field survey corridor, or within an off-ROW footprint, ensuring that the wetland field work occurs near areas most likely to be disturbed by the proposed project.


The Alaska LNG field survey area is divided into eight geographic spreads for planning purposes:

- Cook Inlet to Nikiski (IN), Mainline MP 792-804;
- Trapper Creek to Cook Inlet (TI), MP 664.5-765;
- Healy to Trapper Creek (HT), MP 525-664.5;
- Livengood to Healy (LH), MP 403.5-525;
- Yukon River to Livengood (YL), MP 357-403.5;
- Atigun Pass to Yukon River (AY), MP 169-357;
- Prudhoe Bay to Atigun Pass (PA), MP 0-169; and
- Point Thomson to Prudhoe Bay (PP), PT Pipeline milepost (MP) 0-58.

The 2016 field season will focus on areas along the Project route from the Brooks Foothills to the Cook Inlet Basin.

Figure 2-1. Ecoregions within the 2016 Alaska LNG Study Area



	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1
		PAGE 8 OF 18

3.0 METHODS

3.1 OVERVIEW

The USACE defines wetlands as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.” Wetlands are considered jurisdictional “if the wetland, either alone or in combination with similarly situated lands in the region, significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as ‘navigable.” (Rapanos v. United States and Carabell v. United States [33 U.S. Code §1251 et seq.]) (Stonestreet et al. 2009). Other aquatic habitats under the jurisdiction of the USACE include deepwater aquatic habitats, unvegetated ponds, river channels, and other special aquatic sites as described by the USACE. Uplands are non-wetland areas that are neither deepwater aquatic habitats, nor other special aquatic sites.

All wetlands and other Waters of the U.S. in the preliminary Alaska LNG corridor will be delineated and classified using standard National Wetland Inventory (NWI) codes as described in Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979). Cowardin classifies wetlands and aquatic habitats by system, subsystem, class, subclass, and water regime and is based on hydrologic setting (riverine, lacustrine, estuarine, palustrine), vegetation structure (forested, scrub-shrub, emergent, aquatic bed), and water regime (saturated, temporarily flooded, seasonally flooded, semi-permanently flooded, etc.).


One deviation from standard NWI protocols for this project will be the use of two non-wetland categories. One category will include all vegetated uplands. The other will be labeled “Disturbed/Fill” and include uplands that have been impacted by human development, including all roads, gravel pads, buildings, and farmland.

Standard methods are used to delineate wetlands for large linear projects in Alaska. The protocols comprise a three-phased iterative approach, including: 1) wetland pre-mapping relying primarily on aerial photo interpretation; 2) collection of ground reference data at pre-determined field targets; and 3) revision of wetland pre-mapping based on results of field efforts.

3.2 WETLAND PRE-MAPPING

The wetland pre-mapping has been completed for the preliminary Alaska LNG route (Rev B) corridor. Wetland boundaries were delineated on digital ortho-rectified and geo-referenced true color aerial photography with 1.6-foot pixel resolution using the following aerial imagery:

- Alaska LNG Imagery. (0.5-foot resolution) (Paragon 2013);
- Nikiski Area Aerial Orthophoto. (2.5-foot resolution) (Kenai Peninsula Borough 2006);
- Kenai Peninsula Borough Aerial Imagery. (2.5-foot resolution) (Kenai Peninsula Borough 2013);
- Point MacKenzie Aerial Orthophoto (0.5-meter resolution) (Matanuska Susitna Borough, MSB 2011d);
- Willow Aerial Orthophoto (1.0-foot resolution) (MSB 2011c);
- Caswell Aerial Orthophoto (1.0-foot resolution) (MSB 2011b);
- Talkeetna Aerial Orthophoto (1.0-foot resolution) (MSB 2011a);
- Healy Area Orthophoto (1.0-meter resolution) (U.S. Census Bureau 2006);

	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1
		PAGE 9 OF 18


- Digital Orthophoto Quarter Quadrangles - Anderson Area (0.6-meter resolution) (NRCS 2006);
- Southern Corridor Ortho Mosaic (1.6-foot resolution) (Digital Globe 2013b);
- Northern Central Corridor Ortho Mosaic (Digital Globe 2013a);
- Quantum Aerial Imagery. (1.6-foot resolution) (Quantum Spatial 2014);
- iCubed Satellite Imagery. (1.0-meter resolution) (iCubed 2014);
- ExxonMobil aerial imagery for the Alaska Pipeline Project (0.5-meter pixel resolution; summer 2008, 2009, 2010, and 2011) (ExxonMobil 2008, ExxonMobil 2009b, ExxonMobil 2011);
- BP Exploration Alaska Inc. aerial imagery for Prudhoe Bay, Endicott, and Badami (1.0-foot pixel resolution; July 2012) (BPX 2012a, BPX 2012b, BPX 2012c); and
- ExxonMobil aerial imagery for Point Thomson (2.0 and 0.5-foot pixel resolution; July 2001/2006, and July 2009) (ExxonMobil 2001-6, ExxonMobil 2009a).

Data from the following sources was also used during the mapping process:

- USFWS, NWI digital datasets and hardcopy maps;
- Kenai Watershed Forum – Cook Inlet Wetlands for the Kenai Peninsula and the Matanuska Susitna Boroughs (Gracz 2011);
- NRCS Soil Survey digital datasets and hardcopy maps;
- Light Detection and Ranging generated topographic contours (TransCanada 2011, MSB 2011d);
- Pertinent previous studies, such as Terrestrial and Aquatic Habitat Mapping Along the Alaska Natural Gas Pipeline System (USFWS 1980), the Denali Pipeline Project, the instate Alaska Stand Alone Pipeline Project, and the Alaska Pipeline Project;
- U.S. Geological Survey Digital Raster Graphics (e.g., topographic maps);
- Point Thomson Project wetlands mapping between Point Thomson and Badami (USACE 2012);
- Existing Geographic Information System (GIS) layers including waterbodies, contours, and roads; and
- Existing Land Status GIS layers including: State of Alaska, U.S. Bureau of Land Management, and Native allotments.

All wetland mapping was created in a GIS geodatabase, using a “heads-up” digitizing effort. This “heads-up” process applies aerial image interpretation to delineate vector polygons of ground features. This is the generally accepted wetland and deepwater habitat mapping technique employed by the U.S. Fish and Wildlife Service personnel as part of the NWI program (Dahl et al. 2009). Data sources were overlaid on aerial photography and wetland, non-wetland, and areas of uncertain wetland status were identified by interpreting color, texture, and landscape position, among other elements. Aerial photography clues can include dwarf or stunted trees, topography characteristics (such as swales, toe slopes, and depressions), and obvious signs of inundation.

All wetlands were mapped at a scale of 1:2,400 (1 inch to 200 feet) or finer. Lakes, ponds and rivers were mapped at a scale of 1:1,200 (1 inch to 100 feet). Larger rivers and streams were delineated as polygons. Smaller streams, those with bankfull widths of approximately 10 feet or less, were mapped as vector lines.

	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1
		PAGE 10 OF 18

3.3 FIELD TARGET SELECTION

Field targets were selected from the pre-mapping based on changes in the wetlands types, aerial vegetation signatures, NWI classification, and NRCS soil classification. The primary focus of the pre-selected field targets will be to characterize specific wetland types which represent all similar wetland types in the region and to identify wetland/upland boundaries by selecting paired plots. Field targets will be used to confirm areas where wetland subject matter experts have high confidence in their aerial interpretation, and will be used to confirm or correct wetland boundary locations. Field targets were also placed in low-confidence areas to provide field data where the photo signatures or landscape features were not clearly indicative of wetland or upland. The USACE may want to review and approve the 2016 field target locations that are selected to ensure that an appropriate range of representative wetlands are sampled.

Field targets may be re-evaluated based on the status of land access permissions. When necessary, new field targets will be located on nearby accessible parcels in areas with similar aerial photography vegetation signatures and site conditions as the original field targets.

3.4 WETLAND FIELD DATA COLLECTION

Wetland determinations will be made using the USACE *Wetlands Delineation Manual* (1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region* (Regional Supplement) (2007a).

In order for an area to be identified as a wetland, the following three parameters must be present:


1. Hydrophytic vegetation: The prevalent vegetation must be adapted to areas of saturated or inundated soils.
2. Hydric soils: The soil must be classified as hydric or possess characteristics that are associated with reducing soil conditions.
3. Wetland hydrology: The area must be inundated or saturated at some time during the growing season.

Field targets will be accessed via existing highways and secondary roads where available. A helicopter will be required to access remote sites. A Global Positioning System (GPS) device will be used to locate sites and to collect coordinates. At each field target, a USACE *Wetland Determination Data Form – Alaska Region* (**Appendix A**) will be used to determine if the site is a wetland, other Water of the U.S., or upland. All wetlands and waterbodies will be delineated and classified using NWI codes. The GPS device will also be used to collect limited field data on an electronic form that will be developed for the project.

Field crews will also collect qualitative wetland data at observation points and establish additional field targets and complete *Wetland Determination Data Forms* where necessary, and will not be limited by the pre-selected field targets. The field crews will identify changes in wetland types or wetland/upland boundaries not easily identified on the aerial photography. Wetland scientists will use their best professional judgment and collect appropriate field data to adequately revise the wetland pre-mapping. A detailed wetland field survey gear list is provided in **Appendix B**.

3.5 MAP REVISIONS

As wetlands field data (i.e., GPS data, Wetland Determination Forms, Vegetation Classification Forms for upland sites, site photographs, logbooks, field maps) becomes available, the field data will be downloaded in the office and plotted on the base maps of the route. The location of each plot will be attributed with the information collected in the field. This allows the creation of a reference dataset linking an aerial photography signature to a wetland status and vegetation type. This reference dataset will be used to finalize the mapping of the 2,000-foot corridor which could

	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1
		PAGE 11 OF 18

include adjusting boundaries and wetland classifications such as hydrogeomorphic (HGM) and Cowardin codes.

Generally, the wetland pre-mapping revision process involves:

- Exporting spatial data for all field targets and photo points from the Alaska LNG database;
- Compiling electronic copies of all notes, sketches, and photographs associated with above points; and
- Using this data in a GIS platform to update files through heads-up digitizing, or modifying the initial map on screen as described in Section 3.2 of the Wetland Determination Field Survey Protocols.


3.6 WETLAND FUNCTIONAL ASSESSMENT

Wetlands are known to provide a variety of ecological functions depending on the location and type of wetland. At sites determined to be wetland, functional assessment data (**Appendix A**) will be collected. Information from this data sheet will be incorporated into the functional models described in *A Rapid Procedure for Assessing Wetland Functional Capacity* (Magee and Hollands 1998). Magee and Hollands have identified five HGM classes of wetland that occur in Alaska.

1. Depressional wetlands: Depressional wetlands occur in a topographic depression. Predominant water sources are direct precipitation, surface water runoff, and groundwater (Brinson 1976).
2. Slope wetlands: Slope wetlands generally occur on a hillside and water flow is predominantly unidirectional parallel to the slope. The water source is primarily groundwater and occasionally precipitation (Brinson 1976).
3. Lacustrine fringe wetlands: A lacustrine fringe wetland borders a lake and lacks any topographic features. The water source is surface water and flow is bidirectional.
4. Flat wetlands: There are two types of flats wetlands: organic and mineral flats. Flat wetlands in Alaska are primarily organic flats. Organic flats “can occur on relatively gentle to moderate slopes up to 20% in steepness. In relatively undisturbed conditions and without significant human alteration, the dominant hydrodynamics are vertical, even on relatively gentle to moderate slopes (i.e., slopes < 20%). Specifically, the main hydrologic input to wetlands within the organic soil flat class in interior Alaska is precipitation” (ADEC/USACE 1999).
5. Riverine wetlands: Riverine wetlands are adjacent to rivers and are dominated by overbank flooding. Water flow is bidirectional locally with an overall regional flow down the river valley.

Magee and Hollands use these HGM classes to compare the functions of wetlands within a particular HGM class. Each HGM class represents a separate functional model, which is used to define the Functional Capacity Index (FCI) of eight functions. The eight functions identified by Magee and Hollands are listed below.

1. Modification of groundwater discharge: The capacity of a wetland to influence the amount of water moving from the groundwater to surface water.
2. Modification of groundwater recharge: The capacity of a wetland to influence the amount of water moving from surface water to groundwater.
3. Storm and flood-water storage: The storage of inflowing water from storm or flooding events, resulting in detention and retention of water on the wetland surface.
4. Modification of stream flow: The modification of inflow hydrology by the wetland to produce the outlet stream’s hydrology.
5. Modification of water quality: Removal of suspended and dissolved solids from surface water and dissolved solids from groundwater and conversion into other forms, plant or animal

	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1
		PAGE 12 OF 18

biomass, or gases. Wetlands with a low slope-angle or location in depressions provide a high level of this function.

6. Export of detritus: Export of organic detritus from the wetland to adjacent and downstream aquatic ecosystems.
7. Contribution to abundance and diversity of wetland vegetation: The capacity of a wetland to produce an abundance and diversity of hydrophytic plant species individually or as part of a group of wetlands in a local landscape (Tiner 1984).
8. Contribution to abundance and diversity of wetland fauna: The capacity of a wetland to support large and/or diverse populations of animal species that spend part or all of their lifecycle in wetlands, individually, or as part of a mosaic of wetlands in a local landscape.

The Magee and Hollands's functional assessment method requires site-specific information to be entered into a model that will produce a FCI for each wetland function. The FCI indicates the potential degree to which the wetland performs the function and is only comparable to other wetlands within the same HGM class and region. The FCI scale is from 0.0 to 1.0. Most of the model inputs will be collected in the field, with the remaining variables taken from available GIS datasets (such as wetland size and land ownership). The results from the functional assessment models will be extrapolated to the applicable wetlands within the mapping corridor. This information will potentially serve as the basis to determine appropriate compensatory mitigation for the unavoidable impacts of the project. Wetland functional assessment data will be reported in 2016, after all field data is collected. The Wetland Determination Data Form (**Appendix A**) will be reviewed and adjusted as necessary to collect appropriate functional assessment data for the different ecoregions.

3.7 JURISDICTIONAL DETERMINATION

USACE regulates wetlands and other Waters of the U.S. that are under their jurisdiction. Jurisdictional status is based on connectivity to Traditional Navigable Waters (Rapanos v. United States and Carabell v. United States [33 U.S. Code §1251 et seq.]). Field visits by USACE, the Federal Energy Regulatory Commission, the Environmental Protection Agency, and the Owner's Representative could also be conducted (with minimal notice) to observe field survey teams while they are conducting wetland delineations, and to review protocols and any data collected.


The Project, similar to other large pipeline and energy projects permitted by the USACE, will assume that all wetlands found fall under USACE jurisdiction. Because the FERC requires that the Project adhere to certain construction requirements in all wetlands, regardless of jurisdiction, the Project will assume that all wetlands found will be within the USACE jurisdiction for permitting, mitigation, and construction method purposes.

3.8 DATA RECORDING AND PROCESSING

Data will be recorded on hardcopy field forms (**Appendix A**), and some of the data will be entered into an electronic data form. Electronic data files will be uploaded to a project website through an internet connection or by a satellite link, and will include GPS locations, electronic data form, site photos, site sketches, and field notes.

3.9 QUALITY ASSURANCE / QUALITY CONTROL

Each crew member is responsible for collecting clear and accurate data according to the sampling protocol. The field crew chief will review all hardcopy and electronic data forms and complete a quality assurance/quality control (QA/QC) checklist (**Appendix C**) before leaving each site.

	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1
		PAGE 13 OF 18

The field crew manager will ensure that all data files, hardcopy and electronic, are uploaded to the Project website. These transmitted files will then be downloaded and reviewed by office-based data management staff. The wetlands technical lead will check each hardcopy data sheet and electronic data form for quality and consistency, as it is received. If problems arise, the field crew will be notified promptly to ensure that any data quality issues are corrected immediately.


Wetland mapping will be reviewed by experienced wetland scientists both after the initial pre-mapping, and after map revisions are complete.

3.10 REPORTING

The results of the 2016 field work will be compiled into a field survey report at the end of the season. The report will include a GIS dataset comprised of field-verified wetland and vegetation mapping, field sample locations, and data collected at each site. It will also outline the field survey methods and identify all wetland types found throughout the corridor describing common plant species, hydrology indicators, and hydric soil indicators.


After all wetland field data is finalized, a report on the Wetland Functional Assessment for all wetlands surveyed will be provided. The Wetland Functional Assessment will be submitted to USACE for review and concurrence. Once USACE concurs, the wetland boundaries delineated will be used to calculate Project impacts for Section 404 permitting. The Wetland Functional Assessment will help USACE characterize the impacted wetlands to determine appropriate compensatory mitigation for the unavoidable project impacts to wetlands and other Waters of the U.S.

Results of this survey will be provided in the FERC Resource Report 2.

	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1
		PAGE 14 OF 18


4.0 FIELD STUDIES EXECUTION

Field study execution details are currently in the process of being developed and will include: field crew composition, schedule and march charts, field target maps, and general project-wide permits and approvals. Field safety will also be discussed and a specific Job Safety Analysis (JSA) developed for wetland surveys will be included.

	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1
		PAGE 15 OF 18


5.0 ACRONYMS AND ABBREVIATIONS

FCI	Functional Capacity Index
FERC	Federal Energy Regulatory Commission
GIS	Geographic Information System
GPS	Global Positioning System
GTP	Gas Treatment Plant
HGM	hydrogeomorphic
JSA	Job Safety Analysis
LNG	liquefied natural gas
MP	milepost
MSB	Matanuska Susitna Borough
NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
PBU	Prudhoe Bay Unit
PTU	Point Thomson Unit
ROW	right-of-way
U.S.	United States
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1 PAGE 16 OF 18
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	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1
		PAGE 17 OF 18

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	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1
		PAGE 18 OF 18

7.0 APPENDICES

	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1

APPENDIX A – WETLAND DETERMINATION DATA FORM – ALASKA REGION

Page 1 of 4

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)					
<u>Tree Stratum</u> (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: _____ (A) Total Number of Dominant Species Across All Strata: _____ (B) % Dominant Species that are OBL, FACW, or FAC: _____ (A/B)	
1.					
2.					
3.					
4.					
Total Cover: _____ 50% of total cover: _____ 20% of total cover: _____				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species: _____ X 1 = _____ FACW species: _____ X 2 = _____ FAC species: _____ X 3 = _____ FACU species: _____ X 4 = _____ UPL species: _____ X 5 = _____ Column Totals: _____ (A) _____ (B) PI = B/A = _____	
<u>Sapling/Shrub Stratum</u> (_____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status		
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
Total Cover: _____ 50% of total cover: _____ 20% of total cover: _____					
VEGETATION (use scientific names of plants)					
<u>Herb Stratum</u> (_____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status		Hydrophytic Vegetation Indicators: _____ Dominance Test is > 50% _____ Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
Total Cover: _____ 50% of total cover: _____ 20% of total cover: _____				_____ % Bare Ground _____ % Cover of Wetland Bryophytes _____ Total Cover of Bryophytes _____ % Cover of Water Hydrophytic Vegetation Present (Y/N): _____ Notes: (If observed, list morphological adaptations below):	
10.					

WETLAND DETERMINATION DATA FORM

SOIL		Date	Feature ID		Soil Pit Required (Y/N)			
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Notes
	Color (moist)	%	Color (moist)	%				
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ² Location: PL=Pore Lining, M=Matrix.								
HYDRIC SOIL INDICATORS					INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³			
Histosol or Histel (A1) _____			Alaska Gleyed (A13) _____			Alaska Color Change (TA4) ⁴ _____		
Histic Epipedon (A2) _____			Alaska Redox (A14) _____			Alaska Alpine Swales (TA5) _____		
Black Histic (A3) _____			Alaska Gleyed Pores (A15) _____			Alaska Redox with 2.5Y Hue _____		
Hydrogen Sulfide (A4) _____						Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____		
Thick Dark Surface (A12) _____						Other (Explain in Notes) _____		
¹ One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic. ² Give details of color change in Notes.								
Restrictive Layer (if present): Type: _____ Depth (inches): _____								
Hydric Soil Present (Y/N): _____								
Notes: _____								
HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)					SECONDARY INDICATORS (2 or more required)			
Surface Water (A1) _____		Surface Soil Cracks (B6) _____		Water-stained Leaves (B9) _____		Stunted or Stressed Plants (D1) _____		
High Water Table (A2) _____		Inundation Visible on Aerial Imagery (B7) _____		Drainage Patterns (B10) _____		Geomorphic Position (D2) _____		
Saturation (A3) _____		Sparsely Vegetated Concave Surface (B8) _____		Oxidized Rhizospheres along Living Roots (C3) _____		Shallow Aquitard (D3) _____		
Water Marks (B1) _____		Marl Deposits (B15) _____		Presence of Reduced Iron (C4) _____		Microtopographic Relief (D4) _____		
Sediment Deposits (B2) _____		Hydrogen Sulfide Odor (C1) _____		Salt Deposits (C5) _____		FAC-Neutral Test (D5) _____		
Drift Deposits (B3) _____		Dry-Season Water Table (C2) _____		Notes: _____				
Algal Mat or Crust (B4) _____		Other (Explain in Notes): _____						
Iron Deposits (B5) _____								
Surface Water Present (Y/N): _____		Depth (in): _____		Wetland Hydrology Present (Y/N): _____				
Water Table Present (Y/N): _____		Depth (in): _____						
Saturation Present (Y/N): (includes capillary fringe)		Depth (in): _____		EC: _____				
Notes: _____								

AQUATIC SITE ASSESSMENT DATA FORM

VEGETATION VARIABLES	
P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent- Persistent _____ Aquatic Bed _____	
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (>1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____	
Number of Wetland Types (M): _____	Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____	
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____	
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____	
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____	
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches, Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____	
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____	
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____	
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____	


SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Geologic Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	


LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e., open space) _____	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:


GPS Technician QA/QC check:

	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1


APPENDIX B – WETLAND SURVEY GEAR LIST

	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1

Wetland and Vegetation Gear	Communication
1 - Sharp shooter shovel (fiberglass, not wood handle)	1 - VHF Radio
1 - U-Dig-it (Hand shovel)	1 - charger for vhf radio
1 - Compass	1 - Iridium Satellite Phone
1 - Hand lens	1 - charger for satellite phone
1 - Leatherman/sample knife (folding) 4" serrated	Safety/Survival Pack (Need for 2 teams)
1 - Digital camera	2 - Sleeping Bags
1 - calculator	1 - Tent
1 - extra batteries for digital camera	1 - Wilderness First Aid Kit
1 - pH meter (pen kind) with storage solution	1 - Flare gun kit
1 - Pocket rod (measuring tape)	1 - Emergency procedures Manual
1 - Opaque small spray bottle filled with alpha-alpha diprydil	1 - Iodine Tablets /Filter
2 - packages – gallon Ziploc bags	1 - 50' Nylon Rope/Parachute cord
1 - package- pint Ziploc bags	1 - small Flashlight/headlamp (for soil pit)
Squirt Water bottle (for moistening soil to color)	2 - Space Blankets
200+ - USACE Wetland Determination Form – Alaska Region (on Rite-in-the-Rain) with Aquatic Site Assessment	1 - Bear Spray
1 set - Field Maps on Rite-in-the-Rain	1 - Tarp (10' x 12')
4+ - Rite-in-the-Rain Field notebooks (spiral with lines)	1 - Gloves – Work/Latex/Insulated rubber
12+ - Mechanical Pencils w/ extra lead	matches
12+ - Sharpies (red and black)	1 - Roll of duct tape
1 - Laptop Computer (for downloading data every night)	Flagging tape (1 bright color per team)
2 - Clipboards	BPA-free water jug
Extra Rite-in-the-Rain paper	Personal Gear
1 - 12 inch file (for shovel sharpening) with handle	1 - Xtratuffs
1 - scissors	1 - Felt insoles for Xtratuffs
1 - tape	1 - Blaze Orange Surveyor Field Vest
2 - post it notes	1 - Mosquito Head Net
2 - toilet paper	1 - Rain Jacket/Pants
1 - Roll of duct tape	2 - Bug Spray
1 - (see through) small dry bag for soil kit	2 - Sunblock
1 – (see through) medium dry bag for field reference materials	1 - Sun Glasses
1 – dry erase board (for pictures)	1 - Water Bottle
1 – plant press	1 - Backpack
Books	1 - Hat
1 - Munsell Soil Color charts	Cell phone and charger
1 - Flora of Alaska and Neighboring Territories – Eric Hulten	1 - umbrella
1 - Trees and Shrubs – Viereck	Boot dryers
1 - Western Boreal Forest and Aspen Parkland – MacKinnon and Pojar	
1 - Wetland Sedges of Alaska – Tande and Lipkin	
1 - Willows of Interior Alaska – Collett	
1 - National List of Plant Species that Occur in Wetlands – Alaska Region - Reed 1988 (print)	
1 - Field Guide to Alaskan Wildflowers – Verna Pratt	
1 - Wildflowers along the Alaskan Highway – Verna Pratt	
1 - Rapid Procedure for Assessing Wetland Functional Capacity: Based on HGM Classification – Hollands and Magee (print)	
1 - 1987 Wetland Delineation Manual (print)	
1 - 2007 Regional Supplement to the Corps of Engineers Wetland Delineation Manual – Alaska Region (print)	
1 - Classification of Wetlands and Deepwater Habitats – Cowardin (print)	
1 - Hydric soils in Alaska (print)	

	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1

APPENDIX C – QA/QA CHECKLIST

	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1

Wetland Determination Data Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: _____ Field Target: _____ Date: _____

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☐ Site description, site parameters and summary of findings are complete?
- ☐ A detailed site sketch is included?

2. Vegetation

- ☐ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☐ Vegetation names are entered legibly for all strata present?
- ☐ Cover calculations are complete and correct?
- ☐ All dominant species have been determined and recorded per strata?
- ☐ Indicator status is correct for each species?
- ☐ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☐ Soil profile is complete?
- ☐ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☐ Appropriate hydrology indicators are marked?
- ☐ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values


- ☐ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☐ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☐ Each logbook page is initialed and dated?

7. Maps

- ☐ Wetland boundaries have been corrected if necessary?
- ☐ Maps are initialed and dated?

	2016 WETLAND DETERMINATION FIELD SURVEY PROTOCOLS	USAI-UR-SPFLD-00-000002-000 4-APR-16 REVISION: 1

8. Photos

- ☐ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Wetland Scientist (print)

X

Signature / Date

X

Field Crew Chief (print)

X

Signature / Date

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0


APPENDIX B – 2016 VEGETATION FIELD STUDY PROTOCOLS



2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS

USAI-UR-SPFLD-00-000001-000

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	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1
		PAGE 1 OF 16

AUTHORIZATION



APPROVED BY:
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DATE: APRIL 4, 2016

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DATE: APRIL 4, 2016

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DATE: APRIL 4, 2016

Alaska LNG™	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1
		PAGE 3 OF 16


TABLE OF CONTENTS

1.0	PURPOSE AND SCOPE	4
1.1	PROJECT DESCRIPTION	4
2.0	INTRODUCTION.....	5
2.1	OBJECTIVES.....	5
2.2	PROJECT AREA	5
3.0	METHODS	8
3.1	OVERVIEW	8
3.2	VEGETATION PRE-MAPPING	8
3.3	FIELD TARGET SELECTION	9
3.4	VEGETATION FIELD DATA COLLECTION.....	9
3.5	MAP REVISIONS	10
3.6	MERCHANTABLE TIMBER.....	10
3.7	DATA RECORDING AND PROCESSING	10
3.8	QUALITY ASSURANCE / QUALITY CONTROL	11
3.9	REPORTING.....	11
4.0	FIELD STUDIES EXECUTION	12
5.0	ACRONYMS AND ABBREVIATIONS	13
6.0	REFERENCES.....	14
7.0	APPENDICES	16
	Appendix A – Vegetation Classification Data Form	
	Appendix B – Wetland and Vegetation Survey Gear List	
	Appendix C – QA/QC Checklist	

LIST OF FIGURES

Figure 2-1. Ecoregions within the 2016 Alaska LNG Study Area.....	7
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Note – All pipeline routing and/or facility siting information described in this document should be considered preliminary and subject to change.


	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1
		PAGE 4 OF 16

1.0 PURPOSE AND SCOPE

1.1 PROJECT DESCRIPTION

The Alaska Gasline Development Corporation, BP Alaska LNG LLC, ConocoPhillips Alaska LNG Company, ExxonMobil Alaska LNG LLC, and TransCanada Alaska Midstream LLP (a wholly-owned affiliate of AGDC, and with AGDC, collectively referred to herein as “AGDC”) (Applicants) plan to construct one integrated liquefied natural gas (LNG) Project (Project) with interdependent facilities for the purpose of liquefying supplies of natural gas from Alaska, in particular from the Point Thomson Unit (PTU) and Prudhoe Bay Unit (PBU) production fields on the Alaska North Slope (North Slope), for export in foreign commerce and opportunities for in-state deliveries of natural gas.

In accordance with 18 CFR 157.21(f)(9), the Applicants are submitting the enclosed response to issues raised during scoping. This response covers written comments received by the Federal Energy Regulatory Commission (FERC) from March 4, 2015 to December 4, 2015 and comments made during FERC scoping meetings in October and November 2015. Due to the large number of comments received, and consistent with FERC direction and practice, the comment topics have been grouped into major themes with associated responses. The responses indicate how the Project is addressing or will address the comment themes, and provides cross references to content in Draft Resource Reports, where applicable.

	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1
		PAGE 5 OF 16

2.0 INTRODUCTION

Alaska LNG will conduct vegetation studies to identify and describe vegetative cover types, and to verify the pre-field vegetation mapping within specific areas along the Project route. The 2016 field surveys will focus on previously unmapped or field verified sections of the alignment, as well as off right-of-way (ROW) areas.

Results of the vegetation survey will facilitate the eventual evaluation of project-related direct, indirect, and cumulative impacts under the Federal Energy Regulatory Commission (FERC) Resource Report 3 (Fish, Wildlife, and Vegetation), and the National Environmental Policy Act (NEPA).

This document presents the vegetation survey field protocols that will be used during the 2016 field season. It discusses the protocols used in both the field and office for classifying vegetation cover types that may be impacted by the proposed project.

2.1 OBJECTIVES

The primary objective of the 2016 vegetation survey is to identify and describe vegetative cover types along select areas of the Project route.


Specific objectives include:

- Complete vegetation surveys in the vicinity of the pre-selected field targets;
- Collect data at field-selected observation points and at additional vegetation points where necessary to adequately update the field maps;
- Update the pre-field vegetation mapping based on results of the field data; and
- Complete a desktop analysis to document merchantable timber within the Project area.

2.2 PROJECT AREA

The Alaska LNG Project route passes through three ecoregions with nine sub-ecoregions (Figure 2-1), as described by Nowacki et al. (2001):

- Alaska Range Transition Ecoregion
 - Cook Inlet Basin Sub-Ecoregion
 - Alaska Range Sub-Ecoregion
- Intermontane Boreal Ecoregion
 - Tanana-Kuskokwim Lowlands Sub-Ecoregion
 - Yukon-Tanana Uplands Sub-Ecoregion
 - Ray Mountains Sub-Ecoregion
 - Kobuk Ridges and Valleys Sub-Ecoregion
- Arctic Tundra Ecoregion
 - Brooks Range Sub-Ecoregion
 - Brooks Foothills Sub-Ecoregion
 - Beaufort Coastal Plain Sub-Ecoregion

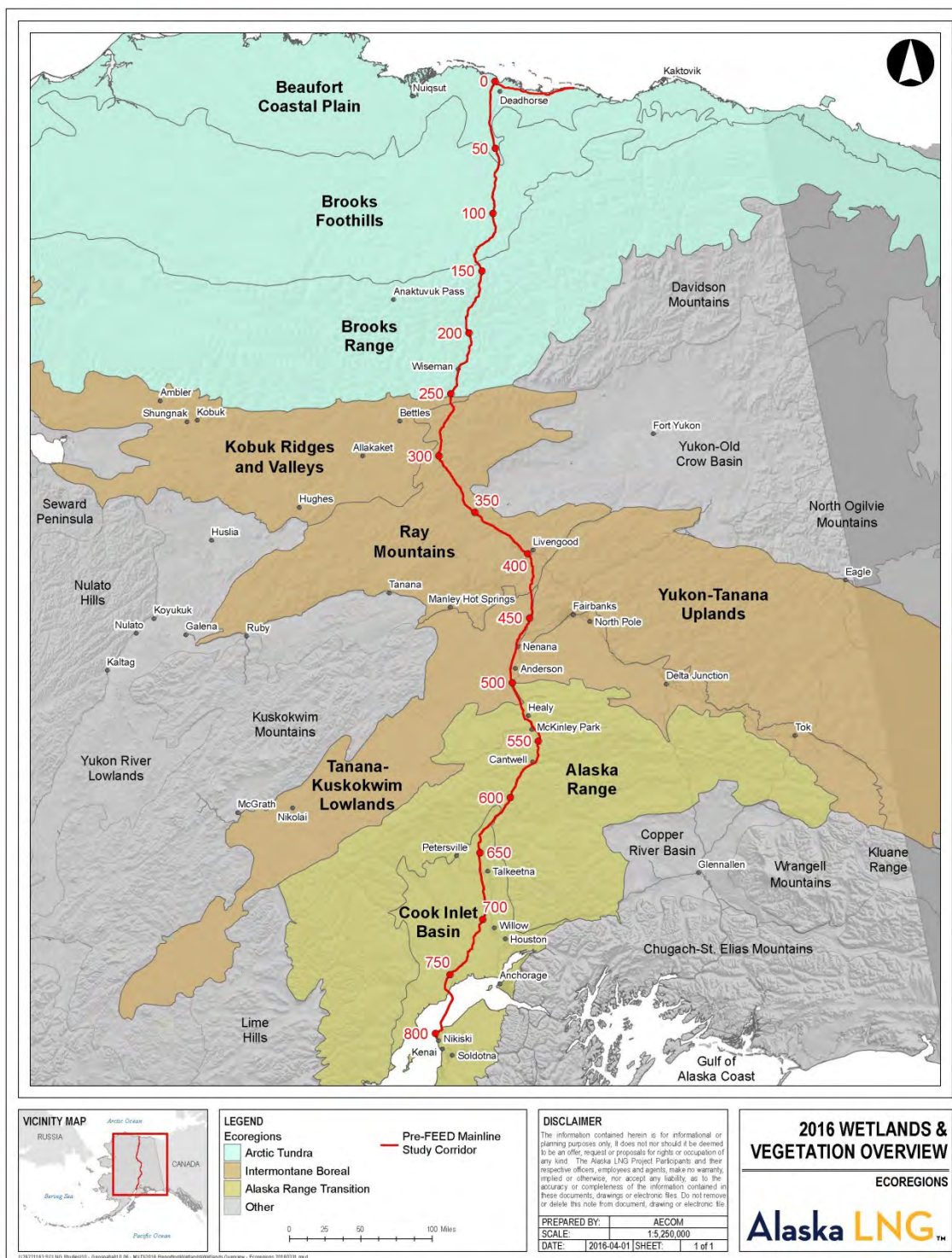
	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1
		PAGE 6 OF 16


Ecoregions are defined as a unit of land or water with a geographically distinct compilation of species, communities, and environmental conditions (World Wildlife Fund 2015). The Alaska LNG corridor begins in the Cook Inlet Basin at the LNG Facility in Nikiski, on the Kenai Peninsula, and continues through the Alaska Range, the Tanana-Kuskokwim Lowlands, Yukon-Tanana Uplands, Ray Mountains, Kobuk Ridges and Valleys, and then up through the Brooks Range and Brooks Foothills. The study area corridor continues north into the Beaufort Coastal Plain reaching Deadhorse, Alaska before bearing east to Point Thompson and the PTU production fields. Ecoregion descriptions are presented in the 2015 Vegetation Study Report (Alaska LNG 2015).

The 2016 Alaska LNG Vegetation Survey will focus on classifying vegetation at pre-selected target sites along the Project route from the Brooks Foothills to the Cook Inlet Basin. Field work will generally be concentrated within a 300-foot field survey corridor (150-feet on each side of the proposed alignment centerline), or within an off-ROW footprint, ensuring that the vegetation field work occurs near areas most likely to be disturbed by the proposed project. The mapping effort will include all the lands and waters within a 2000-foot wide corridor – 1000 feet on either side of the proposed Alaska LNG mainline centerline.

The Alaska LNG field survey area is divided into eight geographic spreads for planning purposes:

- Cook Inlet to Nikiski (IN), Mainline MP 792-804;
- Trapper Creek to Cook Inlet (TI), MP 664.5-765;
- Healy to Trapper Creek (HT), MP 525-664.5;
- Livengood to Healy (LH), MP 403.5-525;
- Yukon River to Livengood (YL), MP 357-403.5;
- Atigun Pass to Yukon River (AY), MP 169-357;
- Prudhoe Bay to Atigun Pass (PA), MP 0-169; and
- Point Thomson to Prudhoe Bay (PP), PT Pipeline milepost (MP) 0-58.



	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1
		PAGE 8 OF 16

3.0 METHODS

3.1 OVERVIEW

Vegetation is classified using Level III of the Alaska Vegetation Classification System (Viereck et al. 1992), which is a hierarchical system based on dominant growth forms (tree, shrub, herb), canopy height and closure, general soil moisture and salinity, and dominant plants. Classification to Level III of the Viereck system provides the detail necessary to characterize plant communities for the purpose of assessing habitat in the survey area.


Standard methods are used to delineate wetlands and vegetation for large linear projects in Alaska. The protocols comprise a three-phased iterative approach, including: 1) vegetation pre-mapping relying primarily on aerial photo interpretation; 2) collection of ground reference data at pre-determined field targets; and 3) revision of vegetation pre-mapping based on results of field efforts. The vegetation survey will be completed in conjunction with the wetland surveys.

3.2 VEGETATION PRE-MAPPING

The vegetation pre-mapping has been completed for the preliminary Alaska LNG route (Rev B) corridor. Vegetation classes were delineated on digital ortho-rectified and geo-referenced true color aerial photography with 1.6-foot pixel resolution using the following aerial imagery:

- Alaska LNG Imagery. (0.5-foot resolution) (Paragon 2013);
- Nikiski Area Aerial Orthophoto. (2.5-foot resolution) (Kenai Peninsula Borough 2006);
- Kenai Peninsula Borough Aerial Imagery. (2.5-foot resolution) (Kenai Peninsula Borough 2013);
- Point MacKenzie Aerial Orthophoto (0.5-meter resolution) (Matanuska Susitna Borough, MSB 2011d);
- Willow Aerial Orthophoto (1.0-foot resolution) (MSB 2011c);
- Caswell Aerial Orthophoto (1.0-foot resolution) (MSB 2011b);
- Talkeetna Aerial Orthophoto (1.0-foot resolution) (MSB 2011a);
- Healy Area Orthophoto (1.0-meter resolution) (U.S. Census Bureau 2006);
- Digital Orthophoto Quarter Quadrangles - Anderson Area (0.6-meter resolution) (NRCS 2006);
- Southern Corridor Ortho Mosaic (1.6-foot resolution) (Digital Globe 2013b);
- Northern Central Corridor Ortho Mosaic (Digital Globe 2013a);
- Quantum Aerial Imagery. (1.6-foot resolution) (Quantum Spatial 2014);
- iCubed Satellite Imagery. (1.0-meter resolution) (iCubed 2014);
- ExxonMobil aerial imagery for the Alaska Pipeline Project (0.5-meter pixel resolution; summer 2008, 2009, 2010, and 2011) (ExxonMobil 2008, ExxonMobil 2009b, ExxonMobil 2011);
- BP Exploration Alaska Inc. aerial imagery for Prudhoe Bay, Endicott, and Badami (1.0-foot pixel resolution; July 2012) (BPX 2012a, BPX 2012b, BPX 2012c); and
- ExxonMobil aerial imagery for Point Thomson (2.0 and 0.5-foot pixel resolution; July 2001/2006, and July 2009) (ExxonMobil 2001-6, ExxonMobil 2009a).

Data from the following sources was also used during the mapping process:

	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1
		PAGE 9 OF 16

- USFWS, NWI digital datasets and hardcopy maps;
- Kenai Watershed Forum – Cook Inlet Wetlands for the Kenai Peninsula and the Matanuska Susitna Boroughs (Gracz 2011);
- NRCS Soil Survey digital datasets and hardcopy maps;
- Light Detection and Ranging generated topographic contours (TransCanada 2011, MSB 2011d);
- Pertinent previous studies, such as Terrestrial and Aquatic Habitat Mapping Along the Alaska Natural Gas Pipeline System (USFWS 1980), the Denali Pipeline Project, the instate Alaska Stand Alone Pipeline Project, and the Alaska Pipeline Project;
- U.S. Geological Survey Digital Raster Graphics (e.g., topographic maps);
- Point Thomson Project wetlands mapping between Point Thomson and Badami (USACE 2012);
- Existing Geographic Information System (GIS) layers including waterbodies, contours, and roads; and
- Existing Land Status GIS layers including: State of Alaska, U.S. Bureau of Land Management, and Native allotments.

All vegetation mapping was created in a GIS geodatabase, using a “heads-up” digitizing effort. This “heads-up” process applies aerial image interpretation to delineate vector polygons of ground features. Data sources were overlain on aerial photography and non-wetland vegetation communities were identified by interpreting color, texture, and landscape position, among other elements. The wetland mapping effort resulted in the classification of mapping polygons as either wetland (meeting the U.S. Army Corps of Engineers [USACE] wetland delineation criteria as a wetland) or non-wetland. The dominant vegetation structure (trees, shrubs, herbaceous vegetation) in wetland polygons was classified using the Cowardin (1979) classification system, while vegetation within non-wetland polygons was classified using the Alaska Vegetation Classification System (Viereck et al., 1992). For completeness, wetland polygons were also assigned a Viereck classification code. It should be noted that although a polygon was classified as “upland” during wetland mapping, that does not mean that the vegetation within the polygon is upland vegetation. Mesic vegetation communities are common in polygons that do not meet the three criteria of a wetland under USACE methods. Vegetation was mapped at a scale of 1:2,400 (1 inch to 200 feet) or finer.


3.3 FIELD TARGET SELECTION

Field targets for the vegetation survey will be the same as those selected for the wetland survey, although vegetation points will be taken in adjacent uplands as well as wetlands. Vegetation observation points will also be established in representative cover types as reference sites.

Field targets may be re-evaluated based on the status of land access permissions. When necessary, new field targets will be located on nearby accessible parcels in areas with similar aerial photography vegetation signatures and site conditions as the original field targets.

3.4 VEGETATION FIELD DATA COLLECTION

Vegetation field surveys will be conducted at the same time as the wetland field surveys and by the same field crew. Field targets will be accessed via existing highways and secondary roads where available. A helicopter will be required to access remote sites. A Global Positioning System (GPS) device will be used to locate sites and to collect coordinates. Field crews will collect vegetation data at each field target using the Vegetation Classification Data Form (**Appendix A**).

	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1
		PAGE 10 OF 16

The GPS device will also be used to collect limited field data on an electronic form that will be developed for the Project.

Regional vegetation guides will be used to identify plants including: Flora of Alaska and Neighboring Territories (Hulten 1968), Wetland Sedges of Alaska (Tande and Lipkin 2003), Field Guide to Alaska Grasses (Skinner et al. 2012), Alaska Trees and Shrubs (Viereck and Little 2007), and Willows of Interior and Southcentral Alaska (Collet 2004, 2010). Non-vascular plants (lichens, mosses, liverworts) and fungi will not be surveyed or recorded as part of this effort. Rare and sensitive plants will also be recorded with photos and GPS locations when encountered, but there will be no specific effort to search for them. Invasive species will also be noted when encountered, but because these species are often very widespread, the exact location would not be recorded for each observation.

Field crews will also collect qualitative vegetation data at observation points and establish additional field targets and complete Vegetation Classification Data Forms where necessary, and will not be limited by the pre-selected field targets. Field crews will use their best professional judgment and collect appropriate field data to adequately revise the wetland pre-mapping. A detailed wetland and vegetation field survey gear list is provided in **Appendix B**.

3.5 MAP REVISIONS

As vegetation field data (i.e., GPS data, Vegetation Classification Forms for upland sites, site photographs, logbooks, and field maps) become available, this data will be downloaded in the office and plotted on the base maps of the route. The location of each plot will be attributed with the information collected in the field. This allows the creation of a reference dataset linking an aerial photography signature to a vegetation type. This reference dataset will be used to finalize the mapping of the 2,000-foot corridor.

Generally, the pre-mapping revision process involves:


- Exporting spatial data for all field targets and photo points from the Alaska LNG database;
- Compiling electronic copies of all notes, sketches, and photographs associated with above points; and
- Using these data in a GIS platform to update files through heads-up digitizing, or modifying the initial map on screen as described in Section 3.2 of the Vegetation Survey Field Study Protocols.

3.6 MERCHANTABLE TIMBER

Existing data will be analyzed to identify timber management areas within the 300-foot mapping corridor. If timber production areas are identified within the mapping corridor, volumetric data will be acquired from the Bureau of Land Management (BLM) or the state, and will be used to determine the approximate board feet of merchantable timber. No field work is proposed for analysis of merchantable timber.

3.7 DATA RECORDING AND PROCESSING

Data will be recorded on hardcopy field forms (**Appendix A**), and some of the data will also be entered into an electronic data form. Electronic data files will be uploaded to a Project website through an internet connection or by a satellite link, and will include GPS locations, electronic data form, site photos, site sketches, and field notes.

	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1
		PAGE 11 OF 16

3.8 QUALITY ASSURANCE / QUALITY CONTROL


Each crew member is responsible for collecting clear and accurate data according to the field survey protocol. The field crew chief will review all hardcopy and electronic data forms and complete a quality assurance/quality control (QA/QC) checklist (**Appendix C**) before leaving each site.

The field crew manager will ensure that all data files are uploaded to the Project website. These transmitted files will then be downloaded and reviewed by office-based data management staff. The wetlands and vegetation technical lead will check each hardcopy data sheet and electronic data form for quality and consistency, as it is received. If problems arise, the field crew will be notified promptly to ensure that any data quality issues are corrected immediately.

3.9 REPORTING


Results will be compiled with the wetland data into a Wetland and Vegetation Survey Report, and will include project background, methodologies, and results and analysis. A GIS dataset consisting of vegetation communities will also be compiled.

Results of this survey will eventually be provided in the FERC Resource Report 3 and provided to other resource agencies to assist in overall Project permitting.

	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1
		PAGE 12 OF 16


4.0 FIELD STUDIES EXECUTION

Field study execution details are currently in the process of being developed and will include: field crew composition, schedule and march charts, field target maps, and general project-wide permits and approvals. Field safety will also be discussed and a specific Job Safety Analysis (JSA) developed for wetland and vegetation surveys will be included.

	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1
		PAGE 13 OF 16


5.0 ACRONYMS AND ABBREVIATIONS

BLM	Bureau of Land Management
FERC	Federal Energy Regulatory Commission
GIS	Geographic Information System
GPS	Global Positioning System
GTP	Gas Treatment Plant
JSA	Job Safety Analysis
LNG	liquefied natural gas
MP	milepost
MSB	Matanuska Susitna Borough
NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service
PBU	Prudhoe Bay Unit
PTU	Point Thomson Unit
ROW	right-of-way
U.S.	United States
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service


	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1
		PAGE 14 OF 16

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	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1
		PAGE 15 OF 16


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	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1
		PAGE 16 OF 16

7.0 APPENDICES

	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1

APPENDIX A – VEGETATION CLASSIFICATION DATA FORM

	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1

Vegetation Classification Data Form		
Date:	Project Name: Alaska LNG	Field Target:
Investigators:		Feature ID:
Latitude:	Longitude:	Datum:
Picture No.:	Logbook No:	Logbook Page No:
Location Description:		
Common Species Observed (Scientific Name)		
Percent Cover of Dominant Structure Level:		
Habitat Description:		
Alaska Vegetation Classification: Level I, Level II, Level III		
Notes:		

Field Crew Chief: _____ Field Scientist/Technician _____

Technical Lead: _____

Table I-Alaska vegetation classification to level III


Level I	Level II	Level III
I. Forest	A. Needleleaf (conifer) forest	(1) Closed needleleaf (conifer) forest (2) Open needleleaf (conifer) forest (3) Needleleaf (conifer) woodland
	B. Broadleaf forest	(1) Closed broadleaf forest (2) Open broadleaf forest (3) Broadleaf woodland
	C. Mixed forest	(1) Closed mixed forest (2) Open mixed forest (3) Mixed woodland
II. Scrub	A. Dwarf tree scrub	(1) Closed dwarf tree scrub (2) Open dwarf tree scrub (3) Dwarf tree scrub woodland
	B. Tall scrub	(1) Closed tall scrub (2) Open tall scrub
	C. Low scrub	(1) Closed low scrub (2) Open low scrub
	D. Dwarf scrub	(1) Dryas dwarf scrub (2) Ericaceous dwarf scrub (3) Willow dwarf scrub
III. Herbaceous	A. Graminoid herbaceous	(1) Dry graminoid herbaceous (2) Mesic graminoid herbaceous (3) Wet graminoid herbaceous (emergent)
	B. Forb herbaceous	(1) Dry forb herbaceous (2) Mesic forb herbaceous (3) Wet forb herbaceous (emergent)
	C. Bryoid herbaceous	(1) Mosses (2) Lichens
	D. Aquatic (nonemergent) herbaceous	(1) Freshwater aquatic herbaceous (2) Brackish water aquatic herbaceous (3) Marine aquatic herbaceous

Descriptions of levels I, II, III, and IV follow the classification table.


Ia. Trees over 3 meters (10 ft) tall are present and have a canopy cover of 10 percent or more	I. Forest	2
1b. Trees over 3 meters (10 ft) tall are absent or nearly so. Less than 10 percent cover. (Dwarf trees, less than 3 meters [10 ft] tall may be present and abundant)		7
I. Forest		
2a. Over 75 percent of tree cover contributed by needleleaf (conifer) species	I.A Needleleaf forest	3
2b. Less than 75 percent of tree cover contributed by needleleaf (conifer) species		4
3a. Tree canopy of 60-100 percent cover	I.A.1 Closed needleleaf forest	
3b. Tree canopy of 25-59 percent cover	I.A.2 Open needleleaf forest	
3c. Tree canopy of 10-24 percent cover	I.A.3 Needleleaf woodland	
4a. Over 75 percent of tree cover contributed by broadleaf species	I.B Broadleaf forest	5
4b. Broadleaf or needleleaf species contribute 25 to 75 percent of the tree cover		6
5a. Tree canopy of 60-100 percent cover	I.B.1 Closed broadleaf forest	
5b. Tree canopy of 25-59 percent cover	I.B.2 Open broadleaf forest	
5c. Tree canopy of 10-24 percent cover	I.B.3 Broadleaf woodland	
6a. Tree canopy of 60-100 percent cover	I.C.1 Closed mixed forest	
6b. Tree canopy of 25-59 percent cover	I.C.2 Open mixed forest	
6c. Tree canopy of 10-24 percent cover	I.C.3 Mixed woodland	
7a. Vegetation with at least 25 percent cover of erect to decumbent shrubs or with at least 10 percent cover of dwarf trees (less than 3 meters [10 ft] tall)		8
7b. Vegetation herbaceous (may have up to 25 percent shrub cover)		15

II. Scrub		
8a. Vegetation with at least 10 percent cover of dwarf trees	II.A Dwarf tree scrub	9
8b. Vegetation with at least 25 percent cover of shrubs and less than 10 percent cover of dwarf trees		10
9a. Dwarf tree canopy of 60-100 percent cover	II.A.1 Closed dwarf tree scrub	
9b. Dwarf tree canopy of 25-59 percent cover	II.A.2 Open dwarf tree scrub	
9c. Dwarf tree canopy of 10-24 percent cover	II.A.3 Dwarf tree scrub woodland	
10a. Shrubs more than 1.5 meters (5 ft) tall	II.B Tall scrub	11
10b. Shrubs less than 1.5 meters (5 ft) tall		12
11 a. Shrub canopy cover greater than 75 percent	II.8.1 Closed tall scrub	
11 b. Shrub canopy cover of 25-74 percent	II.B.2 Open tall scrub	
12a. Shrubs 20 centimeters to 1.5 meters tall	II.C Low scrub	13
12b. Shrubs under 20 centimeters in height	II.D Dwarf scrub	14
13a. Shrub canopy cover greater than 75 percent	II.C.1 Closed low scrub	
13b. Shrub canopy cover of 25-74 percent, or as low as 2 percent if little or no other vegetation cover present	II.C.2 Open low scrub	
14a. Dryas species dominant in the dwarf shrub layer	II.D.1 Dryas dwarf scrub	
14b. Ericaceous species dominant in the dwarf shrub layer	II.D.2 Ericaceous dwarf scrub	
14c. Willow species dominant in the dwarf shrub layer	II.D.2 Willow dwarf scrub	
III. Herbaceous		
15a. Terrestrial vegetation, or if growing in the water, dominated by emergent vegetation		16
15b. Dominant vegetation growing submerged in water or floating on the water surface, but not emerging above the water	III.D Aquatic herbaceous	21


16a. Grasses, sedges, or rushes (graminoid) plants dominant	III.A Graminoid herbaceous	17
16b. Forbs or bryophytes dominant		18
17a. Grasslands of well-drained, dry sites, such as south-facing bluffs, old beaches, and sand dunes. Typically (but not always) dominated by <i>Elymus</i> spp., <i>Festuca</i> spp., and <i>Deschampsia</i> spp.	III.A.1 Dry graminoid herbaceous	
17b. On moist sites, but usually not with standing water. Usually dominated by <i>Calamagrostis</i> spp., <i>Carex</i> spp. or <i>Eriophorum</i> spp.; tussocks often present	III.A.2 Mesic graminoid herbaceous	
17c. On wet sites, standing water present for part of the year; dominated by either sedges or grasses; includes wet tundra, bogs, marshes, and fens	III.A.3 Wet graminoid herbaceous	
18a. Vegetation dominated by forbs (broadleaf herbs, ferns, or horsetails)	III.8 Forb herbaceous	19
18b. Vegetation dominated by mosses or lichens	III.C Bryoid herbaceous	20
19a. On dry sites, usually rocky and well drained; mostly tundra sites	III.B.1 Dry forb herbaceous	
19b. On moist sites but without standing water, mostly within forested areas	III.B.2 Mesic forb herbaceous	
19c. On wet sites, usually with standing water for part of the year	III.B.3 Wet forb herbaceous	
20a. Vegetation cover dominated by mosses	III.C.1 Bryoid moss	
20b. Vegetation cover dominated by lichens	III.C.2 Bryoid lichen	
21a. Vegetation submerged or floating in fresh water	III.D.1 Freshwater aquatic herbaceous	
21 b. Vegetation submerged or floating in brackish water	III.D.2 Brackish water aquatic herbaceous	
21c. Vegetation submerged or floating in salt water	III.D.3 Marine aquatic herbaceous	

	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1


APPENDIX B – WETLAND AND VEGETATION SURVEY GEAR LIST

	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1

Wetland and Vegetation Gear	Communication
1 - Sharp shooter shovel (fiberglass, not wood handle)	1 - VHF Radio
1 - U-Dig-it (Hand shovel)	1 - charger for vhf radio
1 - Compass	1 - Iridium Satellite Phone
1 - Hand lens	1 charger for satellite phone
1 - Leatherman/sample knife (folding) 4" serrated	Safety/Survival Pack (Need for 2 teams)
1 - Digital camera	2 - Sleeping Bags
1 - calculator	1 - Tent
1 - extra batteries for digital camera	1 - Wilderness First Aid Kit
1 - pH meter (pen kind) with storage solution	1 - Flare gun kit
1 - Pocket rod (measuring tape)	1 - Emergency procedures Manual
1 - Opaque small spray bottle filled with alpha-alpha dipyridyl	1 - Iodine Tablets /Filter
2 - packages – gallon Ziploc bags	1 - 50' Nylon Rope/Parachute cord
1 - package- pint Ziploc bags	1 - small Flashlight/headlamp (for soil pit)
Squirt Water bottle (for moistening soil to color)	2 - Space Blankets
200+ - USACE Wetland Determination Form – Alaska Region (on Rite-in-the-Rain) with functional assessment	1 - Bear Spray
1 set - Field Maps on Rite-in-the-Rain	1 - Tarp (10' x 12')
4+ - Rite-in-the-Rain Field notebooks (spiral with lines)	1 - Gloves – Work/Latex/Insulated rubber
12+ - Mechanical Pencils w/ extra lead	matches
12+ - Sharpies (red and black)	1 - Roll of duct tape
1 - Laptop Computer (for downloading data every night)	Flagging tape (1 bright color per team)
2 - Clipboards	BPA-free water jug
Extra Rite-in-the-Rain paper	Personal Gear
1 - 12 inch file (for shovel sharpening) with handle	1 - Xtratuffs
1 - scissors	1 - Felt insoles for Xtratuffs
1 - tape	1 - Blaze Orange Surveyor Field Vest
2 - post it notes	1 - Mosquito Head Net
2 - toilet paper	1 - Rain Jacket/Pants
1 - Roll of duct tape	2 - Bug Spray
1 - (see through) small dry bag for soil kit	2 - Sunblock
1 - (see through) medium dry bag for field reference materials	1 - Sun Glasses
1 - dry erase board (for pictures)	1 - Water Bottle
1 - plant press	1 - Backpack
Books	1 - Hat
1 - Munsell Soil Color charts	Cell phone and charger
1 - Flora of Alaska and Neighboring Territories – Eric Hulten	1 - umbrella
1 - Trees and Shrubs – Viereck	Boot dryers
1 - Western Boreal Forest and Aspen Parkland – MacKinnon and Pojar	
1 - Wetland Sedges of Alaska – Tande and Lipkin	
1 - Willows of Interior Alaska – Collett	
1 - National List of Plant Species that Occur in Wetlands – Alaska Region - Reed 1988 (print)	
1 - Field Guide to Alaskan Wildflowers – Verna Pratt	
1 - Wildflowers along the Alaskan Highway – Verna Pratt	
1 - Rapid Procedure for Assessing Wetland Functional Capacity: Based on HGM Classification – Hollands and Magee (print)	
1 - 1987 Wetland Delineation Manual (print)	
1 - 2007 Regional Supplement to the Corps of Engineers Wetland Delineation Manual – Alaska Region (print)	
1 - Classification of Wetlands and Deepwater Habitats – Cowardin (print)	
1 - Hydric soils in Alaska (print)	

	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1

APPENDIX C – QA/QC CHECKLIST

	2016 VEGETATION SURVEY FIELD STUDY PROTOCOLS	USAI-UR-SPFLD-00-000001-000 4-APR-16 REVISION: 1

Vegetation Classification Data Form QA/QC Checklist

This form is to be completed before leaving the field site.

Feature ID: _____ Field Target: _____ Date: _____

For all items not checked, please provide detailed explanation in the notes section of data form.

1. General Information

- ☐ Location data recorded?
- ☐ Photo taken and photo number recorded?

2. Location Description

- ☐ Location of site recorded with enough detail to help relocate?

3. Common Species

- ☐ Scientific name of common species recorded?
- ☐ Percent cover of dominant structure level noted?

4. Habitat Description

- ☐ Habitat described?

5. Classification

- ☐ All three levels of classification recorded?

6. Field Log Book

- ☐ Field form entries consistent with log book?
- ☐ Logbook clearly identifies the Field Target ID and Feature ID?

X

Field Technician (print)

X

Signature

X

Field Crew Chief (print)


X

Signature

	2016 WETLAND AND VEGETATION FIELD STUDY REPORT	USAI-P1-SRZZZ-00-000016-000 16-SEP-16 REVISION: 0
	CONFIDENTIAL	

APPENDIX C – 2016 WETLAND FIELD DATA SUMMARY TABLE AND US ARMY CORPS OF ENGINEERS ALASKA DISTRICT WETLAND DETERMINATION FORMS

(Provided in a Digital Format)

	2014 WETLAND STUDY REPORT – LIVENGOD (MP 401) TO TRAPPER CREEK (MP 709.5)	USAI-UR-SRZZZ-00-000012-000 JANUARY 2015 REVISION: 1
	CONFIDENTIAL	

**APPENDIX C – 2014 WETLANDS FIELD DATA SUMMARY TABLE AND U.S. ARMY
CORPS OF ENGINEERS ALASKA DISTRICT WETLAND DETERMINATION FORMS**

2014 Wetland and Vegetation Field Data Summary Table

Feature ID	Data Type ¹	Date	Field Target #	Latitude	Longitude	Cowardin Code	HGM Classification	Vegetation Classification
W60HT001	WDF	6/9/2014	87	62.9995	-149.5567	PSS1B	SLOPE	II B 2
W60HT002	WDF	6/9/2014	86	63.0112	-149.5465	PEM1/SS1B	FLAT	III A 2, II C 2
W60HT003	WDF	6/9/2014	88	62.9939	-149.5775	UPLAND	N/A	III A 1, II C 2
W60HT004	WDF	6/10/2014	133	62.4506	-150.271	PSS1/EM1B	DEPRESSIONAL	II C 2, III A 2
W60HT005	WDF	6/10/2014	136	62.4455	-150.2689	PSS1B	DEPRESSIONAL	II B 2
W60HT006	WDF	6/10/2014	135	62.4468	-150.2694	PEM1F	DEPRESSIONAL	III A 3
W60HT007	WDF	6/10/2014	134	62.4489	-150.2715	UPLAND	N/A	II B 1
W60HT008	WDF	6/12/2014	142	62.4209	-150.2638	UPLAND	N/A	I C 2
W60HT009	WDF	6/12/2014	141	62.4207	-150.2655	PEM1F	DEPRESSIONAL	III A 3
W60HT010	WDF	6/12/2014	143	62.4182	-150.2633	UPLAND	N/A	III A 3
W60HT011	Veg	6/13/2014	144	62.3957	-150.2659	UPLAND	N/A	I C 2
W60HT012	WDF	6/13/2014	145	62.3793	-150.2694	PSS1B	RIVERINE	II B 2
W60HT013	WDF	6/14/2014	146	62.3652	-150.2603	PEM1B	DEPRESSIONAL	III A 1
W60HT014	WDF	6/11/2014	147	62.3618	-150.2578	PEM1B/ PUBF	DEPRESSIONAL	III A 2
W60HT015	WDF	6/24/2014	91	62.9348	-149.6872	PSS1B	FLAT	II B 2, II C 2
W60HT015_OP	OP	6/24/2014	91	62.9347	-149.6872	R4SB	*	N/A
W60HT016	Veg	6/24/2014	91	62.9345	-149.6871	UPLAND	N/A	I C 2, II C 2
W60HT017	Veg	6/24/2014	120	62.5347	-150.2366	UPLAND	N/A	I C 2, II B 2
W60HT018	WDF	6/24/2014	121	62.5342	-150.2363	UPLAND	N/A	I C 2, II B 2
W60HT019	WDF	6/24/2014	122	62.5343	-150.2351	PEM1F	DEPRESSIONAL	III A 3
W60HT020	WDF	6/25/2014	125	62.5283	-150.2378	UPLAND	N/A	II B 2, III A 2
W60HT021	WDF	6/25/2014	126	62.5278	-150.2386	UPLAND	N/A	I C 1, II C 2
W60HT022	Veg	6/25/2014	127	62.5229	-150.2405	UPLAND	N/A	I C 2, II B 2
W60HT023	WDF	6/25/2014	128	62.5152	-150.252	UPLAND	N/A	I C 2, II C 2
W60HT023_OP	OP	7/6/2014	129	62.5012	-150.267	UPLAND	N/A	NONE
W60HT024	WDF	6/26/2014	104	62.7728	-150.0452	PSS4/1B	DEPRESSIONAL	II A 2, II B 2, II C 2
W60HT025	WDF	7/9/2014	148	62.3449	-150.2641	PEM1C	DEPRESSIONAL	III A 3, II C 2
W60HT026	WDF	6/26/2014	106	62.7657	-150.0687	UPLAND	N/A	I B 3, II B 1
W60HT026_OP	OP	6/26/2014	105	62.7693	-150.0582	R4SB	*	II B 1, I B 2
W60HT027	WDF	6/26/2014	107	62.7657	-150.0693	PEM1/SS1F	DEPRESSIONAL	III A 3, II C 2
W60HT028	WDF	6/27/2014	92	62.9293	-149.6967	UPLAND	N/A	I C 2
W60HT028_OP	OP	6/27/2014	92	62.9288	-149.6957	R3UB	*	N/A
W60HT029	WDF	6/27/2014	93	62.8983	-149.7387	UPLAND	N/A	I C 2, II C 1

2014 Wetland and Vegetation Field Data Summary Table

Feature ID	Data Type ¹	Date	Field Target #	Latitude	Longitude	Cowardin Code	HGM Classification	Vegetation Classification
W60HT030	WDF	6/27/2014	94	62.8787	-149.8255	PSSI/EM1B	DEPRESSIONAL	II C 2, III A 3
W60HT030_OP	OP	6/27/2014	94	62.8772	-149.8248	UPLAND	N/A	II C 2, II B 2
W60HT031	WDF	6/28/2014	95	62.868	-149.8518	UPLAND	N/A	I B 2, II C 2
W60HT031_OP	OP	6/28/2014	96	62.8679	-149.8521	UPLAND	N/A	I C 2
W60HT032	WDF	6/28/2014	97	62.8679	-149.8532	UPLAND	N/A	I C 2, II C 2
W60HT033	WDF	7/1/2014	89	62.9732	-149.6314	PSS1/EM1B	DEPRESSIONAL	II C 2, III A 3
W60HT034	WDF	7/1/2014	90	62.9565	-149.6504	PSS1/EM1B	FLAT	II C 2, III A 3
W60HT035	WDF	7/1/2014	98	62.8632	-149.8723	PEM1/SS1B	DEPRESSIONAL	III A 3, II C 2
W60HT036	Veg	7/1/2014	98	62.863	-149.872	UPLAND	N/A	I C 2, II C 2
W60HT037	WDF	7/2/2014	99	62.863	-149.8741	PSS1/EM1B	DEPRESSIONAL	II B 1, III A 3
W60HT038	WDF	7/2/2014	100	62.8408	-149.8894	PEM1/SS1B	DEPRESSIONAL	III A 3, II C 2
W60HT039	WDF	7/2/2014	100	62.8402	-149.8888	UPLAND	N/A	I C 3, II B 2
W60HT040	WDF	7/2/2014	101	62.8326	-149.8979	PEM1/SS1F	DEPRESSIONAL	III A 3, II C 2
W60HT041	WDF	7/2/2014	102	62.8213	-149.9196	PEM1/SS1F	FLAT	III A 3, II C 2
W60HT042	WDF	7/3/2014	103	62.8047	-149.9663	PSS1B	DEPRESSIONAL	II C 2, III A 3
W60HT043	Veg	7/3/2014	103	62.8051	-149.9669	UPLAND	N/A	I C 2, II B 1
W60HT044	WDF	7/3/2014	108	62.7582	-150.0935	PEM1/SS1B	DEPRESSIONAL	III A 3, II C 2
W60HT045	WDF	7/3/2014	109	62.7377	-150.1466	PEM1/SS1B	DEPRESSIONAL	III A 2, I C 2, II C 2
W60HT045_OP	OP	7/3/2014	109	62.7377	-150.1465	R4SB	*	III A 2, II C 2, I C 2
W60HT046	WDF	7/3/2014	110	62.7373	-150.1472	PSS1/EM1B	SLOPE	II C 2, III A 2
W60HT046_OP	OP	7/5/2014	111	62.6987	-150.2309	UPLAND	N/A	I C 3, II B 1
W60HT047	WDF	7/9/2014	149	62.3445	-150.2713	PFO4/SS1B	FLAT	I A 2, II C 2
W60HT048	WDF	7/5/2014	112	62.6263	-150.2281	UPLAND	N/A	I B 1
W60HT049	WDF	7/5/2014	118	62.546	-150.2506	PFO4/SS1B	FLAT	I A 3, II B 2
W60HT050	WDF	7/5/2014	119	62.5465	-150.2496	PFO1/4/SS1B	FLAT	I C 2, II B 2
W60HT051	WDF	7/5/2014	123	62.533	-150.2371	PEM1C	DEPRESSIONAL	III A 3
W60HT052	Veg	7/5/2014	124	62.5329	-150.2364	UPLAND	N/A	I C 2, II B 2
W60HT053	WDF	7/8/2014	138	62.4313	-150.2687	PSS1/EM1B	DEPRESSIONAL	II C 2, III A 3
W60HT053_OP	OP	7/8/2014	137	62.4316	-150.2688	PEM1F	*	III A 3
W60HT053_OP1	OP	7/6/2014	140	62.4264	-150.2672	PEM1/SS1F	*	III A 3, II C 2
W60HT054	WDF	7/6/2014	130	62.4886	-150.2726	PEM1/SS1F	DEPRESSIONAL	III A 3, I C 2
W60HT055	WDF	7/6/2014	132	62.477	-150.2716	PEM1F	DEPRESSIONAL	III A 3
W60HT055_OP	OP	7/6/2014	131	62.4865	-150.2716	PEM1F	*	III A 3

2014 Wetland and Vegetation Field Data Summary Table

Feature ID	Data Type ¹	Date	Field Target #	Latitude	Longitude	Cowardin Code	HGM Classification	Vegetation Classification
W60HT055_OP1	OP	7/6/2014	131	62.4893	-150.2728	R4SB	*	N/A
W60HT056	WDF	7/6/2014	139	62.4266	-150.2675	PSS1/EM1B	DEPRESSIONAL	II C 2, III A 3
W60HT057	WDF	9/3/2014	202	62.354	-150.2745	PEM1/SS1B	DEPRESSIONAL	III A 3, II C 2
W60HT058	Veg	9/3/2014	202	62.3547	-150.2735	UPLAND	N/A	I C 2, II C 2
W60HT059	WDF	9/3/2014	203	62.3299	-150.2765	UPLAND	N/A	I C 2, II C 2
W60HT059_OP	OP	9/3/2014	203	62.33	-150.2721	PEM1E	*	III A 2, II C 2
W60HT059_OP1	OP	9/3/2014	204	62.3274	-150.2728	PEM1H	*	III A 3
W60TI001	WDF	6/1/2014	193	61.808	-150.3114	PSS1B	DEPRESSIONAL	II C 1
W60TI001_OP	OP	6/1/2014	193	61.8082	-150.3117	UPLAND	N/A	I A 3, II C 2
W60TI002	Veg	6/1/2014	192	61.8083	-150.3106	UPLAND	N/A	I A 3, II C 2
W60TI003	WDF	6/1/2014	191	61.8313	-150.2817	PEM1B	DEPRESSIONAL	III A 3
W60TI004	WDF	6/2/2014	190	61.8341	-150.2804	PEM1/SS1B	DEPRESSIONAL	III A 2, II C 2
W60TI005	Veg	6/2/2014	190	61.8341	-150.2809	UPLAND	N/A	I C 1
W60TI006	WDF	6/2/2014	188	61.9255	-150.2017	PEM1/SS1B	DEPRESSIONAL	III A 2, II C 2
W60TI007	Veg	6/2/2014	189	61.9238	-150.2045	UPLAND	N/A	II B 2, II C 2, III A 2
W60TI008	WDF	6/3/2014	187	61.9459	-150.1957	PSS1B	FLAT	II C 1
W60TI008_OP	OP	6/3/2014	187	61.9466	-150.1952	UPLAND	N/A	II B 2, II C 2
W60TI009	Veg	6/3/2014	187	61.9467	-150.1952	UPLAND	N/A	II B 2, II C 2
W60TI010	WDF	6/3/2014	186	61.949	-150.1938	PSS1/EM1C	DEPRESSIONAL	II C 2, III A 2
W60TI010_OP	OP	6/3/2014	186	61.9485	-150.1941	PSS1B	*	II B 2, II C 2
W60TI011	Veg	6/3/2014	186	61.9482	-150.1943	UPLAND	N/A	II B 2, II C 2
W60TI012	WDF	6/3/2014	185	61.9553	-150.1912	UPLAND	N/A	II C 2
W60TI012_OP	OP	6/3/2014	185	61.9556	-150.1889	PSS4/1B	*	II A 3, II C 2
W60TI013	WDF	6/3/2014	184	61.9871	-150.1974	PEM1/SS1B	FLAT	II B 2, III A 2
W60TI013_OP	OP	6/3/2014	184	61.9862	-150.1976	PSS1/3B	*	II C 2
W60TI014	WDF	6/4/2014	183	61.988	-150.1973	UPLAND	N/A	II B 2, II C 2
W60TI015	WDF	6/4/2014	181	62.032	-150.1967	PEM1/SS1B	DEPRESSIONAL	III A 2, II C 2
W60TI015_OP	OP	6/4/2014	181	62.0322	-150.1965	PSS4/1B	*	II A 2, II C 2
W60TI016	WDF	6/4/2014	182	62.0317	-150.1972	PEM1B	DEPRESSIONAL	III A 2
W60TI017	WDF	6/4/2014	179	62.0357	-150.1927	PSS4/1B	DEPRESSIONAL	II A 3, II C 2
W60TI018	WDF	6/4/2014	180	62.0352	-150.193	PEM1/SS1F	DEPRESSIONAL	III A 3, II C 2
W60TI019	WDF	6/5/2014	177	62.048	-150.1785	PSS4/1B	DEPRESSIONAL	II A 3, II C 2
W60TI020	WDF	6/5/2014	176	62.0481	-150.1783	PUB/ABH	DEPRESSIONAL	III D 1

2014 Wetland and Vegetation Field Data Summary Table

Feature ID	Data Type ¹	Date	Field Target #	Latitude	Longitude	Cowardin Code	HGM Classification	Vegetation Classification
W60TI020_OP	OP	6/5/2014	176	62.0479	-150.1776	PEM1F	*	III A 3
W60TI021	Veg	6/5/2014	176	62.0483	-150.1748	UPLAND	N/A	I C 2, II C 2
W60TI022	WDF	6/5/2014	178	62.0477	-150.179	PEM1/ SS1B	DEPRESSIONAL	III A 2, II C 2
W60TI023	WDF	6/5/2014	173	62.0581	-150.1671	PSS1/EM1C	RIVERINE	II C 2, III A 3
W60TI023_OP	OP	6/5/2014	173	62.0581	-150.1668	N/A	N/A	N/A
W60TI024	WDF	6/5/2014	174	62.0571	-150.1686	PSS1/EM1B	DEPRESSIONAL	II C 2, III A 2
W60TI025	WDF	6/5/2014	175	62.0569	-150.1686	UPLAND	N/A	I A 2, II B 2
W60TI025_OP	OP	6/5/2014	175	62.0569	-150.1694	PF04/SS4B	*	I A 2, II A 2
W60TI026	Veg	6/5/2014	173	62.0576	-150.1679	UPLAND	N/A	I C 2, II C 2
W60TI027	WDF	6/6/2014	170	62.0645	-150.1595	PSS4/1B	DEPRESSIONAL	II A 2, II C 2
W60TI028	WDF	6/6/2014	171	62.0644	-150.16	PF04/SS4B	FLAT	I A 2, II A 2
W60TI028_OP	OP	6/6/2014	171	62.0641	-150.1605	UPLAND	N/A	I C 2, II C 2
W60TI029	WDF	6/5/2014	172	62.0641	-150.1608	UPLAND	N/A	I C 2, II B 2
W60TI030	WDF	6/5/2014	169	62.0646	-150.1597	PSS4/1B	DEPRESSIONAL	II A 2, II C 2
W60TI031	WDF	6/8/2014	167	62.1223	-150.164	PSS4/1B	DEPRESSIONAL	II A 2, II C 2
W60TI032	WDF	6/8/2014	166	62.123	-150.1637	PF04B	DEPRESSIONAL	I A 2
W60TI033	Veg	6/8/2014	166	62.1233	-150.1646	UPLAND	N/A	I C 2
W60TI034	WDF	6/8/2014	168	62.1223	-150.1636	PSS4/EM1B	DEPRESSIONAL	II A 3, III A 2
W60TI035	WDF	6/8/2014	165	62.1357	-150.1653	PSS1/4/EM1B	DEPRESSIONAL	II C 2, III A 3
W60TI036	WDF	6/8/2014	164	62.1358	-150.1652	PSS4/1B	DEPRESSIONAL	II A 2, II C 2
W60TI037	WDF	6/9/2014	163	62.1362	-150.1652	PF04B	DEPRESSIONAL	I A 2
W60TI038	WDF	6/11/2014	153	62.2427	-150.2513	PSS1C	RIVERINE	II C 1
W60TI039	WDF	6/11/2014	152	62.2858	-150.2474	PSS1C	RIVERINE	II C 2
W60TI040	WDF	6/11/2014	151	62.2882	-150.2495	PEM1B	DEPRESSIONAL	III A 2
W60TI041	WDF	6/30/2014	161	62.1681	-150.195	PSS4/EM1B	DEPRESSIONAL	II A 2, III A 2
W60TI042	WDF	6/13/2014	160	62.1884	-150.216	PSS1/4/EM1F	DEPRESSIONAL	II C 2, III A 2
W60TI043	WDF	6/13/2014	159	62.1888	-150.2134	PF04/1B	RIVERINE	I C 2
W60TI044	WDF	6/14/2014	154	62.2313	-150.2404	UPLAND	N/A	I C 1
W60TI045	WDF	6/14/2014	155	62.2314	-150.2399	PSS4/1B	DEPRESSIONAL	II A 2, II B 2
W60TI046	WDF	6/14/2014	156	62.2314	-150.2393	PSS1F	DEPRESSIONAL	II C 2
W60TI047	WDF	6/30/2014	162	62.1678	-150.1942	PEM1F	FLAT	III A 3
W60TI048	WDF	6/30/2014	162	62.1676	-150.1923	PFO1/4B	FLAT	I C 1, II C 1
W60TI049	WDF	7/8/2014	157	62.221	-150.2349	PSS4/1B	FLAT	II A 3, II C 2

2014 Wetland and Vegetation Field Data Summary Table

Feature ID	Data Type ¹	Date	Field Target #	Latitude	Longitude	Cowardin Code	HGM Classification	Vegetation Classification
W60TI050	WDF	7/8/2014	158	62.2208	-150.2359	PEM1/SS4E	FLAT	III A 3, II A 3
W60TI051	WDF	7/9/2014	150	62.29	-150.2512	PEM1B	DEPRESSIONAL	III A 2
W60TI052	WDF	9/4/2014	205	62.2084	-150.2376	PEM1E	DEPRESSIONAL	III A 3
W60TI052_OP	OP	9/4/2014	205	62.2084	-150.2359	PEM1/SS1B	*	III A 2, II B 2
W60TI053	WDF	9/4/2014	206	62.1985	-150.235	UPLAND	N/A	I C 2, II C 2
W60TI054	WDF	9/4/2014	207	62.1792	-150.2229	PF01/SS1B	FLAT	I B 2, II B 2, III B 2
W60TI055	WDF	9/5/2014	208	62.1549	-150.2082	PEM1/SS1B	DEPRESSIONAL	III A 2, II B 2
W60TI055_OP	OP	9/5/2014	208	62.1548	-150.2084	R2UBH	*	N/A
W60TI056	WDF	9/5/2014	209	62.1352	-150.2288	PSS1/EM1C	DEPRESSIONAL	II C 2, III A 3
W60TI057	Veg	9/5/2014	211	62.1046	-150.2247	PF01/SS1E	*	I B 2, II B 2
W60TI058	WDF	9/6/2014	210	62.1065	-150.2254	PEM1/SS1F	DEPRESSIONAL	III A 3, II C 2
W60TI059	WDF	9/6/2014	212	62.1034	-150.2253	PFO4/SS1B	FLAT	I A 2, II C 2
W60TI060	Veg	9/6/2014	213	62.086	-150.2128	PF04/SS1B	*	I A 2, II B 1
W60TI061	WDF	9/7/2014	214	62.0609	-150.2039	PSS1/4C	DEPRESSIONAL	II B 2, II C 2
W60TI062	WDF	9/7/2014	215	62.0501	-150.2095	PEM1/SS1E	FLAT	III A 3, II C 2
W60TI063	WDF	9/7/2014	216	62.0492	-150.2115	UPLAND	N/A	I C 2, II C 2
W60TI063_OP	OP	9/7/2014	216	62.0492	-150.2116	R4SB	*	N/A
W60TI064	WDF	9/7/2014	217	62.0428	-150.2133	PEM1/SS1E	DEPRESSIONAL	III A 3, II C 2
W60TI065	WDF	9/7/2014	218	62.0423	-150.2136	UPLAND	N/A	I A 1, II B 2
W60TI066	Veg	9/7/2014	219	62.0355	-150.2151	UPLAND	N/A	I C 2, II B 2, III A 2
W60TI067	WDF	9/8/2014	221	62.0318	-150.2051	PSS4/EM1B	DEPRESSIONAL	II A 3, III A 2
W60TI068	WDF	9/8/2014	220	62.0317	-150.2083	UPLAND	N/A	I C 2, II B 2
W60TI068_OP	OP	9/8/2014	220	62.0319	-150.2089	PSS4/EM1B	*	I B 2, III A 3
W60TI069	WDF	9/8/2014	223	61.768	-150.3201	UPLAND	N/A	I C 2, II B 2
W60TI070	WDF	9/8/2014	224	61.7612	-150.3139	PSS3/1B	DEPRESSIONAL	I C 2, III A 2
W60TI071	Veg	9/8/2014	225	61.7602	-150.3142	UPLAND	N/A	I C 3, II B 2
W60TI072	Veg	9/6/2014	210	62.1062	-150.2247	UPLAND	N/A	I C 3, II C 2
W61HT001	WDF	6/27/2014	53	63.8855	-149.0751	PSSI/4B	FLAT	II C 1, II A 3
W61HT001_OP	OP	6/27/2014	53	63.8845	-149.0798	UPLAND	N/A	I C 2
W61HT002	WDF	6/28/2014	60	63.6074	-148.7725	PSS4/1B	SLOPE	I A 2, II C 1
W61HT002_OP	OP	6/28/2014	60	63.6075	-148.7714	PEM1/SS1/4C	*	III A 1, II C 1, II B 2
W61HT003	WDF	6/28/2014	57	63.672	-148.7644	PSS1/4B	FLAT	II C 1, II A 2
W61HT003_OP	OP	6/28/2014	57	63.6714	-148.7642	PSS1C	*	II C 1

2014 Wetland and Vegetation Field Data Summary Table

Feature ID	Data Type ¹	Date	Field Target #	Latitude	Longitude	Cowardin Code	HGM Classification	Vegetation Classification
W61HT004	WDF	6/28/2014	58	63.6724	-148.7633	UPLAND	N/A	II C 1, I A 2
W61HT004_OP	OP	6/28/2014	58	63.6721	-148.7632	PSS1/4B	*	II C 1, II A 2
W61HT005	WDF	6/29/2014	59	63.6414	-148.7389	PEM1B		III A 2
W61HT005_OP	OP	6/29/2014	59	63.6413	-148.7387	PEM1E	*	III A 3
W61HT006	WDF	6/29/2014	72	63.3494	-149.075	PSS1C	RIVERINE	II B 1
W61HT006_OP	OP	6/29/2014	72	63.3495	-149.0753	PEM1E	*	III A 3
W61HT007	WDF	6/29/2014	80	63.1576	-149.4106	PEM1E	FLAT	III A 3
W61HT008	WDF	6/29/2014	81	63.1574	-149.4109	PEM1F	FLAT	III A 3
W61HT009	WDF	6/29/2014	82	63.1573	-149.4113	PUB/ABH	DEPRESSIONAL	III D 1
W61HT010	WDF	6/30/2014	55	63.8192	-148.9913	PSS1/EM1B	FLAT	II C 1, III A 2
W61HT010_OP	OP	6/30/2014	55	63.8191	-148.991	PSS1/EM1B	*	II C 1, III A 2
W61HT011	WDF	6/30/2014	54	63.8198	-148.9922	PSS1/EM1B	FLAT	II C 1, III A 2
W61HT011_OP	OP	6/30/2014	54	63.8197	-148.9924	PSS1C	*	II C 1, III A 3
W61HT012	WDF	6/30/2014	56	63.8099	-148.967	PSS1/EM1B	FLAT	II C 1, III A 2
W61HT012_OP	OP	6/30/2014	56	63.8103	-148.9679	PSS1A	*	II B 1
W61HT013	WDF	7/1/2014	83	63.1423	-149.4213	UPLAND	N/A	I A 2, II B 2, II C 1
W61HT014	WDF	7/1/2014	84	63.1328	-149.4491	UPLAND	N/A	I C 2, II B 2, II C 1
W61HT014_OP	OP	7/1/2014	84	63.1323	-149.4503	UPLAND	N/A	I A 2, II C 1
W61HT015	WDF	7/1/2014	85	63.1143	-149.4715	UPLAND	N/A	III A 1
W61HT015_OP	OP	7/1/2014	85	63.1145	-149.4714	PSS1C	*	II B 1
W61HT016	WDF	7/2/2014	115	62.5653	-150.2594	UPLAND	N/A	III A 3
W61HT016_OP	OP	7/2/2014	115	62.5654	-150.2592	UPLAND	N/A	II B 1
W61HT017	WDF	7/2/2014	114	62.5659	-150.2634	UPLAND	N/A	I B 1, III A 1
W61HT017_OP	OP	7/2/2014	114	62.5661	-150.2626	PEM1C	*	III A 3
W61HT018	WDF	7/2/2014	113	62.5648	-150.265	PEM1B	DEPRESSIONAL	III A 3
W61HT019	WDF	7/3/2014	117	62.5571	-150.2628	UPLAND	N/A	I C 3, II B 2, III A 1
W61HT019_OP	OP	7/3/2014	117	62.5571	-150.2623	PEM1B	*	III A 2
W61HT020	WDF	7/3/2014	116	62.5577	-150.2654	PEM1/SS1B	FLAT	III A 3, II C 2
W61HT021	WDF	7/5/2014	74	63.3134	-149.1822	PEM1/SS1F	FLAT	III A 3, II C 2
W61HT022	WDF	7/5/2014	73	63.315	-149.1814	UPLAND	N/A	II B 2, II C 1
W61HT022_OP	OP	7/5/2014	73	63.3152	-149.1819	UPLAND	N/A	II C 1
W61HT022_OP1	OP	7/5/2014	73	63.3149	-149.181	UPLAND	N/A	II B 2, II C 1
W61HT023	WDF	7/5/2014	67	63.4159	-148.8457	PSS1/EM1B	FLAT	II C 1, III A 2

2014 Wetland and Vegetation Field Data Summary Table

Feature ID	Data Type ¹	Date	Field Target #	Latitude	Longitude	Cowardin Code	HGM Classification	Vegetation Classification
W61HT023_OP	OP	7/5/2014	67	63.4161	-148.8459	PSS1C	*	II C 1
W61HT024	WDF	7/5/2014	66	63.4377	-148.8269	PSSIB	FLAT	II C 1
W61HT024_OP	OP	7/5/2014	66	63.4377	-148.8278	UPLAND	N/A	I A 2, II C 1
W61HT025	WDF	7/6/2014	64	63.4416	-148.8026	PSSIB	SLOPE	II C 1
W61HT025_OP	OP	7/6/2014	64	63.4418	-148.8027	UPLAND	N/A	I A 2, II A 2, II C 1
W61HT026	WDF	7/6/2014	65	63.4416	-148.8039	UPLAND	N/A	I A 2, II C 2, III A 1
W61HT027	WDF	7/6/2014	68	63.4025	-148.8579	PEM1/SS1B	SLOPE	III A 2, II C 2
W61HT027_OP	OP	7/6/2014	68	63.4023	-148.858	UPLAND	N/A	II C 2
W61HT028	WDF	7/6/2014	69	63.3799	-148.9101	PSS1/EM1B	FLAT	II C 1, III A 2
W61HT029	WDF	7/6/2014	71	63.374	-148.9484	PSS1/EM1B	RIVERINE	II C 1, III A 2
W61HT030	WDF	7/6/2014	70	63.3742	-148.9471	PSS1C	RIVERINE	II B 1, II C 2
W61HT031	WDF	7/7/2014	75	63.2556	-149.2624	PEM1/SS1F	FLAT	III A 3, II C 2
W61HT031_OP	OP	7/7/2014	75	63.2551	-149.2626	PSS1B	*	II C 1
W61HT032	WDF	7/7/2014	76	63.254	-149.2642	PSS1/EM1B	FLAT	II C 1, III A 3
W61HT033	WDF	7/7/2014	77	63.2536	-149.2647	PSS1B	FLAT	II B 1, III A 2
W61HT034	WDF	7/8/2014	79	63.2366	-149.2748	PFO1/4/SS1B	RIVERINE	I C 3, III A 2
W61HT035	WDF	7/8/2014	78	63.2441	-149.2724	UPLAND	N/A	II C 2, III A 2
W61HT036	WDF	7/8/2014	63	63.4654	-148.8062	PSS1/EM1B	FLAT	II A 2, II C 1, III A 2
W61HT036_OP	OP	7/8/2014	63	63.4654	-148.8062	PSS1B	*	II C 1
W61HT037	WDF	7/8/2014	62	63.5206	-148.8005	UPLAND	N/A	I A 2, II C 1, III A 1
W61HT038	WDF	7/8/2014	61	63.5235	-148.8019	UPLAND	N/A	I A 2, II C 2
W61HT038_OP	OP	7/8/2014	61	63.5235	-148.8021	PEM1F	*	III A 3
W61LH001	WDF	6/7/2014	1	65.4459	-148.6187	PSS4/1/F04B	FLAT	II B 1, I A 2
W61LH002	WDF	6/7/2014	2	65.4451	-148.6184	PSS1/4C	RIVERINE	II C 1
W61LH002_OP	OP	6/7/2014	2	65.445	-148.6185	R4SB	*	N/A
W61LH003	WDF	6/7/2014	3	65.4441	-148.6186	UPLAND	FLAT	II A 2, II B 2, II C 2
W61LH004	WDF	6/7/2014	4	65.4303	-148.6122	PSS4B	FLAT	II A 2
W61LH005	WDF	6/8/2014	5	65.4195	-148.6085	UPLAND	FLAT	I A 2
W61LH005_OP	OP	6/8/2014	5	65.4201	-148.6075	PSS1C	*	II C 1
W61LH006	WDF	6/8/2014	6	65.4045	-148.6171	PSS1B	FLAT	II B 2, II C 2
W61LH006_OP	OP	6/8/2014	6	65.4045	-148.6177	PSS1/4B	*	II B 2, II C 2
W61LH007	WDF	6/8/2014	7	65.3952	-148.6277	PSS4/1B	FLAT	II A 2, II C 2
W61LH008	WDF	6/8/2014	8	65.3196	-148.6614	PSS 13B	FLAT	II C 1, II C 2

2014 Wetland and Vegetation Field Data Summary Table

Feature ID	Data Type ¹	Date	Field Target #	Latitude	Longitude	Cowardin Code	HGM Classification	Vegetation Classification
W61LH009	WDF	6/9/2014	9	65.3075	-148.6655	UPLAND	N/A	I A 2, II C 1
W61LH009_OP	OP	6/9/2014	9	65.307	-148.6652	PSS1B	*	II C 1
W61LH010	WDF	6/8/2014	7	65.3948	-148.6281	PSS1/EM1B	FLAT	II C 1, III A 2
W61LH011	WDF	6/9/2014	11	65.2631	-148.6819	UPLAND	N/A	II C 1
W61LH011_OP	OP	6/9/2014	11	65.2629	-148.6822	PSS1B	*	II B 2, II C 2
W61LH011_OP1	OP	6/9/2014	10	65.2642	-148.6791	UPLAND	N/A	II B 1
W61LH012	WDF	6/9/2014	12	65.2143	-148.6904	PSS1B	FLAT	II C 1
W61LH012_OP	OP	6/9/2014	12	65.2141	-148.6906	PSS1/EM1B	*	II C 1, III B 2
W61LH013	WDF	6/10/2014	13	65.1957	-148.7037	PSS4/1B	FLAT	I A 2, II A 2, II C 1
W61LH014	WDF	6/10/2014	14	65.1945	-148.7052	PSS4/1B	FLAT	II A 2, II C 2
W61LH015	WDF	6/10/2014	15	65.1256	-148.7437	PSS1B	DEPRESSIONAL	II B 1
W61LH016	WDF	6/11/2014	16	65.1146	-148.7285	PSS1/4	FLAT	II C 2, II A 2
W61LH016_OP	OP	6/11/2014	16	65.1145	-148.7291	PSS1/4B	*	II B 1, II C 1, III A 3
W61LH017	WDF	6/10/2014	17	65.1076	-148.7204	PSS1/EM1B	FLAT	II C 1, III A 2
W61LH018	WDF	6/10/2014	18	65.1074	-148.7203	PSS1/EM1B	FLAT	II C 1, III A 2
W61LH019	WDF	6/11/2014	19	65.0862	-148.7217	PEM 1 SS1B	FLAT	III A 2, II C 1
W61LH020	WDF	6/11/2014	20	65.0851	-148.7205	PSS1/EMIB	FLAT	II C 1, III A 2
W61LH021	WDF	6/11/2014	21	65.0843	-148.7199	UPLAND	N/A	I B 2, III B 1
W61LH022	WDF	6/12/2014	22	65.0732	-148.7052	UPLAND	N/A	I C 2, II A 2
W61LH023	WDF	6/12/2014	23	65.0354	-148.6759	PF04/SS1B	FLAT	I A 2, II C 2
W61LH024	WDF	6/12/2014	24	65.0339	-148.6752	UPLAND	N/A	I C 1
W61LH025	WDF	6/14/2014	25	64.9949	-148.6753	UPLAND	N/A	II C 2, III A 2
W61LH025_OP	OP	6/14/2014	25	64.9948	-148.6748	PSS1/EM1B	*	II C 2, III A 2
W61LH026	WDF	6/12/2014	26	64.9946	-148.6742	UPLAND	N/A	II C 2
W61LH027	WDF	6/14/2014	27	64.9943	-148.6724	UPLAND	N/A	II A 2, I A 2
W61LH028	WDF	6/14/2014	35	64.782	-148.8209	UPLAND	N/A	I A 2, II C 1
W61LH028_OP	OP	6/14/2014	35	64.7822	-148.8211	UPLAND	N/A	II B 1
W61LH029	WDF	6/14/2014	36	64.7824	-148.8228	PM1B	FLAT	III A 2
W61LH030	WDF	6/15/2014	34	64.7887	-148.8101	PSS4/IB	FLAT	I A 2, II C 2
W61LH030_OP	OP	6/15/2014	34	64.7882	-148.8117	PSS4B	*	II A 1
W61LH030_OP1	OP	6/15/2014	34	64.7873	-148.8118	PSS4/1B	*	II A 2, II C 2
W61LH031	WDF	6/15/2014	37	64.7643	-148.8276	PF04/SSIB	FLAT	I A 2, II C 1
W61LH031_OP	OP	6/15/2014	37	64.7642	-148.8271	PSS4/1C	*	II A 2, II C 2

2014 Wetland and Vegetation Field Data Summary Table

Feature ID	Data Type ¹	Date	Field Target #	Latitude	Longitude	Cowardin Code	HGM Classification	Vegetation Classification
W61LH032	WDF	6/15/2014	38	64.7635	-148.8271	UPLAND	N/A	I C 2, II B , II C 2
W61LH033	WDF	6/16/2014	39	64.7391	-148.8337	PFO4/SS1B	FLAT	I A 2, II C 1
W61LH033_OP	OP	6/16/2014	39	64.739	-148.8336	UPLAND	N/A	I B 2, II C 1
W61LH034	WDF	6/16/2014	40	64.7363	-148.8406	PSS4B	FLAT	I A 2, II C 1
W61LH034_OP	OP	6/16/2014	40	64.7365	-148.8371	UPLAND	N/A	I C 2, II C 2
W61LH035	WDF	6/16/2014	41	64.7218	-148.8574	PSS1/4B	FLAT	II C 2, II A 2
W61LH035_OP	OP	6/16/2014	41	64.7221	-148.8575	PF04/SS1B	*	I A 2, II B 1
W61LH036	WDF	6/16/2014	42	64.7215	-148.8583	PF04/SS4B	FLAT	I A 2, II A 2
W61LH037	WDF	6/16/2014	43	64.7209	-148.856	PF04/SS1B	FLAT	I A 2, II C 1
W61LH037_OP	OP	6/16/2014	43	64.7203	-148.8572	UPLAND	N/A	I B 1, II C 2
W61LH038	WDF	6/17/2014	44	64.709	-148.8758	UPLAND	N/A	I A 2, II C 1
W61LH038_OP	OP	6/17/2014	44	64.7093	-148.8756	PSS1B	*	II B 1
W61LH039	WDF	6/17/2014	45	64.7081	-148.8741	PSS1B	FLAT	II B 1
W61LH039_OP	OP	6/17/2014	45	64.7086	-148.8735	PFO4/SS1B	*	I A 2, II B 2, III A 2
W61LH040	WDF	6/17/2014	47	64.6867	-148.9252	PF01/SS1B	FLAT	I B 2, II C 2
W61LH041	WDF	6/17/2014	46	64.6863	-148.9226	UPLAND	N/A	II B 1, II C 2
W61LH041_OP	OP	6/17/2014	46	64.6864	-148.9224	PSS1/EM1B	*	III A 2, II C 2
W61LH041_OP1	OP	6/17/2014	46	64.6853	-148.9225	PEM1C	*	III A 3
W61LH042	WDF	6/18/2014	48	64.0043	-149.1292	PSS1/EM1B	FLAT	II C 1, III A 2
W61LH042_OP	OP	6/18/2014	48	64.005	-149.1299	PSS1/4B	*	II C 1, II A 2
W61LH043	WDF	6/19/2014	49	63.9926	-149.1228	PSS1/4B	FLAT	II B 2, II C 1
W61LH043_OP	OP	6/19/2014	49	63.9924	-149.1228	PSS1/4/EM1B	*	II C 1, III A 2
W61LH044	WDF	6/19/2014	50	63.9467	-149.1097	PFO4/SS1B	FLAT	I A 2, II B 2, II C 1
W61LH045	WDF	6/19/2014	51	63.9439	-149.1071	PSS1/4B	FLAT	II C 1, II A 2
W61LH046	WDF	6/27/2014	52	63.9307	-149.0932	PSS1/EM1B	FLAT	II C 1, III A 2
W61LH046_OP	OP	6/27/2014	52	63.9308	-149.0919	PSS1/4B	*	II C 1, II A 2
W61LH047	WDF	6/11/2014	20	65.086	-148.72	PEM1 SS1C	FLAT	III A 3, II C 1

¹WDF = Wetland Data Form; Veg = Vegetation Data Form; OP = Observation Point, No Data Form

*HGM Classification was not collected on Vegetation Forms or at Observation Points

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline		Access Road (explain)	Other (explain) <u>X</u> <u>corridor</u>
Field Target: <u>087</u>		Map #: <u>59</u> Map Date: <u>5/27/14</u>	
Date: <u>06-09-2014</u>	Project Name & No.: <u>Alaska LNG 26221306</u>		Feature Id: <u>W60HT001</u>
Investigators: <u>Dan LaPlant, Zoe Meade</u>			Team No.: <u>W60</u>
State: <u>Alaska</u>	Region: <u>Alaska</u>	Milepost: <u>603</u>	
Latitude: <u>62° 59' 58.11"</u>		Longitude: <u>149° 33' 24.63"</u>	Datum: <u>WGS84</u>
Logbook No.: <u>2</u>	Logbook Page No.: <u>001</u>	Picture No.: <u>PHT001 - N, S, pit, plug</u>	

SITE PARAMETERS	
Subregion: <u>interior</u>	Landform (hillslope, terrace, hummocks, etc.): <u>hillslope</u>
Slope (%): <u>3-5°</u>	Local relief (concave, convex, none):
Pre-mapped Alaska LNG/NWI classification: <u>PSS1F</u>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (if no explain in Notes)	
Are "Normal Circumstances" present: Yes _____ No <u>X</u> (If no, explain in Notes.)	
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed? No <u>X</u> (If yes, explain in Notes)	
Are Vegetation _____, Soil _____, or Hydrology <u>X</u> Naturally Problematic? No _____ (If yes, explain in Notes.)	
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <u>X</u> No _____	Is the Sampled Area within a Wetland? Yes <u>X</u> No _____
Hydric Soil Present? Yes <u>X</u> No _____	Wetland Type: <u>PSS1B</u>
Wetland Hydrology Present? Yes <u>X</u> No _____	Alaska Vegetation Classification (Vioreck): <u>IB2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

Beaver dam complex

See sketch on
page 001 in
logbook 2

LC0

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				Indicator Status	Dominant Species? (Y/N)	Absolute % Cover	Tree Stratum (Plot sizes: _____)
1.							
2.							
3.							
4.							
Total Cover: <u>0</u>							
50% of total cover: <u>0</u> 20% of total cover: <u>0</u>							
Sapling/Shrub Stratum (<u>26'</u>)							
1. <i>Alnus ssp.</i>						15	FAC
2. <i>Salex richardsonii</i>					Y	65	FACW
3. <i>Salex pulchra</i>						15	FACW
4. <i>Spiraea stevenii</i>						5	FACU
5.							
6.							
7.							
8.							
9.							
Total Cover: <u>100</u>							
50% of total cover: <u>50</u> 20% of total cover: <u>20</u>							

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

% Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:

OBL species: 0 X 1 = 0

FACW species: 83 X 2 = 166

FAC species: 88 X 3 = 264

FACU species: 11 X 4 = 44

UPL species: 0 X 5 = 0

Column Totals: 182 (A) 484 (B)

PI = B/A = 2.60

VEGETATION (use scientific names of plants)				Indicator Status	Dominant Species? (Y/N)	Absolute % Cover	Herb Stratum (<u>26'</u>)
1. <i>Chamerion angustifolium</i>						1	FACU
2. <i>Mertensia paniculata</i>						1	FACU
3. <i>Anemone richardsonii</i>						T	FAC
4. <i>Viola palustris</i>						3	FACW
5. <i>Geranium erianthum</i>						4	FACU
6. <i>Calamagrostis Canadensis</i>					Y	60	FAC
7. <i>Smilacina stellata</i>						1	FAC
8. <i>Veratrum viride</i>						10	FAC
9. <i>Sanguisorba canadensis</i>						T	FACW
10. <i>Equisetum Arvense</i>						2	FAC
Total Cover: <u>85</u>							
50% of total cover: <u>42.5</u> 20% of total cover: <u>17</u>							
unidentified herb <u>3</u>							

Hydrophytic Vegetation Indicators:

☒ Dominance Test is > 50%

☒ Prevalence Index is ≤ 3.0

_____ Morphological Adaptations¹ (Provide supporting data in Notes)

_____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

30 % Cover of Wetland Bryophytes

50 Total Cover of Bryophytes

20 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

arctis Lupinus

11

Page 3 of 4

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>15</u> Short shrub (0.5-2m) <u>85</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>85</u> Moss-Lichen <u>50</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>3</u>	Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>X</u>	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>X</u> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover <u>X</u> >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few <u>X</u> Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) <u>X</u> High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope <u>X</u> Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy <u>X</u> Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet <u>X</u>	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) <u>X</u> Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs <u>X</u> Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow <u>X</u> Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) <u>X</u> Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading <u>6.6</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) <u>X</u>	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring <u>X</u>	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <u>X</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) <u>X</u>	

Crew Chief QA/QC check:

[Signature]

GPS Technician QA/QC check:

[Signature]

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT001

Field Target: 087

Date: 06-09-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated? -

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X

zoe meade

Signature / Date

X Dan Laplant

Field Crew Chief (print)

X

Dan Laplant 6/9/14

Signature / Date

HT052

FT 87

veg confirmed
Hydrophytic from first
site visit.

WETLAND DETERMINATION DATA FORM

W60AT001

FT 87

SOIL		Date 6/30/14		Feature ID		Soil Pit Required (Y/N)	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix	Redox Features					
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²	Notes
0-4							Fibric organics
4-20	5Y 5/1	95	5Y 3/4	5	C	PL	Loamy sand - mod. / fine
High Sand Content. Recently forming Hydric Soil							
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ² Location: PL=Pore Lining, M=Matrix.							
HYDRIC SOIL INDICATORS						INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) _____		Alaska Gleyed (A13) _____		Alaska Color Change (TA4) ⁴ _____			
Histic Epipedon (A2) _____		Alaska Redox (A14) _____		Alaska Alpine Swales (TA5) _____			
Black Histic (A3) _____		Alaska Gleyed Pores (A15) _____		Alaska Redox with 2.5Y Hue _____			
Hydrogen Sulfide (A4) _____				Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____			
Thick Dark Surface (A12) _____				Other (Explain in Notes) X 461 low organic carbon pg 93			
³ One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic. ⁴ Give details of color change in Notes.							
Restrictive Layer (if present): Type: <u>None</u> Depth (inches): <u>N/A</u>							
Hydric Soil Present (Y/N): <u>Y</u> - Primary Hydric, position, Hyd. Veg Present.							
Notes: Soil did not meet Indicator for A. Redox due to low % of Redox conc. & LACK of AVAILABLE iron. Soil has low organic iron content & Hydric Prob. Soil 461							
HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)				SECONDARY INDICATORS (2 or more required)			
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____		Water-stained Leaves (B9) _____		Stunted or Stressed Plants (D1) _____		
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____		Drainage Patterns (B10) <u>X</u>		Geomorphic Position (D2) <u>X</u>		
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____		Oxidized Rhizospheres along Living Roots (C3) _____		Shallow Aquitard (D3) _____		
Water Marks (B1) _____	Marl Deposits (B15) _____		Presence of Reduced Iron (C4) _____		Microtopographic Relief (D4) _____		
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____		Salt Deposits (C5) _____		FAC-Neutral Test (D5) _____		
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____		Notes:				
Algal Mat or Crust (B4) _____	Other (Explain in Notes):						
Iron Deposits (B5) _____							
Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>>1'</u>		Wetland Hydrology Present (Y/N): <u>Y</u>				
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0</u>						
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0</u>						
Notes: <u>beaver pond.</u>							

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 086	Map #: 58 Map Date: 5/27/14
Date: 06-09-2014	Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT002
Investigators: Dan LaPlant, Zoe Meade			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 602	
Latitude: 63° 00' 40.08'		Longitude: 149° 32' 47.86"	Datum: WGS84
Logbook No.: 002	Logbook Page No.: 2	Picture No.: PW60HT002 - N, S, Pit, Plug	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): terrace
Slope (%): 15	Local relief (concave, convex, none): concave
Pre-mapped Alaska LNG/NWI classification: PEM1/SSIB	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: PEM1/SSIB
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Viereck): IIIA2, IIC2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See site sketch in field notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Andromeda polifolia</i>	35	Y	FACW
2. <i>Betula nana</i>	30	Y	FAC
3. <i>Empetrum nigrum</i>	10		FAC
4. <i>Spiraea stevenii</i>	—	—	—
5. <i>Salix ovalifolia</i>	10		FAC
6. <i>Vaccinium uliginosum</i>	20		FAC
7. <i>Vaccinium vitis-idaea</i>	T		
8.			
9.			
Total Cover: <u>105</u> 50% of total cover: <u>52.5</u> 20% of total cover: <u>21</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)
 Total Number of Dominant Species Across All Strata: 3 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: 0 X 1 = 0
 FACW species: 35 X 2 = 70
 FAC species: 70 X 3 = 210
 FACU species: 0 X 4 = 0
 UPL species: 0 X 5 = 0
 Column Totals: 105 (A) 280 (B)
 PI = B/A = 2.67

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Carex bigelowii</i>	45	Y	FAC
2. <i>Rubus chamaemorus</i>	T		FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>45</u> 50% of total cover: <u>22.5</u> 20% of total cover: <u>9</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
85 % Cover of Wetland Bryophytes
85 Total Cover of Bryophytes
0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>06-09-14</u> Feature ID <u>W60 HT002</u>					Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0 - 13	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	Fibric	organics
13 - 20	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	Histic	Hemic
20 - 22	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	Sand/gravel	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) <u> </u>	Alaska Color Change (TA4) ⁴ <u> </u>
Histic Epipedon (A2) <u> </u>	Alaska Redox (A14) <u> </u>	Alaska Alpine Swales (TA5) <u> </u>
Black Histic (A3) <u> </u>	Alaska Gleyed Pores (A15) <u> </u>	Alaska Redox with 2.5Y Hue <u> </u>
Hydrogen Sulfide (A4) <u> </u>		Alaska Gleyed without 5Y Hue or Redder Underlying Layer <u> </u>
Thick Dark Surface (A12) <u> </u>		Other (Explain in Notes) <u> </u>

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: Depth (inches):

Hydric Soil Present (Y/N): Y

Notes: water table 2" from surface

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u> </u>	Surface Soil Cracks (B6) <u> </u>	Water-stained Leaves (B9) <u> </u>	Stunted or Stressed Plants (D1) <u> </u>
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) <u> </u>	Drainage Patterns (B10) <u> </u>	Geomorphic Position (D2) <u> </u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) <u> </u>	Oxidized Rhizospheres along Living Roots (C3) <u> </u>	Shallow Aquitard (D3) <u> </u>
Water Marks (B1) <u> </u>	Marl Deposits (B15) <u> </u>	Presence of Reduced Iron (C4) <u> </u>	Microtopographic Relief (D4) <u> </u>
Sediment Deposits (B2) <u> </u>	Hydrogen Sulfide Odor (C1) <u> </u>	Salt Deposits (C5) <u> </u>	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) <u> </u>	Dry-Season Water Table (C2) <u> </u>	Notes: <u> </u>	
Algal Mat or Crust (B4) <u> </u>	Other (Explain in Notes): <u> </u>		
Iron Deposits (B5) <u> </u>			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>N/A</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>2</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0"</u>	
Notes: <u> </u>		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES	
P= Plot, M= Matrix Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <u>X</u> Aquatic Bed _____	
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>0</u> Dwarf shrub (<0.5m) <u>105</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>45</u> Moss-Lichen <u>85</u> Floating <u>0</u> Submerged <u>0</u>	
Number of Wetland Types (M): <u>3</u>	Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>X</u>
Vegetation Density/Dominance (P): Sparse (0-20%) <u>X</u> Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____	
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A <u>X</u>	
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____	
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <u>X</u>	
Cover Distribution of Dominant Layer (P): No Veg _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>	
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____	
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) <u>X</u> High (small groupings, diverse and interspersed) _____	
HGM Class (P): Slope _____ Flat <u>X</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____	

SOIL VARIABLES
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____

HYDROLOGIC VARIABLES
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet <u>X</u> No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____
Micorelief of Wetland Surface (P): Absent <u>X</u> Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow <u>X</u>
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) <u>X</u>
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed <u>X</u> Intermittent Spring _____ Perennial Spring _____

LANDSCAPE VARIABLES (M)
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below <u>X</u> Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____

Crew Chief QA/QC check: 

GPS Technician QA/QC check: 

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W004T0~~08~~⁰² Field Target: 086 Date: 06-09-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X

[Signature]

Signature / Date

X Don Lobant

Field Crew Chief (print)

X

[Signature] 6/9/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION				corridor	
Survey Type: Centerline		Access Road (explain)		Other (explain) <input checked="" type="checkbox"/>	
Field Target: 088		Map #: 60		Map Date: 7/27/14	
Date: 06-09-14		Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT003	
Investigators: Dan LaPlant, Zoe Meade				Team No.: W60	
State: Alaska		Region: Alaska		Milepost: 603	
Latitude: 62° 59' 38.18"		Longitude: 149° 39' 39.18'		Datum: WGS84	
Logbook No.: 002		Logbook Page No.: 3		Picture No.: P-W60HT-W, E, Pit. plug	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): hillslope w/
Slope (%): 15	Local relief (concave, convex, none): hummocks
Pre-mapped Alaska LNG/NWI classification: PSS1B	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No (If no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No	Is the Sampled Area within a Wetland? Yes No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes No <input checked="" type="checkbox"/>	Wetland Type: upland
Wetland Hydrology Present? Yes No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Viereck): IIIA1, IIC2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

see logbook

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
Sapling/Shrub Stratum (<u>20</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Spiraea stevenii</i>	2		FACU
2. <i>Betula nana</i>	25	Y	FAC
3. <i>Empetrum nigrum</i>	10	Y	FAC
4. <i>Vaccinium vitis-idaea</i>	T		FAC
5. <i>Rhododendron tomentosum</i>	1		FACW
6. <i>Vaccinium uliginosum</i>	10	Y	FAC
7.			
8.			
9.			
Total Cover: <u>47</u> 50% of total cover: <u>23.5</u> 20% of total cover: <u>9.4</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 4 (A)
 Total Number of Dominant Species Across All Strata: 4 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: 0 X 1 = 0
 FACW species: 1 X 2 = 2
 FAC species: 130 X 3 = 390
 FACU species: 7 X 4 = 28
 UPL species: 0 X 5 = 0
 Column Totals: 138 (A) 420 (B)
 PI = B/A = 3.04

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>20</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Calamagrostis canadensis</i>	85	Y	FAC
2. <i>Gymnocarpium dryopteris</i>	5		FACU
3. <i>Cornus canadensis</i>	T		FACU
4. <i>Anemone narcissiflora</i>	T		FACU
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>96</u> 50% of total cover: <u>45</u> 20% of total cover: <u>17</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☐ Prevalence Index is ≤ 3.0
☐ Morphological Adaptations¹ (Provide supporting data in Notes)
☐ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
20 % Cover of Wetland Bryophytes
20 Total Cover of Bryophytes
0 % Cover of Water
Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

3 (JA)

SOIL		Date <u>06-14-09</u> Feature ID <u>W60HT002</u>						Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)									
Depth (inches)	Matrix		Redox Features				Texture	Notes	
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²			
0-2							Fibric	organic	
2-6							Silt loam		
6-22	10 YR 4/1	100					Silt loam + gravel mix		
	7.5 YR 2.5/1	100							

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS	INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____
Hydrogen Sulfide (A4) _____	Alaska Redox with 2.5Y Hue _____
Thick Dark Surface (A12) _____	Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
	Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): N

Notes: _____

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): _____	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): _____	
Saturation Present (Y/N): <u>N</u> (includes capillary fringe)	Depth (in): _____	
Notes: _____		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____	Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____

HYDROLOGIC VARIABLES
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____

LANDSCAPE VARIABLES (M)
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____

Crew Chief QA/QC check:

Don J. Platt

GPS Technician QA/QC check:

nm

Wetland Determination Data Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60 HT063

Field Target: 88

Date: 6/9/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?

☒ Maps are initialed and dated?

8. Photos

☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?

☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X Yarmouth

Signature / Date

X Don Lachant

Field Crew Chief (print)

X Don Lachant

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/>		Field Target: 133	Map #: 93 Map Date: 5/27/14
Date: 06-10-14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT004
Investigators: Dan LaPlant, Zoe Meade			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 124	
Latitude: 62° 27' 02.02"		Longitude: 150° 16' 15.34"	Datum: WGS84
Logbook No.: 002	Logbook Page No.: 005	Picture No.: PW60HT004_E, S.P.H. plug	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): slight hummocks
Slope (%): 0-3	Local relief (concave, convex, none): concave
Pre-mapped Alaska LNG/NWI classification: PSS1/EM1C	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (if no, explain in Notes.)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Wetland Type: PSS1/EM1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Alaska Vegetation Classification (Vioreck): II C2, III A2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See sketch in logbook 002 page 005

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea mariana</i>	20	Y	FACW
2. <i>Betula nana</i>	15		FAC
3. <i>Vaccinium oxycoccus</i>	5		OBL
4. <i>Chamaedaphne calyculata</i>	2		FACW
5. <i>Rhododendron tomentosum</i>	4		FACW
6. <i>Empetrum nigrum</i>	30	Y	FAC
7.			
8.			
9.			
Total Cover: <u>76</u> 50% of total cover: <u>38</u> 20% of total cover: <u>15.2</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)
 Total Number of Dominant Species Across All Strata: 3 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: 48 X 1 = 48
 FACW species: 35 X 2 = 70
 FAC species: 52 X 3 = 156
 FACU species: 0 X 4 = 0
 UPL species: 0 X 5 = 0
 Column Totals: 135 (A) 274 (B)
 PI = B/A = 2.03

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Equisetum arvense</i>	7		FAC
2. <i>Oxyspora rotundifolia</i>	1		OBL
3. <i>Rubus Cham aemorow</i>	7		FACW
4. <i>Pedicularis labradorica</i>	2		FACW
5. <i>Carex microglochin</i>	40	Y	OBL
6. <i>Carex limosa</i>	3		OBL
7.			
8.			
9.			
10.			
Total Cover: <u>00</u> 50% of total cover: <u>30</u> 20% of total cover: <u>12</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
65 % Cover of Wetland Bryophytes
85 Total Cover of Bryophytes
5 % Cover of Water
Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>06-10-14</u> Feature ID <u>W60H1004</u>		Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)					
Depth (inches)	Matrix		Redox Features		Notes
	Color (moist)	%	Color (moist)	%	
<u>0-22</u>					<u>Histic</u> <u>organics</u>
					<u>Fibric</u>

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS	INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____
Hydrogen Sulfide (A4) _____	Alaska Color Change (TA4) ⁴ _____
Thick Dark Surface (A12) _____	Alaska Alpine Swales (TA5) _____
	Alaska Redox with 2.5Y Hue _____
	Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
	Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>2" between hummocks</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>3</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>Surface</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <input checked="" type="checkbox"/> Aquatic Bed _____			
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>20</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>21</u> Dwarf shrub (<0.5m) <u>35</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>60</u> Moss-Lichen <u>85</u> Floating <u>0</u> Submerged <u>0</u>			
Number of Wetland Types (M): <u>2</u>		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <input checked="" type="checkbox"/>	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <input checked="" type="checkbox"/> High Density (60-80%) _____ Very High Density (80-100%) _____			
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <input checked="" type="checkbox"/> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____			
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <input checked="" type="checkbox"/> High (>25) _____			
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <input checked="" type="checkbox"/>			
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <input checked="" type="checkbox"/>			
Dead Woody Material (P): Low Abundance (0-25% of surface) <input checked="" type="checkbox"/> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____			
Vegetative Interspersion (P): Low (large patches, concentric rings) <input checked="" type="checkbox"/> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____			
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <input checked="" type="checkbox"/> Riverine _____ Estaurine Fringe _____			

SOIL VARIABLES
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <input checked="" type="checkbox"/> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____

HYDROLOGIC VARIABLES
Inlet/Outlet Class (P): No Inlet/Outlet <input checked="" type="checkbox"/> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <input checked="" type="checkbox"/> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____
Evidence of Sedimentation (P): No Evidence Observed <input checked="" type="checkbox"/> Sediment Observed on Wetland Substrate _____ Fluvial/Quaternary Soils Sediment Created _____
Micorelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) <input checked="" type="checkbox"/> Pronounced (>18in.) _____
Frequency of Overbank Flooding (P): No Overbank Flooding <input checked="" type="checkbox"/> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____
Degree of Outlet Restriction (P): No Outflow <input checked="" type="checkbox"/> Restricted Outflow _____ Unrestricted Outflow _____
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) <input checked="" type="checkbox"/> Alkaline (>7.4) _____ Acid (<5.5) <input checked="" type="checkbox"/> pH Reading <u>4.6</u>
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <input checked="" type="checkbox"/> Glacial Till/Not Permeable _____
Basin Topographic Gradient (M): Low Gradient (<2%) <input checked="" type="checkbox"/> High Gradient (≥2%) _____
Evidence of Seeps and Springs (P): No Seeps or Springs <input checked="" type="checkbox"/> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____

LANDSCAPE VARIABLES (M)
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <input checked="" type="checkbox"/> Unknown _____
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <input checked="" type="checkbox"/>
Watershed Land Use: 0-5% Rural <input checked="" type="checkbox"/> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) <input checked="" type="checkbox"/>

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT004

Field Target: 133

Date: 06-10-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X

Signature / Date

X

Field Crew Chief (print)

X

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/>		Field Target: 136	Map #: 94 Map Date: 5/27/14
Date: 06-10-14	Project Name & No.: Alaska LNG 26221306		Feature Id: W604T005
Investigators: Dan La Plant, Zoe Meade			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 124	
Latitude: 62°20'43.854" <i>62°20'43.854"</i>	Longitude: <i>150°16'8.709"</i>	Datum: WGS84	
Logbook No.: 002	Logbook Page No.: 006	Picture No.: P_N.E. pit, plug	

SITE PARAMETERS	
Subregion: Interior	Landform (hillslope, terrace, hummocks, etc.):
Slope (%): 0-3	Local relief (concave, convex, none): <i>concave</i>
Pre-mapped Alaska LNG/NWI classification: <i>upland</i>	Soil Map Unit Name: —
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Wetland Type: <i>PSS1B</i>
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Alaska Vegetation Classification (Vioreck): <i>II B2</i>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See sketch in logbook 002 page 006

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: _____ 50% of total cover: _____ 20% of total cover: _____			
Sapling/Shrub Stratum (_____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Salix alaxensis</i>	80	Y	FAC
2. <i>Alnus</i> ssp.	3		FAC
3. <i>Viburnum edule</i>	3		FACU
4. <i>Rubus parviflorus</i>	3		FACU
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>91</u> 50% of total cover: <u>45.5</u> 20% of total cover: <u>18.2</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)
 Total Number of Dominant Species Across All Strata: 2 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: 0 X 1 = 0
 FACW species: 5 X 2 = 10
 FAC species: 178 X 3 = 534
 FACU species: 17 X 4 = 68
 UPL species: 0 X 5 = 0
 Column Totals: 200 (A) 612 (B)
 PI = B/A = 3.1

VEGETATION (use scientific names of plants)			
Herb Stratum (_____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Calamagrostis Canadensis</i>	90	Y	FAC
2. <i>Chamerion angustifolium</i>	1		FACU
3. <i>Viola epipsa palustris</i>	5		FACW
4. <i>Equisetum arvense</i>	5		FAC
5. <i>Mertensia paniculata</i>	2		FACU
6. <i>Echinopanax</i> Horridum	8		FACU
7. <i>Oplapanax</i>			
8.			
9.			
10.			
Total Cover: <u>111</u> 50% of total cover: <u>55.5</u> 20% of total cover: <u>22.2</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☐ Prevalence Index is ≤ 3.0
☐ Morphological Adaptations¹ (Provide supporting data in Notes)
☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
0 % Cover of Wetland Bryophytes
0 Total Cover of Bryophytes
0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>16-10-14</u>		Feature ID <u>WG01T 005</u>		Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features				Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²	
0-2							Fibric organic
2-9	10YR 4/1						Silt loam
9-22	10YR 5/8	50	6.5Y 4/1 5G/	50	C	M	Silt clay
			5.5Y 4/1				

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) <u>X</u>	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer <u>X</u>
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes: _____

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>NO</u>	Depth (in): _____	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Yes</u>	Depth (in): <u>13"</u>	
Saturation Present (Y/N): <u>Yes</u> (includes capillary fringe)	Depth (in): <u>9</u>	
Notes: _____		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>80</u> Short shrub (0.5-2m) <u>5</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>90</u> Short herb (<1m) <u>10</u> Moss-Lichen <u>0</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u>		Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <u>X</u> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) <u>X</u> High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty <u>X</u> Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial/Quaternary Soils Sediment Created _____	
Micorelief of Wetland Surface (P): Absent <u>X</u> Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated <u>X</u> Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT005

Field Target: 136

Date: 06-10-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X *Zoe Meade*

Signature / Date

X *Dan Laplant*

Field Crew Chief (print)

X *Dan Laplant* 6/10/14

Signature / Date

soil check

WETLAND DETERMINATION DATA FORM

Soils check

FT 136

136

SOIL		Date <u>7/2/14</u>		Feature ID <u>W60 AT 005</u>		Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-5							Fibric	organic
5-10		60					Fibric	organic
	10 YR 2/2	40					Silt loam	
10-16	5 Y 4/1	80	2.5 YR 3/6	20	C	PL	silt loam	
16-20	10 YR 5/2	50	10 YR 4/6	50	C	PL		

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) <u>X</u>	Alaska Redox (A14) <u>X</u>	Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____	
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____	
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) <u>X</u>	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) <u>X</u>	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): _____	Depth (in): _____	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>14</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>10</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/> <u>Corridor</u>		Field Target: <u>135</u>	Map #: <u>94</u> Map Date: <u>5/27</u>
Date: <u>06-10-14</u>	Project Name & No.: <u>Alaska LNG 26221306</u>		Feature Id: <u>W60HT006</u>
Investigators: <u>Dan LaPlant, Zoe Meade</u>			Team No.: <u>W60</u>
State: <u>Alaska</u>	Region: <u>Alaska</u>	Milepost: <u>124</u>	
Latitude: <u>62°26'48.485"</u>	Longitude: <u>150°16'9.867"</u>	Datum: <u>WGS84</u>	
Logbook No.: <u>002</u>	Logbook Page No.: <u>007</u>	Picture No.: <u>P-5, SW, pit, plug</u>	

SITE PARAMETERS	
Subregion: <u>interior</u>	Landform (hillslope, terrace, hummocks, etc.): <u>depression</u>
Slope (%): <u>0-3</u>	Local relief (concave, convex, none): <u>concave</u>
Pre-mapped Alaska LNG/NWI classification: <u>upland</u>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (if no, explain in Notes.)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Wetland Type: <u>PEM1F</u>
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Alaska Vegetation Classification (Vioreck): <u>III A3</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See sketch in logbook 002 page 007

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Salix alaxensis</i>	25	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>25</u> 50% of total cover: <u>12.5</u> 20% of total cover: <u>5</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)
 Total Number of Dominant Species Across All Strata: 2 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: 75 X 1 = 75
 FACW species: 0 X 2 = 0
 FAC species: 35 X 3 = 105
 FACU species: 4 X 4 = 16
 UPL species: 0 X 5 = 0
 Column Totals: 114 (A) 196 (B)
 PI = B/A = 1.72

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Equisetum fluviatile</i>	75	Y	OBL
2. <i>Calamagrostis Canadensis</i>	10		FAC
3. <i>Gymnocarpium dryopteris</i>	3		FACU
4. <i>Streptopus amplexifolius</i>	1		FACU
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>89</u> 50% of total cover: <u>44.5</u> 20% of total cover: <u>17.8</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

☐ % Bare Ground
☐ % Cover of Wetland Bryophytes
☐ Total Cover of Bryophytes
☐ % Cover of Water
Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>06-10-14</u> Feature ID <u>W60HI006</u>				Soil Pit Required (Y/N) <u>N</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) <u>X</u>

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes: target in center of wetland pond - no pit possible

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>10-12"</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0</u>	
Saturation Present (Y/N): <u>X</u> (includes capillary fringe)	Depth (in): <u>0</u>	

Notes: target in center of wetland pond - inundation observed

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <input checked="" type="checkbox"/> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>25</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>75</u> Short shrub (0.5-2m) <u>0</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>10</u> Short herb (<1m) <u>0</u> Moss-Lichen <u>0</u> Floating <u>0</u> Submerged <u>75</u>		
Number of Wetland Types (M): <u>1</u>	Evenness of Wetland Type Distribution (M): Even <u>1</u> Highly Uneven _____ Moderately even _____	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) <input checked="" type="checkbox"/> Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <input checked="" type="checkbox"/> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) <input checked="" type="checkbox"/> Medium (5-25 species) <input checked="" type="checkbox"/> High (>25) _____		
Presence of Islands (M): Absent (none) <input checked="" type="checkbox"/> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems <input checked="" type="checkbox"/> 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <input checked="" type="checkbox"/> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) <input checked="" type="checkbox"/> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <input checked="" type="checkbox"/> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking <input checked="" type="checkbox"/> Histosol:Fibric _____ Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet <input checked="" type="checkbox"/> No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <input checked="" type="checkbox"/> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <input checked="" type="checkbox"/> Sediment Observed on Wetland Substrate _____ Fluvial/Quaternary Soils Sediment Created _____	
Micorelief of Wetland Surface (P): Absent <input checked="" type="checkbox"/> Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs <input checked="" type="checkbox"/> Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow <input checked="" type="checkbox"/> Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) <input checked="" type="checkbox"/> Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading <u>5.6</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <input checked="" type="checkbox"/> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <input checked="" type="checkbox"/> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <input checked="" type="checkbox"/> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated <input checked="" type="checkbox"/> Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <input checked="" type="checkbox"/>	
Watershed Land Use: 0-5% Rural <input checked="" type="checkbox"/> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <input checked="" type="checkbox"/> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT006

Field Target: 135

Date: 06-10-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☐ Soil profile is complete? *no soil at*
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)? *2 veg photos (no soil pit dug)*
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X *Zoe Meade*

Wetland Scientist (print)

X *Zoe Meade*

Signature / Date

X *Don LaPoint*

Field Crew Chief (print)

X *Don LaPoint* 6/10/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION				off Highway, Map QC	
Survey Type: Centerline		Access Road (explain)		Other (explain) <input checked="" type="checkbox"/>	
Field Target: 134		Map #: 94		Map Date: 5/27	
Date: 06-10-14		Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT007	
Investigators: Dan LaPlant, Zoe Meade				Team No.: W60	
State: Alaska		Region: Alaska		Milepost: 124	
Latitude: 62° 26' 55.82"		Longitude: -150° 16' 17.45"		Datum: WGS84	
Logbook No.: 002		Logbook Page No.: 008		Picture No.: P_S, N, pit, plug	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): terrace
Slope (%): 3-5	Local relief (concave, convex, none): concave
Pre-mapped Alaska LNG/NWI classification: upland	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No (if no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes No <input checked="" type="checkbox"/>	Wetland Type: upland
Wetland Hydrology Present? Yes No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Vioreck): II B 1

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See sketch Logbook 002 page 008

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
<u>Tree Stratum</u> (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>4</u> (B) % Dominant Species that are OBL, FACW, or FAC: <u>25</u> (A/B)
1.				
2.				
3.				
4.				
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species: <u>0</u> X 1 = <u>0</u> FACW species: <u>0</u> X 2 = <u>0</u> FAC species: <u>93</u> X 3 = <u>279</u> FACU species: <u>165</u> X 4 = <u>660</u> UPL species: <u>0</u> X 5 = <u>0</u> Column Totals: <u>258</u> (A) <u>939</u> (B) PI = B/A = <u>3.64</u>
<u>Sapling/Shrub Stratum</u> (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <u>Alnus ssp.</u>	<u>90</u>	<u>Y</u>	<u>FAC</u>	
2. <u>Oplopanax horridus</u>	<u>30</u>	<u>Y</u>	<u>FACU</u>	
3.				
4.				
5.				
6.				
7.				
8.				
9.				
Total Cover: <u>120</u> 50% of total cover: <u>60</u> 20% of total cover: <u>24</u>				

VEGETATION (use scientific names of plants)				
<u>Herb Stratum</u> (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Hydrophytic Vegetation Indicators: <u>No</u> Dominance Test is > 50% <u>No</u> Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
1. <u>Streptopus amplexifolius</u>	<u>5</u>		<u>FACU</u>	
2. <u>Gymnocarpium dryopteris</u>	<u>50</u>	<u>Y</u>	<u>FACU</u>	
3. <u>Dryopteris expansa</u>	<u>80</u>	<u>Y</u>	<u>FACU</u>	
4. <u>Equisetum sylvaticum</u>	<u>3</u>		<u>FAC</u>	
5.				_____ % Bare Ground _____ % Cover of Wetland Bryophytes _____ Total Cover of Bryophytes _____ % Cover of Water Hydrophytic Vegetation Present (Y/N): <u>No</u> Notes: (If observed, list morphological adaptations below):
6.				
7.				
8.				
9.				
10.				
Total Cover: <u>138</u> 50% of total cover: <u>69</u> 20% of total cover: <u>27.6</u>				

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>06-10-14</u> Feature ID <u>W60HT007</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-2							Fibric	organics
2-9	10YR 3/2	100					Silt loam	
9-22	10YR 4/4	100					Silt loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): N

Notes: _____

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>N/A</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>N/A</u>	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): <u>15</u>	
Saturation Present (Y/N): <u>N</u> (includes capillary fringe)	Depth (in): <u>14</u>	

Notes: saturation at 14"
Water table at 15"

WETLAND DETERMINATION DATA FORM

Upland

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		
SOIL VARIABLES		
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____		
HYDROLOGIC VARIABLES		
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____		
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____		
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____		
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____		
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____		
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____		
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____		
Surficial Glacial Deposits Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____		
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____		
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____		
LANDSCAPE VARIABLES (M)		
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____		
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____		
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____		
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____		

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT007

Field Target: 134

Date: 06-10-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X *Joe Meade*

Wetland Scientist (print)

X *[Signature]*

Signature / Date

X *Jim Laplant*

Field Crew Chief (print)

X *[Signature]* 6/10/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/>		Field Target: 142	Map #: 98 Map Date: 5/27/14
Date: 06-12-14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60 HT008
Investigators: Dan La Plant, Zoe Meade			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 122.2	
Latitude: 62° 25' 15.03"		Longitude: 150° 15' 50.03"	Datum: WGS84
Logbook No.: 002	Logbook Page No.: 013	Picture No.: P- NW, NE, pit, plug	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): valley bottom
Slope (%): 0-4	Local relief (concave, convex, none): none
Pre-mapped Alaska LNG/NWI classification: Upland	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Wetland Type: upland
Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Vioreck): IC2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See sketch in Logbook 002 page 013.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: <u>2</u> (A) Total Number of Dominant Species Across All Strata: <u>6</u> (B) % Dominant Species that are OBL, FACW, or FAC: <u>33</u> (A/B)
1. <i>Betula neoalaskana</i>	30	Y	FACU	
2. <i>Picea glauca</i>	35	Y	FACU	
3.				
4.				
Total Cover: <u>65</u> 50% of total cover: <u>32.5</u> 20% of total cover: <u>13</u>				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species: <u>0</u> x 1 = <u>0</u> FACW species: <u>0</u> x 2 = <u>0</u> FAC species: <u>173</u> x 3 = <u>519</u> FACU species: <u>147</u> x 4 = <u>588</u> UPL species: <u>0</u> x 5 = <u>0</u> Column Totals: <u>320</u> (A) <u>1107</u> (B) PI = B/A = <u>3.46</u>
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <i>Viburnum edule</i>	40	Y	FACU	
2. <i>Oplopanax horridus</i>	25	Y	FACU	
3. <i>Alnus ssp.</i>	15		FAC	
4. <i>Sambucus racemosa</i>	5		FACU	
5.				
6.				
7.				
8.				
9.				
Total Cover: <u>85</u> 50% of total cover: <u>42.5</u> 20% of total cover: <u>17</u>				

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Hydrophytic Vegetation Indicators: <input type="checkbox"/> Dominance Test is > 50% <input type="checkbox"/> Prevalence Index is ≤ 3.0 <input type="checkbox"/> Morphological Adaptations ¹ (Provide supporting data in Notes) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
1. <i>Calamagrostis Canadensis</i>	80	Y	FAC	
2. <i>Athyrium cyclosorum</i>	75	Y	FAC	
3. <i>Gymnocarpium dryopteris</i>	10		FACU	
4. <i>Streptopus amplexifolius</i>	2		FACU	
5. <i>Equisetum sylvaticum</i>	3		FAC	0 % Bare Ground 0 % Cover of Wetland Bryophytes 0 Total Cover of Bryophytes 0 % Cover of Water Hydrophytic Vegetation Present (Y/N): <u>N</u> Notes: (If observed, list morphological adaptations below):
6. <i>Cornus canadensis</i>	T		FAC	
7.				
8.				
9.				
10.				
Total Cover: <u>170</u> 50% of total cover: <u>85</u> 20% of total cover: <u>34</u>				

WETLAND DETERMINATION DATA FORM

SOIL		Date 06-12-14		Feature ID W60HT008		Soil Pit Required (Y/N) Y		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-4	—	—	—	—	—	—	organic	
4-6.5	—	—	—	—	—	—		Ash
5.5-8.5	2.5YR 3/1	100	—	—	—	—	silt loam	
8.5-22	5YR 5/6	100	—	—	—	—	silt loam	
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ² Location: PL=Pore Lining, M=Matrix.								
HYDRIC SOIL INDICATORS							INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) _____			Alaska Gleyed (A13) _____			Alaska Color Change (TA4) ⁴ _____		
Histic Epipedon (A2) _____			Alaska Redox (A14) _____			Alaska Alpine Swales (TA5) _____		
Black Histic (A3) _____			Alaska Gleyed Pores (A15) _____			Alaska Redox with 2.5Y Hue _____		
Hydrogen Sulfide (A4) _____						Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____		
Thick Dark Surface (A12) _____						Other (Explain in Notes) _____		
³ One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic. ⁴ Give details of color change in Notes.								
Restrictive Layer (if present): Type: _____ Depth (inches): _____								
Hydric Soil Present (Y/N): <u>N</u>								
Notes:								

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____	_____		
Surface Water Present (Y/N): N	Depth (in): _____	Wetland Hydrology Present (Y/N): N	
Water Table Present (Y/N): N	Depth (in): _____		
Saturation Present (Y/N): (includes capillary fringe) N	Depth (in): _____		
Notes:			

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____			
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (>1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____			
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____			
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____			
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____			
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____			
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____			
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____			
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____			
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____			
SOIL VARIABLES			
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____			
HYDROLOGIC VARIABLES			
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____			
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____			
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____			
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____			
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____			
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____			
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____			
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____			
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____			
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____			
LANDSCAPE VARIABLES (M)			
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____			
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____			
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____			
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____			

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT008

Field Target: 142

Date: 06-12-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☐ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☐ Vegetation names are entered legibly for all strata present?
- ☐ Cover calculations are complete and correct?
- ☐ All dominant species have been determined and recorded per strata?
- ☐ Indicator status is correct for each species?
- ☐ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☐ Soil profile is complete?
- ☐ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☐ Appropriate hydrology indicators are marked?
- ☐ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☐ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☐ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☐ Each logbook page is initialed and dated?

7. Maps

- ☐ Wetland boundaries have been corrected if necessary?
- ☐ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade
Wetland Scientist (print)

X *Zoe Meade* 6/12/14
Signature / Date

X *Dan Laplant*
Field Crew Chief (print)

X *D. Laplant* 6/12/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION 2000' corridor			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/>		Field Target: 141	Map #: 98 Map Date: 5/27/14
Date: 06-12-14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT009
Investigators: Dan Laplant, Zoe Meade			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 122.2	
Latitude: 62° 25' 14.37"		Longitude: 150° 15' 56.09"	Datum: WGS84
Logbook No.: 002	Logbook Page No.: 014	Picture No.: P.W, NW, pit, plug	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): Valley bottom
Slope (%): 0-2	Local relief (concave, convex, none): Concave
Pre-mapped Alaska LNG/NWI classification: PSS 1/EM 1 B	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Wetland Type: PEM 1 F
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Alaska Vegetation Classification (Vioreck): III A 3

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See sketch in Logbook 002 page 015.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: <u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: <u>2</u> (A) Total Number of Dominant Species Across All Strata: <u>2</u> (B) % Dominant Species that are OBL, FACW, or FAC: <u>100</u> (A/B)
1.				
2.				
3.				
4.				
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species: <u>105</u> X 1 = <u>105</u> FACW species: <u>0</u> X 2 = <u>0</u> FAC species: <u>10</u> X 3 = <u>30</u> FACU species: <u>0</u> X 4 = <u>0</u> UPL species: <u>0</u> X 5 = <u>0</u> Column Totals: <u>115</u> (A) <u>135</u> (B) PI = B/A = <u>1.17</u>
Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>				

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Hydrophytic Vegetation Indicators: <input checked="" type="checkbox"/> Dominance Test is > 50% <input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
1. <u>Comarum palustre</u>	<u>15</u>		<u>OBL</u>	
2. <u>Equisetum fluviale</u>	<u>65</u>	<u>Y</u>	<u>OBL</u>	
3. <u>unidentified herb</u>	<u>5</u>		<u>---</u>	
4. <u>Carex aquatilis</u>	<u>25</u>	<u>Y</u>	<u>OBL</u>	
5. <u>Calamagrostis canadensis</u>	<u>10</u>		<u>FAC</u>	<u>0</u> % Bare Ground <u>25</u> % Cover of Wetland Bryophytes <u>25</u> Total Cover of Bryophytes <u>75</u> % Cover of Water Hydrophytic Vegetation Present (Y/N): <u>Y</u> Notes: (If observed, list morphological adaptations below):
6.				
7.				
8.				
9.				
10.				
Total Cover: <u>120</u> 50% of total cover: <u>60</u> 20% of total cover: <u>24</u>				

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>06-12</u> Feature ID <u>W60HT009</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0 - 3	—	—	—	—	—	—	—	organics
3 - 14	2.5 YR 3/1	100	—	—	—	—	Silt loam	
14 - 22+	7.5 YR 7/1	75	2.5 YR 6/8	25	C	PL, M	Silt loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ <u>X</u>
Histic Epipedon (A2) _____	Alaska Redox (A14) <u>X</u>	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer
Thick Dark Surface (A12) _____		Other (Explain in Notes)

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes:
 2.5 YR 6/8 Mottles are in the pore spaces and in the matrix.
 5 YR 5/8 mottled, 7.5 YR 7/1 matrix } Very large/color of matrix changed when exposed to oxygen w/in first 5 minutes of exposure

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) <u>X</u>	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) <u>X</u>	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) <u>X</u>	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes):		
Iron Deposits (B5) <u>X</u>			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>?</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>9</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>4"</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent <u>X</u> Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>8</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>0</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>10</u> Short herb (<1m) <u>0</u> Moss-Lichen <u>25</u> Floating <u>0</u> Submerged <u>90</u>		
Number of Wetland Types (M): <u>1</u>	Evenness of Wetland Type Distribution (M): Even <u>1</u> Highly Uneven _____ Moderately even _____	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) <u>X</u> Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) <u>X</u> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty <u>X</u> Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded <u>X</u>	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial/Quaternary Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent <u>X</u> Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) <u>X</u> pH Reading <u>5.36</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated <u>X</u> Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

[Handwritten signature]

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT009

Field Target: 141

Date: 06-012-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

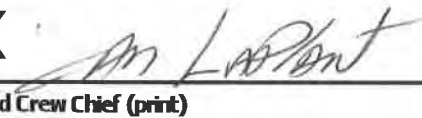
- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade
Wetland Scientist (print)

X 
Signature / Date

X 
Field Crew Chief (print)

X  6/12/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: <u>143</u>	Map #: <u>98</u> Map Date: <u>5/27</u>
Date: <u>06-12-2014</u>	Project Name & No.: <u>Alaska LNG 26221306</u>		Feature Id: <u>W60HT010</u>
Investigators: <u>Dan LaPlant, Zoe Meade</u>			Team No.: <u>W60</u>
State: <u>Alaska</u>	Region: <u>Alaska</u>	Milepost: <u>122</u>	
Latitude: <u>62° 25' 05.39"</u>		Longitude: <u>150° 15' 48.46"</u>	Datum: <u>WGS84</u>
Logbook No.: <u>002</u>	Logbook Page No.: <u>016</u>	Picture No.: <u>P-SE, NW, pit, plug</u>	

SITE PARAMETERS	
Subregion: <u>interior</u>	Landform (hillslope, terrace, hummocks, etc.): <u>Valley bottom</u>
Slope (%): <u>0-1</u>	Local relief (concave, convex, none): <u>concave</u>
Pre-mapped Alaska LNG/NWI classification: <u>upland</u>	Soil Map Unit Name: _____
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (if no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/>	Wetland Type: <u>upland</u>
Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Vioreck): <u>III A31</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See sketch in Logbook 002 page 016.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>4</u> (B) % Dominant Species that are OBL, FACW, or FAC: <u>25</u> (A/B)
1. <i>Betula neolaskana</i>	10	Y	FACU	
2.				
3.				
4.				
Total Cover: <u>10</u> 50% of total cover: <u>5</u> 20% of total cover: <u>2</u>				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species: <u>0</u> X 1 = <u>0</u> FACW species: <u>0</u> X 2 = <u>0</u> FAC species: <u>114</u> X 3 = <u>342</u> FACU species: <u>61</u> X 4 = <u>244</u> UPL species: <u>0</u> X 5 = <u>0</u> Column Totals: <u>175</u> (A) <u>586</u> (B) PI = B/A = <u>3.35</u>
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <i>Sambucus racemosa</i>	2		FACU	
2. <i>Oplopanax horridus</i>	10	Y	FACU	
3. <i>Rubus idaeus</i>	3	Y	FACU	
4.				
5.				
6.				
7.				
8.				
9.				
Total Cover: <u>15</u> 50% of total cover: <u>7.5</u> 20% of total cover: <u>3</u>				

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Hydrophytic Vegetation Indicators: <input type="checkbox"/> Dominance Test is > 50% <input type="checkbox"/> Prevalence Index is ≤ 3.0 <input type="checkbox"/> Morphological Adaptations ¹ (Provide supporting data in Notes) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
1. <i>Calamagrostis canadensis</i>	90	Y	FAC	
2. <i>Chamaerion angustifolium</i>	5		FACU	
3. <i>Trientalis europaea</i>	T		FACU	
4. <i>Gymnocarpium dryopteris</i>	25		FACU	
5. <i>Equisetum sylvaticum</i>	20		FAC	
6. <i>Veratrum viride</i>	2		FAC	
7. <i>Streptopus amplexifolius</i>	1		FACU	
8. <i>Dryopteris expansa</i>	5		FACU	
9.				
Total Cover: <u>148</u> 50% of total cover: <u>74</u> 20% of total cover: <u>29.6</u>				% Bare Ground: <u>0</u> % Cover of Wetland Bryophytes: <u>0</u> Total Cover of Bryophytes: <u>0</u> % Cover of Water: <u>0</u> Hydrophytic Vegetation Present (Y/N): <u>N</u> Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>06-12</u> Feature ID <u>W60HT010</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-2								Organics
2-4								Ash, volcanic
4-8	2.5YR 2.5/1	100					Silt loam	
8-22	10YR 5/8	100					Silt loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer
Thick Dark Surface (A12) _____		Other (Explain in Notes)

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): N

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes):		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): _____	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): _____	
Saturation Present (Y/N): <u>N</u> (includes capillary fringe)	Depth (in): _____	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____			
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____			
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____			
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____			
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____			
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____			
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site _____ Open _____ Small Scattered Patches _____ Continuous Cover _____			
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____			
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____			
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____			
SOIL VARIABLES			
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____			
HYDROLOGIC VARIABLES			
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____			
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____			
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____			
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____			
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____			
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____			
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____			
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____			
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____			
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____			
LANDSCAPE VARIABLES (M)			
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____			
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____			
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____			
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____			

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT010

Field Target: 143

Date: 06-12-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X

Zoe Meade

Signature / Date

06-12-14

X

Dej Laplant

Field Crew Chief (print)

X

Dej Laplant

Signature / Date

6/12/14

Vegetation Classification Data Form

Site Description		
Date: 06-13-14	Project Name & #: Alaska LNG 26221306	Field Target: 144
Investigators: Dan LaPlant, Zoe Meade		Feature ID: W60HT011
Latitude: 62°23'44.53"	Longitude: 150°15'57.64"	Datum: WGS84
Logbook #: 002 pg. 020	Logbook Page #: 020	Picture #: P_W60HT011 - veg - veg
Location Description:		
Common Species Observed (Scientific Name)		
Betula neoalaskana	dryopteris expansa	
Alnus ssp.	trientalis europaea	
Calamagrostis canadensis		
Sambucus racemosa		
Percent Cover of Dominant Structure Level: Bet neo - 50% , Alnus ssp. - 50%		
Habitat Description:		
upland - Birch/Spice forest		
Alaska Vegetation Classification: Level I, Level II, Level III		
I	C	2
Notes:		
Field target approximately 3' off of recreational ATV trail, easily accessible and no signs of wetland features.		

Field Crew Chief:



Field Scientist/Technician



Vegetation Classification Data Form

Table I-Alaska vegetation classification to level III

Level I	Level II	Level III
I Forest	A. Needleleaf (conifer) forest	(1) Closed needleleaf (conifer) forest (2) Open needleleaf (conifer) forest (3) Needleleaf (conifer) woodland
	B Broadleaf forest	(1) Closed broadleaf forest (2) Open broadleaf forest (3) Broadleaf woodland
	C Mixed forest	(1) Closed mixed forest (2) Open mixed forest (3) Mixed woodland
II Scrub	A Dwarf tree scrub	(1) Closed dwarf tree scrub (2) Open dwarf tree scrub (3) Dwarf tree scrub woodland
	B Tall scrub	(1) Closed tall scrub (2) Open tall scrub
	C Low scrub	(1) Closed low scrub (2) Open low scrub
	D Dwarf scrub	(1) Dryas dwarf scrub (2) Ericaceous dwarf scrub (3) Willow dwarf scrub
III Herbaceous	A Graminoid herbaceous	(1) Dry graminoid herbaceous (2) Mesic graminoid herbaceous (3) Wet graminoid herbaceous (emergent)
	B Forb herbaceous	(1) Dry forb herbaceous (2) Mesic forb herbaceous (3) Wet forb herbaceous (emergent)
	C Bryoid herbaceous	(1) Mosses (2) Lichens
	D Aquatic (nonemergent) herbaceous	(1) Freshwater aquatic herbaceous (2) Brackish water aquatic herbaceous (3) Marine aquatic herbaceous

Descriptions of levels I, II, III, and IV follow the classification table

1a. Trees over 3 meters (10 ft) tall are present and have a canopy cover of 10 percent or more	I Forest	2
1b. Trees over 3 meters (10 ft) tall are absent or nearly so. Less than 10 percent cover. (Dwarf trees, less than 3 meters [10 ft] tall may be present and abundant)		7
I Forest		
2a. Over 75 percent of tree cover contributed by needleleaf (conifer) species	IA Needleleaf forest	3
2b. Less than 75 percent of tree cover contributed by needleleaf (conifer) species		4
3a. Tree canopy of 60-100 percent cover	IA 1 Closed needleleaf forest	
3b. Tree canopy of 25-59 percent cover	IA 2 Open needleleaf forest	
3c. Tree canopy of 10-24 percent cover	IA 3 Needleleaf woodland	
4a. Over 75 percent of tree cover contributed by broadleaf species	IB Broadleaf forest	5
4b. Broadleaf or needleleaf species contribute 25 to 75 percent of the tree cover		6
5a. Tree canopy of 60-100 percent cover	IB 1 Closed broadleaf forest	
5b. Tree canopy of 25-59 percent cover	IB 2 Open broadleaf forest	
5c. Tree canopy of 10-24 percent cover	IB 3 Broadleaf woodland	
6a. Tree canopy of 60-100 percent cover	IC 1 Closed mixed forest	
6b. Tree canopy of 25-59 percent cover	IC 2 Open mixed forest	
6c. Tree canopy of 10-24 percent cover	IC 3 Mixed woodland	
7a. Vegetation with at least 25 percent cover of erect to decumbent shrubs or with at least 10 percent cover of dwarf trees (less than 3 meters [10 ft] tall)		8
7b. Vegetation herbaceous (may have up to 25 percent shrub cover)		15

II. Scrub		
8a. Vegetation with at least 10 percent cover of dwarf trees	II A Dwarf tree scrub	9
8b. Vegetation with at least 25 percent cover of shrubs and less than 10 percent cover of dwarf trees		10
9a. Dwarf tree canopy of 60-100 percent cover	II A.1 Closed dwarf tree scrub	
9b. Dwarf tree canopy of 25-59 percent cover	II A.2 Open dwarf tree scrub	
9c. Dwarf tree canopy of 10-24 percent cover	II A 3 Dwarf tree scrub woodland	
10a. Shrubs more than 1.5 meters (5 ft) tall	II B Tall scrub	11
10b. Shrubs less than 1.5 meters (5 ft) tall		12
11 a. Shrub canopy cover greater than 75 percent	II B 1 Closed tall scrub	
11 b. Shrub canopy cover of 25-74 percent	II B 2 Open tall scrub	
12a. Shrubs 20 centimeters to 1.5 meters tall	II C Low scrub	13
12b. Shrubs under 20 centimeters in height	II D Dwarf scrub	14
13a. Shrub canopy cover greater than 75 percent	II C 1 Closed low scrub	
13b. Shrub canopy cover of 25-74 percent, or as low as 2 percent if little or no other vegetation cover present	II C 2 Open low scrub	
14a. Dryas species dominant in the dwarf shrub layer	II D 1 Dryas dwarf scrub	
14b. Ericaceous species dominant in the dwarf shrub layer	II D 2 Ericaceous dwarf scrub	
14c. Willow species dominant in the dwarf shrub layer	II D 2 Willow dwarf scrub	
III. Herbaceous		
15a. Terrestrial vegetation, or if growing in the water, dominated by emergent vegetation		16
15b. Dominant vegetation growing submerged in water or floating on the water surface, but not emerging above the water	III D Aquatic herbaceous	21

16a. Grasses, sedges, or rushes (graminoid) plants dominant	III A Graminoid herbaceous	17
16b. Forbs or bryophytes dominant		18
17a. Grasslands of well-drained, dry sites, such as south-facing bluffs, old beaches, and sand dunes. Typically (but not always) dominated by <i>Elymus</i> spp., <i>Festuca</i> spp., and <i>Deschampsia</i> spp.	III A.1 Dry graminoid herbaceous	
17b. On moist sites, but usually not with standing water. Usually dominated by <i>Calamagrostis</i> spp., <i>Carex</i> spp. or <i>Enophorum</i> spp.; tussocks often present	III A 2 Mesic graminoid herbaceous	
17c. On wet sites, standing water present for part of the year; dominated by either sedges or grasses; includes wet tundra, bogs, marshes, and fens	III A 3 Wet graminoid herbaceous	
18a. Vegetation dominated by forbs (broadleaf herbs, ferns, or horsetails)	III B Forb herbaceous	19
18b. Vegetation dominated by mosses or lichens	III C Bryoid herbaceous	20
19a. On dry sites, usually rocky and well drained, mostly tundra sites	III B 1 Dry forb herbaceous	
19b. On moist sites but without standing water, mostly within forested areas	III B 2 Mesic forb herbaceous	
19c. On wet sites, usually with standing water for part of the year	III B 3 Wet forb herbaceous	
20a. Vegetation cover dominated by mosses	III C.1 Bryoid moss	
20b. Vegetation cover dominated by lichens	III C 2 Bryoid lichen	
21a. Vegetation submerged or floating in fresh water	III D.1 Freshwater aquatic herbaceous	
21 b. Vegetation submerged or floating in brackish water	III D 2 Brackish water aquatic herbaceous	
21c. Vegetation submerged or floating in salt water	III D 3 Marine aquatic herbaceous	

Vegetation Classification Data Form QA/QC Checklist

This form is to be completed before leaving the field site.

Feature ID: 144

Field Target: W60HT011

Date: 06-13-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. General Information

- ☒ Location data recorded?
- ☒ Photo taken and photo number recorded?

2. Location Description

- ☒ Location of site recorded with enough detail to help relocate?

3. Common Species

- ☒ Scientific name of common species recorded?
- ☒ Percent cover of dominant structure level noted?

4. Habitat Description

- ☒ Habitat described?

5. Classification

- ☒ All three levels of classification recorded?

6. Field Log Book

- ☒ Field form entries consistent with log book?
- ☒ Logbook clearly identifies the Field Target ID and Feature ID?

X Zoe Meade

Field Technician (print)

X Zoe Meade

Signature

X Don L. L. L.

Field Crew Chief (print)

X Don L. L. L. 6/13/14

Signature

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 145	Map #: 100 Map Date: 5/27
Date: 06-13-14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT012
Investigators: Dan LaPlant, Zoe Meade			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 119.2	
Latitude: 62° 22' 45.36"		Longitude: 150° 16' 10.02"	Datum: WGS84
Logbook No.: 002	Logbook Page No.: 021	Picture No.: P-W, E, pit, plug	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): stream bed
Slope (%): 0-2	Local relief (concave, convex, none): concave
Pre-mapped Alaska LNG/NWI classification: upland	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (if no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: PSS1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Vioreck): II B2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See sketch in Logbook 002, page 021.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: <u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: <u>2</u> (A) Total Number of Dominant Species Across All Strata: <u>4</u> (B) % Dominant Species that are OBL, FACW, or FAC: <u>50</u> (A/B)
1.				
2.				
3.				
4.				
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species: <u>10</u> X 1 = <u>10</u> FACW species: <u>30</u> X 2 = <u>60</u> FAC species: <u>155</u> X 3 = <u>465</u> FACU species: <u>79</u> X 4 = <u>316</u> UPL species: <u>0</u> X 5 = <u>0</u> Column Totals: <u>274</u> (A) <u>551</u> (B) PI = B/A = <u>2.01</u>
Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <i>Ainus ssp.</i>	50	Y	FAC	
2. <i>Spiraea stevenii</i>	2		FACU	
3. <i>Viburnum edule</i>	5		FACU	
4. <i>Oplopanax horridus</i>	15	Y	FACU	
5.				
6.				
7.				
8.				
9.				
Total Cover: <u>72</u> 50% of total cover: <u>36</u> 20% of total cover: <u>14.4</u>				

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Hydrophytic Vegetation Indicators: <input checked="" type="checkbox"/> Dominance Test is > 50% <u>Y</u> <input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
1. <i>Equisetum arvens</i>	70	Y	FAC	
2. <i>Gymnocarpium dryopteris</i>	2		FACU	
3. <i>Viola palustris</i>	30		FACW	
4. <i>Streptopus amplexifolius</i>	T		FACU	
5. <i>Calamagrostis Canadensis</i>	10		FAC	
6. <i>Dryopteris expansa</i>	55	Y	FACU	
7. <i>Carex aquatilis</i>	10		OBL	
8. <i>Equisetum sylvaticum</i>	25		FAC	
9.				
Total Cover: <u>202</u> 50% of total cover: <u>101</u> 20% of total cover: <u>40.4</u>				_____ % Bare Ground _____ % Cover of Wetland Bryophytes _____ Total Cover of Bryophytes _____ % Cover of Water Hydrophytic Vegetation Present (Y/N): <u>Y</u> Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>06-13-14</u> Feature ID <u>W60H1012</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-2							Histic	0
2-3	7.5 YR 3/1	100						← glacial till
3-15 +	gley 2-3/5Bg 5Bg 3/1	100					glacial till	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) <u>X</u> <u>vw</u>	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) <u>X</u> <u>vw</u>	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: glacial till Depth (inches): 3+

Hydric Soil Present (Y/N): Y

Notes: soil was rechecked on 6/25/14 by S. Christophen. See W60-3 logbook page 9.
0-4 4Bric org. saturated
4-8 4/1N sandy sand 80% with small gravel / Redox 10YR 4/4 20% C, PL Refusal at 8" - meets AK Redox indicator

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) <u>X</u>	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) <u>X</u>	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>0-3 *</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0-3 *</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>5</u>	

Notes: * perched water table over gley layer (glacial till)

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES	
P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____	
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>67</u> Short shrub (0.5-2m) <u>5</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>55</u> Short herb (<1m) <u>147</u> Moss-Lichen <u>0</u> Floating <u>0</u> Submerged <u>0</u>	
Number of Wetland Types (M): <u>2</u>	Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) <u>X</u>	
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____	
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____	
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____	
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>	
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) <u>X</u> Abundant (>50% of surface) _____	
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) <u>X</u> High (small groupings, diverse and interspersed) _____	
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine <u>X</u> Estaurine Fringe _____	

SOIL VARIABLES
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey <u>X</u>

HYDROLOGIC VARIABLES
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet <u>X</u>
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) <u>X</u> Pronounced (>18in.) _____
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs <u>X</u> Return Interval 2-5 yrs _____ Return Interval >5 yrs _____
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow <u>X</u>
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable <u>X</u>
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____

LANDSCAPE VARIABLES (M)
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below <u>X</u> Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT012

Field Target: 145

Date: 6/13/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X

Zoe Meade 6/13/14

Signature / Date

X

Dan LaPoint

Field Crew Chief (print)

X

Dan LaPoint 6/13/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Outside 2000' corridor			
Survey Type: Centerline	Access Road (explain)	Other (explain) <input checked="" type="checkbox"/>	Field Target: 146
Date: 06-14-14	Project Name & No.: Alaska LNG 26221306		Map #: 101 Map Date: 5/27/14
Investigators: Dan LaPlant, Zoe Meade		Feature Id: W60HT013	
State: Alaska	Region: Alaska	Milepost: 118.2	Team No.: W60
Latitude: 62° 21' 54.69"		Longitude: 150° 15' 36.99"	Datum: WGS84
Logbook No.: 002	Logbook Page No.: 023	Picture No.: P - W, NW, pit, plug	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): hummocks
Slope (%): upland 0-2	Local relief (concave, convex, none): concave
Pre-mapped Alaska LNG/NWI classification: upland	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No (if no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No	Wetland Type: PEM1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No	Alaska Vegetation Classification (Vioreck): III A 1.

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See sketch in logbook 002 page 024.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1.				
2.				
3.				
4.				
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>				
Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <i>Betula neolasiana</i>	10	Y	FACU	
2. <i>Rubus idaeus</i>	4	Y	FACU	
3. <i>Salix alaxensis</i>	5	Y	FAC	
4. <i>Spiraea stevenii</i>	T		FACU	
5.				
6.				
7.				
8.				
9.				
Total Cover: <u>19</u> 50% of total cover: <u>9.5</u> 20% of total cover: <u>3.8</u>				

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)
 Total Number of Dominant Species Across All Strata: 4 (B)
 % Dominant Species that are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: 0 X 1 = 0
 FACW species: 2 X 2 = 4
 FAC species: 97 X 3 = 291
 FACU species: 54 X 4 = 216
 UPL species: 0 X 5 = 0
 Column Totals: 153 (A) 511 (B)
 PI = B/A = 3.34

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <i>Chamaerion angustifolium</i>	10		FACU	
2. <i>Equisetum sylvaticum</i>	2		FAC	
3. <i>Chamaerion canadensis</i>	85	Y	FAC	
4. <i>Streptopus amplexifolius</i>	T		FACU	
5. <i>Eleocharis horridus</i>	—	—	—	
6. <i>Rubus idaeus</i>	—	—	—	
7. <i>Gymnocarpium dryopteris</i>	15		FACU	
8. <i>Dryopteris expansa</i>	15		FACU	
9. <i>Equisetum arvense</i>	5		FAC	
10. <i>Viola palustre</i>	2		FACW	
Total Cover: <u>132</u> 50% of total cover: <u>66</u> 20% of total cover: <u>26.4</u>				
<i>Geocaulon lividicum</i> T N FACU				

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☐ Prevalence Index is ≤ 3.0
☐ Morphological Adaptations¹ (Provide supporting data in Notes)
☐ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
0 % Cover of Wetland Bryophytes
0 Total Cover of Bryophytes
5 % Cover of Water
 Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>06-14-14</u> Feature ID <u>W00HT013</u>				Soil Pit Required (Y/N) <u>X</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0 - 1								organics
1 - 7	10 YR 3/1	100					silt loam	
7 - 22	10 YR 4/3	70	5YR 4/6	30	C	M	silt loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ <u>X</u> ?
Histic Epipedon (A2) _____	Alaska Redox (A14) --- <u>X</u> v w	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes: Soil was rechecked on 6/25/14 by J. Christopher, see W60-3 logbook page 8.
0-2 organics
2-10 10YR 5/3 90%, Redox 7.5 YR 4/6 10% PL
10-20 5Y 4/1 85%, Redox 10YR 4/6 15% PL
- meets AK Redox indicator

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>0</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>12</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>5</u>	
Notes: _____		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <u>X</u> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>10</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>9</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>85</u> Short herb (<1m) <u>41</u> Moss-Lichen <u>0</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>1</u>		Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) <u>X</u> Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover <u>N/A</u>		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) <u>X</u> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty <u>X</u> Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) <u>X</u> Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading <u>5.59</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated <u>X</u> Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

[Signature]

[Signature]

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT013

Field Target: 146

Date: 06-14-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X

Zoe Meade

Signature / Date

6/14/14

X Dan LaPlante

Field Crew Chief (print)

X

Dan LaPlante

Signature / Date

6/14/14

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION 2000' corridor			
Survey Type: Centerline	Access Road (explain)	Other (explain) <input checked="" type="checkbox"/>	Field Target: 147
Date: 06-11-14	Project Name & No.: Alaska LNG 26221306	Feature Id: W6071041 W60HT014	Map #: 102 Map Date: 5/27/14
Investigators: Dan LaPlant, Zoe Meade			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 118	
Latitude: 62° 21' 42.015"	Longitude: 150° 15' 28.701"	Datum: WGS84	
Logbook No.: 002	Logbook Page No.: 012	Picture No.: P-S, SW, pit. plug	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): hillslope
Slope (%): 5-10	Local relief (concave, convex, none): concave
Pre-mapped Alaska LNG/NWI classification: PEM1B	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No (If no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No (If no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No	Wetland Type: PEM1B/PUBF
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No	Alaska Vegetation Classification (Viereck): IIIA2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

Several large boulders in the Pond/islands

upland ICI

400'

Park's Highway

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
<u>Tree Stratum</u> (Plot sizes: <u>26'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.				
2.				
3.				
4.				
Total Cover: <u>0</u>				
50% of total cover: <u>0</u>		20% of total cover: <u>0</u>		
<u>Sapling/Shrub Stratum</u> (<u>26'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
Total Cover: <u>0</u>				
50% of total cover: <u>0</u>		20% of total cover: <u>0</u>		

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)
 Total Number of Dominant Species Across All Strata: 2 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species: <u>8</u> X 1 = <u>8</u>	
FACW species: <u>0</u> X 2 = <u>0</u>	
FAC species: <u>165</u> X 3 = <u>495</u>	
FACU species: <u>0</u> X 4 = <u>0</u>	
UPL species: <u>0</u> X 5 = <u>0</u>	
Column Totals: <u>173</u> (A)	<u>503</u> (B)
PI = B/A = <u>2.91</u>	

VEGETATION (use scientific names of plants)				
<u>Herb Stratum</u> (<u>26</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<u>Carex aquatilis</u>	<u>8</u>		<u>OBL</u>
2.	<u>Equisetum arvense</u>	<u>80</u>	<u>Y</u>	<u>FAC</u>
3.	<u>Calamagrostis Can.</u>	<u>85</u>	<u>Y</u>	<u>FAC</u>
4.	<u>Viola palustris</u>	<u>T</u>		<u>FACW</u>
5.				
6.				
7.				
8.				
9.				
10.				
Total Cover: <u>173</u>				
50% of total cover: <u>86.5</u>		20% of total cover: <u>34.6</u>		

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

_____ % Bare Ground
0 % Cover of Wetland Bryophytes
0 % Total Cover of Bryophytes
 _____ % Cover of Water
Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>06-11-14</u> Feature ID <u>W60T104 W60HT014</u> <small>vw</small> Soil Pit Required (Y/N) <u>Y</u>						
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-2	—	—	—	—	—	—	—	organics
2-8	10YR 3/1	—	—	—	—	—	Silt loam	
8-22	10YR 5/3	60	10YR 5/8	30	C	M	clay loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS	INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____
Histic Epipedon (A2) _____	Alaska Redox (A14) <u>X</u> <u>3</u> <u>+</u>
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____
Hydrogen Sulfide (A4) _____	Alaska Redox with 2.5Y Hue _____
Thick Dark Surface (A12) _____	Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Other (Explain in Notes) _____	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes: * Soil reflected on 7/8/14 by J. Christopher. See logbook W60-3. confirmed Alaska Redox

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)			SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____	
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>	
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____	
Water Marks (B1) <u>X</u>	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____	
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>	
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____		
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____			
Iron Deposits (B5) _____				

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>0</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): <u>N/A</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>12</u>	

Notes: Pit dug on 5-10% gradient above depression pond. See site sketch.

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <input checked="" type="checkbox"/> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>0</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>85</u> Short herb (<1m) <u>0</u> Moss-Lichen <u>0</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u>	Evenness of Wetland Type Distribution (M): Even <input checked="" type="checkbox"/> Highly Uneven _____ Moderately even _____	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <input checked="" type="checkbox"/> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <input checked="" type="checkbox"/> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) <input checked="" type="checkbox"/> Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few <input checked="" type="checkbox"/> Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <input checked="" type="checkbox"/>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <input checked="" type="checkbox"/> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) <input checked="" type="checkbox"/> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <input checked="" type="checkbox"/> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey <input checked="" type="checkbox"/>	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <input checked="" type="checkbox"/> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <input checked="" type="checkbox"/> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <input checked="" type="checkbox"/> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) <input checked="" type="checkbox"/> Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <input checked="" type="checkbox"/> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <input checked="" type="checkbox"/> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) <input checked="" type="checkbox"/> pH Reading <u>5.45</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <input checked="" type="checkbox"/> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) <input checked="" type="checkbox"/>	
Evidence of Seeps and Springs (P): No Seeps or Springs <input checked="" type="checkbox"/> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated <input checked="" type="checkbox"/> Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <input checked="" type="checkbox"/>	
Watershed Land Use: 0-5% Rural <input checked="" type="checkbox"/> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <input checked="" type="checkbox"/> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: ~~W60T1041~~ ^{W60HT014}

Field Target: 147

Date: 6/11/2014

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X *Zoe Meade* 6/11/14

Signature / Date

X *Don Lalor*

Field Crew Chief (print)

X *Don Lalor* 6/11/14

Signature / Date

soils recheck

WETLAND DETERMINATION DATA FORM

Soils check FT 147

SOIL		Date <u>7/8/14</u> Feature ID _____		Soil Pit Required (Y/N) <u>Y</u>				
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features			Texture	Notes	
	Color (moist)	%	Color (moist)	%	Type ¹			Loc ²
0-1							Fibric	organics; dry
1-8	10YR 4/1						Silt loam	
8-12	10YR 5/1						Silt loam	
12-20	5Y 5/1	90	10YR 4/6	10	C	PL	silt loam	
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ² Location: PL=Pore Lining, M=Matrix.								
HYDRIC SOIL INDICATORS						INDICATORS FOR PROBLEMATIC HYDRIC SOILS³		
Histosol or Histel (A1) _____			Alaska Gleyed (A13) _____			Alaska Color Change (TA4) ⁴ _____		
Histic Epipedon (A2) _____			Alaska Redox (A14) <u>X</u>			Alaska Alpine Swales (TA5) _____		
Black Histic (A3) _____			Alaska Gleyed Pores (A15) _____			Alaska Redox with 2.5Y Hue _____		
Hydrogen Sulfide (A4) _____						Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____		
Thick Dark Surface (A12) _____						Other (Explain in Notes) _____		
³ One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic. ⁴ Give details of color change in Notes.								
Restrictive Layer (if present): Type: _____ Depth (inches): _____								
Hydric Soil Present (Y/N): <u>Y</u>								
Notes:								

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) <u>X</u>	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			
Surface Water Present (Y/N): _____		Depth (in): _____	
Water Table Present (Y/N): _____		Depth (in): _____	
Saturation Present (Y/N): _____ (includes capillary fringe)		Depth (in): _____	
Notes: * area appears to be type of vernal pool			

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 091	Map #: 63 Map Date: 5/27/14
Date: 06-24-14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT015
Investigators: Joe Christopher, Valerie Watkins, Zoe Meade			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 167.4	
Latitude: 62°56'05.42"		Longitude: 149°41'14.17"	Datum: WGS84
Logbook No.: 003	Logbook Page No.: 001	Picture No.: PE, PW, Pit, plug	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): FLAT
Slope (%): 0-3	Local relief (concave, convex, none): CONCAVE
Pre-mapped Alaska LNG/NWI classification: PSS1B	Soil Map Unit Name: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	
Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)	
Are Vegetation <input checked="" type="checkbox"/> , Soil _____, or Hydrology _____ Significantly Disturbed? No <input checked="" type="checkbox"/> (If yes, explain in Notes)	
Are Vegetation <input checked="" type="checkbox"/> , Soil <input checked="" type="checkbox"/> , or Hydrology _____ Naturally Problematic? No <input checked="" type="checkbox"/> (If yes, explain in Notes.)	
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: PSS1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Viereck): II B2, II C2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

2.5-4 Hrs w/ R. box.

- Site sketch in Logbook

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
<u>Tree Stratum</u> (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Picea glauca</u>	1		FACU
2.			
3.			
4.			
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
<u>Sapling/Shrub Stratum</u> (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Betula nana</u>	70	Y	FAC
2. <u>Salix fuscescens</u>	5		FAC
3. <u>Spiraea steyerii</u>	4		FACU
4. <u>Empetrum nigrum</u>	1		FAC
5. <u>Picea glauca</u>	2		FACU
6. <u>Vaccinium uliginosum</u>	35	Y	FAC
7. <u>Salix pulchra</u>	5		FACW
8. <u>Betula neoalaskana</u>	2		FACU
9. <u>Salix barclayi</u>	2		FAC
Total Cover: <u>127</u> 50% of total cover: <u>63.5</u> 20% of total cover: <u>25.4</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

% Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:

OBL species: 0 X 1 = 0

FACW species: 13 X 2 = 26

FAC species: 123 X 3 = 369

FACU species: 10 X 4 = 40

UPL species: 0 X 5 = 0

Column Totals: 146 (A) 435 (B)

PI = B/A = 2.98

Picea glauca tree added to shrubs.

Burnet

VEGETATION (use scientific names of plants)			
<u>Herb Stratum</u> (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Chamerion angustifolium</u>	1		FACU
2. <u>Calamagrostis canadensis</u>	7	Y	FAC
3. <u>Equisetum Arvense</u>	3		FAC
4. <u>Trientalis europaea</u>	T		FACU
5. <u>Sanguisorba canadensis</u>	7	Y	FACW
6. <u>Rubus chamaemorus</u>	1		FACW
7. <u>Vaccinium uliginosum</u>			FAC
8. <u>Equisetum sylvaticum</u>	T		FAC
9. <u>Rubus arcticus</u>	T		FAC
10.			
Total Cover: <u>19</u> 50% of total cover: <u>9.5</u> 20% of total cover: <u>3.8</u>			

Hydrophytic Vegetation Indicators:

X Dominance Test is > 50%

X Prevalence Index is ≤ 3.0

____ Morphological Adaptations¹ (Provide supporting data in Notes)

____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

0 % Cover of Wetland Bryophytes

90 Total Cover of Bryophytes

0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>06-24-14</u> Feature ID <u>W60HT015</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-6	—	—	—	—	—	—	Fibric	organics
6-8	10 YR 2/1	90					Silt loam	10% cobbles & gravels
8-18	2.5 Y 2/1	85	10 YR 4/4	15	C	PL	Silt loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue <u>X</u>
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): N/A

Hydric Soil Present (Y/N): Y

Notes: Saturated @ 5"
Have Primary Hydric & Hyd. Veg.

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) <u>X</u>	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>Y</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>2</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>6</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>5</u>	

Notes: Localized Standing H₂O In Low Pockets to East.

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>1</u> Sapling (<5 dbh, <6m tall) <u>3</u> Tall shrub (2-6m) <u>7</u> Short shrub (0.5-2m) <u>107</u> Dwarf shrub (<0.5m) <u>6</u> Tall herb (>1m) <u>12</u> Short herb (<1m) <u>19</u> Moss-Lichen <u>90</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>1</u> Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>X</u> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>X</u>		
HGM Class (P): Slope _____ Flat <u>X</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty <u>X</u> Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet <u>X</u> Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow <u>X</u>	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) <u>X</u> Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading <u>6.1</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <u>X</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check: [Signature]

GPS Technician QA/QC check: _____

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W6HT015

Field Target: 91

Date: 6/24/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?

☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Joe Christoph

Wetland Scientist (print)

X 6/24/14

Signature / Date

X Zoe Meade

Field Crew Chief (print)

X 6/24/14

Signature / Date

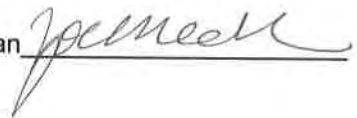
Vegetation Classification Data Form

Site Description		
Date: 06-24-14	Project Name & #: Alaska LNG 26221306	Field Target: HT091
Investigators: Joe Christopher, Zoe Meade, Valerie Watkins		Feature ID: W60HT016
Latitude: 02° 56' 04.24"	Longitude: 149° 41' 13.92"	Datum: WGS84
Logbook #: 003	Logbook Page #: 002	Picture #: P-N ₂ -5
Location Description:		
South of W60HT015		
Common Species Observed (Scientific Name)		
Betula nana	Vaccinium vitis-idaea	
Picea	Empetrum nigrum	
Rhododendron tomentosum		
Geocaulon lividum		
Percent Cover of Dominant Structure Level: 30%		
Habitat Description:		
Spruce birch forrest		
Alaska Vegetation Classification: Level I, Level II, Level III		
IC2	II C2	
Notes:		
Upland knoll Adj to FT91		

Field Crew Chief:



Field Scientist/Technician



Vegetation Classification Data Form

Table I-Alaska vegetation classification to level III

Level I	Level II	Level III
I. Forest	A. Needleleaf (conifer) forest	(1) Closed needleleaf (conifer) forest (2) Open needleleaf (conifer) forest (3) Needleleaf (conifer) woodland
	B. Broadleaf forest	(1) Closed broadleaf forest (2) Open broadleaf forest (3) Broadleaf woodland
	C. Mixed forest	(1) Closed mixed forest (2) Open mixed forest (3) Mixed woodland
II. Scrub	A. Dwarf tree scrub	(1) Closed dwarf tree scrub (2) Open dwarf tree scrub (3) Dwarf tree scrub woodland
	B. Tall scrub	(1) Closed tall scrub (2) Open tall scrub
	C. Low scrub	(1) Closed low scrub (2) Open low scrub
	D. Dwarf scrub	(1) Dryas dwarf scrub (2) Ericaceous dwarf scrub (3) Willow dwarf scrub
III. Herbaceous	A. Graminoid herbaceous	(1) Dry graminoid herbaceous (2) Mesic graminoid herbaceous (3) Wet graminoid herbaceous (emergent)
	B. Forb herbaceous	(1) Dry forb herbaceous (2) Mesic forb herbaceous (3) Wet forb herbaceous (emergent)
	C. Bryoid herbaceous	(1) Mosses (2) Lichens
	D. Aquatic (nonemergent) herbaceous	(1) Freshwater aquatic herbaceous (2) Brackish water aquatic herbaceous (3) Marine aquatic herbaceous

Descriptions of levels I, II, III, and IV follow the classification table

1a. Trees over 3 meters (10 ft) tall are present and have a canopy cover of 10 percent or more	I Forest	2
1b. Trees over 3 meters (10 ft) tall are absent or nearly so. Less than 10 percent cover. (Dwarf trees, less than 3 meters (10 ft) tall may be present and abundant)		7
I Forest		
2a. Over 75 percent of tree cover contributed by needleleaf (conifer) species	I A Needleleaf forest	3
2b. Less than 75 percent of tree cover contributed by needleleaf (conifer) species		4
3a. Tree canopy of 60-100 percent cover	I A.1 Closed needleleaf forest	
3b. Tree canopy of 25-59 percent cover	I A.2 Open needleleaf forest	
3c. Tree canopy of 10-24 percent cover	I A.3 Needleleaf woodland	
4a. Over 75 percent of tree cover contributed by broadleaf species	I B Broadleaf forest	5
4b. Broadleaf or needleleaf species contribute 25 to 75 percent of the tree cover		6
5a. Tree canopy of 60-100 percent cover	I B.1 Closed broadleaf forest	
5b. Tree canopy of 25-59 percent cover	I B.2 Open broadleaf forest	
5c. Tree canopy of 10-24 percent cover	I B.3 Broadleaf woodland	
6a. Tree canopy of 60-100 percent cover	I C.1 Closed mixed forest	
6b. Tree canopy of 25-59 percent cover	I C.2 Open mixed forest	
6c. Tree canopy of 10-24 percent cover	I C.3 Mixed woodland	
7a. Vegetation with at least 25 percent cover of erect to decumbent shrubs or with at least 10 percent cover of dwarf trees (less than 3 meters (10 ft) tall)		8
7b. Vegetation herbaceous (may have up to 25 percent shrub cover)		15

II. Scrub		
8a. Vegetation with at least 10 percent cover of dwarf trees	II A Dwarf tree scrub	9
8b. Vegetation with at least 25 percent cover of shrubs and less than 10 percent cover of dwarf trees		10
9a. Dwarf tree canopy of 60-100 percent cover	II A.1 Closed dwarf tree scrub	
9b. Dwarf tree canopy of 25-59 percent cover	II A.2 Open dwarf tree scrub	
9c. Dwarf tree canopy of 10-24 percent cover	II A.3 Dwarf tree scrub woodland	
10a. Shrubs more than 1.5 meters (5 ft) tall	II B Tall scrub	11
10b. Shrubs less than 1.5 meters (5 ft) tall		12
11a. Shrub canopy cover greater than 75 percent	II B.1 Closed tall scrub	
11b. Shrub canopy cover of 25-74 percent	II B.2 Open tall scrub	
12a. Shrubs 20 centimeters to 1.5 meters tall	II C Low scrub	13
12b. Shrubs under 20 centimeters in height	II D Dwarf scrub	14
13a. Shrub canopy cover greater than 75 percent	II C.1 Closed low scrub	
13b. Shrub canopy cover of 25-74 percent, or as low as 2 percent if little or no other vegetation cover present	II C.2 Open low scrub	
14a. Dryas species dominant in the dwarf shrub layer	II D.1 Dryas dwarf scrub	
14b. Ericaceous species dominant in the dwarf shrub layer	II D.2 Ericaceous dwarf scrub	
14c. Willow species dominant in the dwarf shrub layer	II D.2 Willow dwarf scrub	
III. Herbaceous		
15a. Terrestrial vegetation, or if growing in the water, dominated by emergent vegetation		16
15b. Dominant vegetation growing submerged in water or floating on the water surface, but not emerging above the water	III D Aquatic herbaceous	21

16a. Grasses, sedges, or rushes (graminoid) plants dominant	III A Graminoid herbaceous	17
16b. Forbs or bryophytes dominant		18
17a. Grasslands of well-drained, dry sites, such as south-facing bluffs, old beaches, and sand dunes. Typically (but not always) dominated by <i>Elymus</i> spp., <i>Festuca</i> spp., and <i>Deschampsia</i> spp.	III A.1 Dry graminoid herbaceous	
17b. On moist sites, but usually not with standing water. Usually dominated by <i>Calamagrostis</i> spp., <i>Carex</i> spp. or <i>Eriophorum</i> spp.; tussocks often present	III A.2 Mesic graminoid herbaceous	
17c. On wet sites, standing water present for part of the year; dominated by either sedges or grasses; includes wet tundra, bogs, marshes, and fens	III A.3 Wet graminoid herbaceous	
18a. Vegetation dominated by forbs (broadleaf herbs, ferns, or horsetails)	III B Forb herbaceous	19
18b. Vegetation dominated by mosses or lichens	III C Bryoid herbaceous	20
19a. On dry sites, usually rocky and well drained; mostly tundra sites	III B.1 Dry forb herbaceous	
19b. On moist sites but without standing water, mostly within forested areas	III B.2 Mesic forb herbaceous	
19c. On wet sites, usually with standing water for part of the year	III B.3 Wet forb herbaceous	
20a. Vegetation cover dominated by mosses	III C.1 Bryoid moss	
20b. Vegetation cover dominated by lichens	III C.2 Bryoid lichen	
21a. Vegetation submerged or floating in fresh water	III D.1 Freshwater aquatic herbaceous	
21b. Vegetation submerged or floating in brackish water	III D.2 Brackish water aquatic herbaceous	
21c. Vegetation submerged or floating in salt water	III D.3 Marine aquatic herbaceous	

Vegetation Classification Data Form QA/QC Checklist

This form is to be completed before leaving the field site.

Feature ID: 091

Field Target: W60HT016

Date: 06-24-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. General Information

- ☒ Location data recorded?
- ☒ Photo taken and photo number recorded?

2. Location Description

- ☒ Location of site recorded with enough detail to help relocate?

3. Common Species

- ☒ Scientific name of common species recorded?
- ☒ Percent cover of dominant structure level noted?

4. Habitat Description

- ☒ Habitat described?

5. Classification

- ☒ All three levels of classification recorded?

6. Field Log Book

- ☒ Field form entries consistent with log book?
- ☒ Logbook clearly identifies the Field Target ID and Feature ID?

X Zoe Meade

Field Technician (print)

X Zoe Meade

Signature

X [Signature]

Field Crew Chief (print)

X 1/1 Zoe Christopher

Signature

Vegetation Classification Data Form

Site Description		
Date:	Project Name & #: Alaska LNG 26221306	Field Target: HT120 120
Investigators: Joe Christopher, Valerie Watkins, ZM		Feature ID: W60HT017
Latitude: 62° 32' 04.71"	Longitude: 150° 14' 11.73"	Datum: WGS84
Logbook #: 003	Logbook Page #: 003	Picture #: P-W-E-E
Location Description:		
FT120 West of Parks Hwy		
Common Species Observed (Scientific Name)		
Alnus ssp.	Oplopanax horridus	
Veratrum viride	Ribes triste	
Mertensia paniculata	Gymnocarpium dryopteris	
Athyrium cyclosorum	Streptopus amplexifolius	
Percent Cover of Dominant Structure Level: 70%		
Habitat Description:		
Tall birch, alder thicket with devils club		
Alaska Vegetation Classification: Level I, Level II, Level III		
IC 2	II B2	
Notes:		
Tall Birch w/ Alnus, Fern, D. club understory. Depression 12m to west.		

Field Crew Chief:

Field Scientist/Technician:

Vegetation Classification Data Form

Table I-Alaska vegetation classification to level III

Level I	Level II	Level III
I. Forest	A. Needleleaf (conifer) forest	(1) Closed needleleaf (conifer) forest (2) Open needleleaf (conifer) forest (3) Needleleaf (conifer) woodland
	B. Broadleaf forest	(1) Closed broadleaf forest (2) Open broadleaf forest (3) Broadleaf woodland
	C. Mixed forest	(1) Closed mixed forest (2) Open mixed forest (3) Mixed woodland
II. Scrub	A. Dwarf tree scrub	(1) Closed dwarf tree scrub (2) Open dwarf tree scrub (3) Dwarf tree scrub woodland
	B. Tall scrub	(1) Closed tall scrub (2) Open tall scrub
	C. Low scrub	(1) Closed low scrub (2) Open low scrub
	D. Dwarf scrub	(1) Dryas dwarf scrub (2) Ericaceous dwarf scrub (3) Willow dwarf scrub
III. Herbaceous	A. Graminoid herbaceous	(1) Dry graminoid herbaceous (2) Mesic graminoid herbaceous (3) Wet graminoid herbaceous (emergent)
	B. Forb herbaceous	(1) Dry forb herbaceous (2) Mesic forb herbaceous (3) Wet forb herbaceous (emergent)
	C. Bryoid herbaceous	(1) Mosses (2) Lichens
	D. Aquatic (nonemergent) herbaceous	(1) Freshwater aquatic herbaceous (2) Brackish water aquatic herbaceous (3) Marine aquatic herbaceous

Descriptions of levels I, II, III, and IV follow the classification table.

1a. Trees over 3 meters (10 ft) tall are present and have a canopy cover of 10 percent or more	I Forest	2
1b. Trees over 3 meters (10 ft) tall are absent or nearly so. Less than 10 percent cover. (Dwarf trees, less than 3 meters (10 ft) tall may be present and abundant)		7
I. Forest		
2a. Over 75 percent of tree cover contributed by needleleaf (conifer) species	IA Needleleaf forest	3
2b. Less than 75 percent of tree cover contributed by needleleaf (conifer) species		4
3a. Tree canopy of 60-100 percent cover	IA 1 Closed needleleaf forest	
3b. Tree canopy of 25-59 percent cover	IA 2 Open needleleaf forest	
3c. Tree canopy of 10-24 percent cover	IA 3 Needleleaf woodland	
4a. Over 75 percent of tree cover contributed by broadleaf species	IB Broadleaf forest	5
4b. Broadleaf or needleleaf species contribute 25 to 75 percent of the tree cover		6
5a. Tree canopy of 60-100 percent cover	IB 1 Closed broadleaf forest	
5b. Tree canopy of 25-59 percent cover	IB 2 Open broadleaf forest	
5c. Tree canopy of 10-24 percent cover	IB 3 Broadleaf woodland	
6a. Tree canopy of 60-100 percent cover	IC 1 Closed mixed forest	
6b. Tree canopy of 25-59 percent cover	IC 2 Open mixed forest	
6c. Tree canopy of 10-24 percent cover	IC 3 Mixed woodland	
7a. Vegetation with at least 25 percent cover of erect to decumbent shrubs or with at least 10 percent cover of dwarf trees (less than 3 meters (10 ft) tall)		8
7b. Vegetation herbaceous (may have up to 25 percent shrub cover)		15

II. Scrub

8a. Vegetation with at least 10 percent cover of dwarf trees	II A Dwarf tree scrub	9
8b. Vegetation with at least 25 percent cover of shrubs and less than 10 percent cover of dwarf trees		10
9a. Dwarf tree canopy of 60-100 percent cover	II A.1 Closed dwarf tree scrub	
9b. Dwarf tree canopy of 25-59 percent cover	II A.2 Open dwarf tree scrub	
9c. Dwarf tree canopy of 10-24 percent cover	II A 3 Dwarf tree scrub woodland	
10a. Shrubs more than 1.5 meters (5 ft) tall	II B Tall scrub	11
10b. Shrubs less than 1.5 meters (5 ft) tall		12
11a. Shrub canopy cover greater than 75 percent	II B 1 Closed tall scrub	
11b. Shrub canopy cover of 25-74 percent	II B 2 Open tall scrub	
12a. Shrubs 20 centimeters to 1.5 meters tall	II C Low scrub	13
12b. Shrubs under 20 centimeters in height	II D Dwarf scrub	14
13a. Shrub canopy cover greater than 75 percent	II C 1 Closed low scrub	
13b. Shrub canopy cover of 25-74 percent, or as low as 2 percent if little or no other vegetation cover present	II C 2 Open low scrub	
14a. Dryas species dominant in the dwarf shrub layer	II D 1 Dryas dwarf scrub	
14b. Ericaceous species dominant in the dwarf shrub layer	II D 2 Ericaceous dwarf scrub	
14c. Willow species dominant in the dwarf shrub layer	II D 2 Willow dwarf scrub	
III. Herbaceous		
15a. Terrestrial vegetation, or if growing in the water, dominated by emergent vegetation		16
15b. Dominant vegetation growing submerged in water or floating on the water surface, but not emerging above the water	III D Aquatic herbaceous	21

16a. Grasses, sedges, or rushes (graminoid) plants dominant	III A Graminoid herbaceous	17
16b. Forbs or bryophytes dominant		18
17a. Grasslands of well-drained, dry sites, such as south-facing bluffs, old beaches, and sand dunes. Typically (but not always) dominated by <i>Elymus</i> spp., <i>Festuca</i> spp., and <i>Deschampsia</i> spp.	III A 1 Dry graminoid herbaceous	
17b. On moist sites, but usually not with standing water. Usually dominated by <i>Calamagrostis</i> spp., <i>Carex</i> spp. or <i>Eniophorum</i> spp.; tussocks often present	III A 2 Mesic graminoid herbaceous	
17c. On wet sites, standing water present for part of the year; dominated by either sedges or grasses, includes wet tundra, bogs, marshes, and fens	III A.3 Wet graminoid herbaceous	
18a. Vegetation dominated by forbs (broadleaf herbs, ferns, or horsetails)	III B Forb herbaceous	19
18b. Vegetation dominated by mosses or lichens	III C Bryoid herbaceous	20
19a. On dry sites, usually rocky and well drained, mostly tundra sites	III B 1 Dry forb herbaceous	
19b. On moist sites but without standing water, mostly within forested areas	III B.2 Mesic forb herbaceous	
19c. On wet sites, usually with standing water for part of the year	III B 3 Wet forb herbaceous	
20a. Vegetation cover dominated by mosses	III C.1 Bryoid moss	
20b. Vegetation cover dominated by lichens	III C 2 Bryoid lichen	
21a. Vegetation submerged or floating in fresh water	III D.1 Freshwater aquatic herbaceous	
21b. Vegetation submerged or floating in brackish water	III D 2 Brackish water aquatic herbaceous	
21c. Vegetation submerged or floating in salt water	III D.3 Marine aquatic herbaceous	

Vegetation Classification Data Form QA/QC Checklist

This form is to be completed before leaving the field site.

Feature ID: W60HT17

Field Target: 120

Date: 6/24/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. General Information

- ☒ Location data recorded?
- ☒ Photo taken and photo number recorded?

2. Location Description

- ☒ Location of site recorded with enough detail to help relocate?

3. Common Species

- ☒ Scientific name of common species recorded?
- ☒ Percent cover of dominant structure level noted?

4. Habitat Description

- ☒ Habitat described?

5. Classification

- ☒ All three levels of classification recorded?

6. Field Log Book

- ☒ Field form entries consistent with log book?
- ☒ Logbook clearly identifies the Field Target ID and Feature ID?

X Zoe Meade

Field Technician (print)

X

Signature

X Joe Christopher

Field Crew Chief (print)

X

Signature

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION				corridor 300'	
Survey Type: Centerline		Access Road (explain)		Other (explain) <input checked="" type="checkbox"/>	
Date: 06-24-14		Project Name & No.: Alaska LNG 26221306		Field Target: J21	
				Map #: 85 Map Date: 5/27/14	
Investigators: Valerie Watkins, Joe Christensen, Zoe Meade		Feature Id: W60HT018		Team No.: W60	
State: Alaska		Region: Alaska		Milepost: 647.8	
Latitude: 62° 32' 03.32"		Longitude: 150° 14' 10.84"		Datum: WGS84	
Logbook No.: 003		Logbook Page No.: 4		Picture No.: P-N, S, pit plug	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): hill slope
Slope (%): 40	Local relief (concave, convex, none): convex
Pre-mapped Alaska LNG/NWI classification: upland	Soil Map Unit Name: NIA
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No (if no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes No <input checked="" type="checkbox"/>	Wetland Type: upland
Wetland Hydrology Present? Yes No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Viereck): IC2, IIB2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

- Bare/open Areas in mapping appear to be from early season photo
I have not ground up yet.

See page 3 for Diagram

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
<u>Tree Stratum</u> (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Betula neoalaskana</i>	75	Y	FACU
2. <i>Picea glauca</i>	1		FACU
3.			
4.			
Total Cover: <u>76</u> 50% of total cover: <u>38</u> 20% of total cover: <u>15.2</u>			
<u>Sapling/Shrub Stratum</u> (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Vaccinium uliginosum</i>	15	Y	FAC
2. <i>Opiopanax horridus</i>	15	Y	FACU
3. <i>Alnus</i> ssp.	25	Y	FAC
4. <i>Picea glauca</i>	1		FACU
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>56</u> 50% of total cover: <u>28</u> 20% of total cover: <u>11.2</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

% Dominant Species that are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:

OBL species: 0 X 1 = 0

FACW species: 0 X 2 = 0

FAC species: 65 X 3 = 195

FACU species: 124 X 4 = 496

UPL species: 0 X 5 = 0

Column Totals: 189 (A) 691 (B)

PI = B/A = 3.67

VEGETATION (use scientific names of plants)			
<u>Herb Stratum</u> (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Streptopus amplexifolius</i>	10		FACU
2. <i>Dryopteris expansa</i>	15	Y	FACU
3. <i>Gymnocarpium dryopteris</i>	5		FACU
4. <i>Athyrium cyclosorum</i>	15	Y	FAC
5. <i>Calamagrostis canadensis</i>	10		FAC
6. <i>Equisetum sylvaticum</i>	1		FACU
7. <i>Cornus canadensis</i>	1		FACU
8.			
9.			
10.			
Total Cover: <u>57</u> 50% of total cover: <u>28.5</u> 20% of total cover: <u>11.4</u>			

Hydrophytic Vegetation Indicators:

_____ Dominance Test is > 50%

_____ Prevalence Index is ≤ 3.0

_____ Morphological Adaptations¹ (Provide supporting data in Notes)

_____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

0 % Cover of Wetland Bryophytes

0 Total Cover of Bryophytes

0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): N

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>06-24-14</u> Feature ID <u>WG0HT018</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-4							Fibric	dry organics
4-19	10 YR 4/3	100					Silt loam	
19-21	2.5 Y 5/1	100					SANDY silt	small gravels

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): N/A

Hydric Soil Present (Y/N): N

Notes: Fine sand & Gravels @ 20"
- NO hydric soils observed

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>N/A</u>	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): <u>N/A</u>	
Saturation Present (Y/N): <u>N</u> (includes capillary fringe)	Depth (in): <u>N/A</u>	
Notes: _____		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		
SOIL VARIABLES		
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____		
HYDROLOGIC VARIABLES		
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____		
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____		
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____		
Micorelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____		
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____		
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____		
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____		
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____		
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____		
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____		
LANDSCAPE VARIABLES (M)		
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____		
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____		
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____		
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____		

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT018

Field Target: 121

Date: 06-24-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X *ZoMeade* 06-24-14

Signature / Date

X Joe Christensen

Field Crew Chief (print)

X *[Signature]* 8/24/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION				300' corridor	
Survey Type: Centerline		Access Road (explain)		Other (explain) <input checked="" type="checkbox"/>	
Field Target: 122		Map #: 85 Map Date: 5/27/14			
Date: 06-24-14		Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT019	
Investigators: Joe Christopher, Valerie Watkins, Zoe Meade				Team No.: W60	
State: Alaska		Region: Alaska		Milepost: 647.8	
Latitude: 62° 32' 03.52"		Longitude: 150° 14' 06.47"		Datum: WGS84	
Logbook No.: 003		Logbook Page No.: 005		Picture No.: R-W60HT019-N-S-Surface	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): flat
Slope (%): 0-3	Local relief (concave, convex, none): concave
Pre-mapped Alaska LNG/NWI classification: upland	Soil Map Unit Name: 1A
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No (if no explain in Notes)	
Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No (if no, explain in Notes.)	
Are Vegetation, Soil, or Hydrology Significantly Disturbed? No <input checked="" type="checkbox"/> (If yes, explain in Notes)	
Are Vegetation, Soil, or Hydrology Naturally Problematic? No <input checked="" type="checkbox"/> (If yes, explain in Notes.)	
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No	Wetland Type: PEMIF
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No	Alaska Vegetation Classification (Viereck): IIIA 3

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See PAGE 3 for DIAGRAM

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
<u>Tree Stratum</u> (Plot sizes: <u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
<u>Sapling/Shrub Stratum</u> (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Atrius ssp.</u>			<u>FAC</u>
2. <u>Salix pulchra</u>	<u>20</u>	<u>Y</u>	<u>FACW</u>
3.			
4.			
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>20</u> 50% of total cover: <u>10</u> 20% of total cover: <u>4</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)
 Total Number of Dominant Species Across All Strata: 2 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: 7 X 1 = 7
 FACW species: 20 X 2 = 40
 FAC species: 95 X 3 = 285
 FACU species: 0 X 4 = 0
 UPL species: 0 X 5 = 0
 Column Totals: 122 (A) 332 (B)
 PI = B/A = 2.72

*Salix up on mounds
all other vegetation @ plot
site lower in marshy waters*

VEGETATION (use scientific names of plants)			
<u>Herb Stratum</u> (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Comarum palustre</u>	<u>5</u>		<u>OBL</u>
2. <u>Equisetum arvense</u>	<u>20</u>		<u>FAC</u>
3. <u>Carex utriculata</u>	<u>2</u>		<u>OBL</u>
4. <u>Calamagrostis canadensis</u>	<u>75</u>	<u>Y</u>	<u>FAC</u>
5. <u>Viola palustris</u>	<u>7</u>		<u>FACW</u>
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>102</u> 50% of total cover: <u>51</u> 20% of total cover: <u>20.4</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
— % Cover of Wetland Bryophytes
10 Total Cover of Bryophytes
5 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>06-24-14</u> Feature ID <u>W60HT019</u>				Soil Pit Required (Y/N) <u>N</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) <u>X</u>

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): N/A

Hydric Soil Present (Y/N): Y

Notes: no soil pit dug due to inundation - hydric soils assumed.

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) <u>X</u>
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>2-3</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0</u>	

Notes: Toe of slope, next to Parks Hwy

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <u>X</u> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) <u>20</u> Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) <u>10</u> Moss-Lichen <u>10</u> Floating _____ Submerged _____		
Number of Wetland Types (M): <u>1</u> Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>X</u> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover <u>X</u> N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) <u>X</u> High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____ <i>Assumed</i>	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded <u>X</u>	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Micorelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) <u>X</u> Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) <u>X</u> pH Reading <u>4.93</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected <u>X</u> Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT019

Field Target: 122

Date: 06-24-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☐ Soil profile is complete? - no pit dug due to inundation
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X

Zoe Meade 06-24-14

Signature / Date

X

Soe Christina

Field Crew Chief (print)

X

Soe Christina 6/24/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION				300' study	
Survey Type: Centerline		Access Road (explain)		Other (explain) <input checked="" type="checkbox"/>	Field Target: 125
Map #: 86		Map Date: 5/27/14			
Date: 06-25-14	Project Name & No.: Alaska LNG 26221306			Feature Id: W60HT020	
Investigators: Joe Christopher, Zoe Meade					Team No.: W60
State: Alaska		Region: Alaska		Milepost: 130	
Latitude: 62° 31' 41.97"			Longitude: 150° 14' 16.16"		Datum: WGS84
Logbook No.: 003		Logbook Page No.: 005		Picture No.: P-N, S, pit, plug	

SITE PARAMETERS	
Subregion:	Landform (hillslope, terrace, hummocks, etc.):
Slope (%): interior 0-3	Local relief (concave, convex, none): concave
Pre-mapped Alaska LNG/NWI classification: PEM1C	Soil Map Unit Name: UA
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No (if no explain in Notes)	
Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No (if no, explain in Notes.)	
Are Vegetation, Soil, or Hydrology Significantly Disturbed? No <input checked="" type="checkbox"/> (If yes, explain in Notes)	
Are Vegetation, Soil, or Hydrology Naturally Problematic? No <input checked="" type="checkbox"/> (If yes, explain in Notes.)	
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No	Is the Sampled Area within a Wetland? Yes No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes No <input checked="" type="checkbox"/>	Wetland Type: upland
Wetland Hydrology Present? Yes No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Viereck): IC1 IB2, IIIA2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

field sketch on page 005 of logbook 003

the field target Viereck Code of IB2, IIIA2 is correct
and the polygon Viereck Code of IC2, IB2 is also
correct. The polygon represents a much larger area than
the field target site.

[Signature]

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: <u>0</u>			
50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Saxex bebbiana</i>	10	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>10</u>			
50% of total cover: <u>5</u> 20% of total cover: <u>2</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

% Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:

OBL species: 0 X 1 = 0

FACW species: 0 X 2 = 0

FAC species: 103 X 3 = 489

FACU species: 0 X 4 = 0

UPL species: 0 X 5 = 0

Column Totals: _____ (A) _____ (B)

PI = B/A = 3.0

Dom of all FAC veg.

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Calamagrostis canadensis</i>	90	Y	FAC
2. <i>Equisetum sylvaticum</i>	3		FAC
3. <i>Equisetum arvense</i>	60	Y	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>153</u>			
50% of total cover: <u>16.5</u> 20% of total cover: <u>30.6</u>			

Hydrophytic Vegetation Indicators:

X Dominance Test is > 50%

X Prevalence Index is ≤ 3.0

____ Morphological Adaptations¹ (Provide supporting data in Notes)

____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

0 % Cover of Wetland Bryophytes

0 Total Cover of Bryophytes

0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>5/6/24/14</u> Feature ID <u>W60H7020</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
1-4							Fibric	organics
4-8	10YR 3/3						Silt loam	
8-20	10YR 5/3						Silt loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): N/A

Hydric Soil Present (Y/N): N

Notes: No hydric soils observed. Bright high chroma soils, no Redox.

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): _____	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): _____	
Saturation Present (Y/N): <u>N</u> (includes capillary fringe)	Depth (in): _____	

Notes: Depressional Area within tall mixed forest.
- Holds snow pack for extended duration.

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____			
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____			
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____			
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____			
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____			
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____			
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____			
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____			
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____			
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____			
SOIL VARIABLES			
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____			
HYDROLOGIC VARIABLES			
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____			
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____			
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____			
Micorelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____			
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____			
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____			
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____			
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____			
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____			
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____			
LANDSCAPE VARIABLES (M)			
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____			
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____			
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____			
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____			

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60 HT 020

Field Target: 125

Date: 06-25-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland? Not wetland

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X Zoe Meade 06-25-14

Signature / Date

X Joe Christopher

Field Crew Chief (print)

X Joe Christopher 6/25/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 126	Map #: 86 Map Date: 5/27/14
Date: 06-25-14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT021
Investigators: Joe Christopher, Zoe Meade			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 130	
Latitude: 62° 31' 39.96" N	Longitude: 150° 14' 19.14" W	Datum: WGS84	
Logbook No.: 003	Logbook Page No.: 006	Picture No.: P_N, S, pit, plug	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): Depression
Slope (%): 0-3	Local relief (concave, convex, none): concave
Pre-mapped Alaska LNG/NWI classification: PEM1F	Soil Map Unit Name: NA
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/>	Wetland Type: UPL
Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Viereck): IC1 , IC2, IIA

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

PAGE 006 of Logbook Ser DINGMAN

See note on F# 125 data form —
same issue.

off

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				Dominance Test worksheet:
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <i>Betula neolaskana</i>	3	X	FACU	No. of Dominant Species that are OBL, FACW, or FAC: <u>2</u> (A) Total Number of Dominant Species Across All Strata: <u>4</u> (B) % Dominant Species that are OBL, FACW, or FAC: <u>50%</u> (A/B)
2. <i>Picea glauca</i>	3	X	FACU	
3.				
4.				
Total Cover: <u>6</u> 50% of total cover: <u>3</u> 20% of total cover: <u>1.2</u>				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species: <u>0</u> X 1 = <u>0</u> FACW species: <u>2</u> X 2 = <u>2</u> FAC species: <u>88</u> X 3 = <u>264</u> FACU species: <u>19</u> X 4 = <u>76</u> UPL species: <u>1</u> X 5 = <u>5</u> Column Totals: <u>108</u> (A) <u>347</u> (B) PI = B/A = <u>3.21</u>
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <i>Salix bebbiana</i>	20	✓	FAC	
2. <i>Rosa acicularis</i>	3		FACU	
3.				
4.				
5.				
6.				
7.				
8.				
9.				
Total Cover: <u>23</u> 50% of total cover: <u>11.5</u> 20% of total cover: <u>4.6</u>				

VEGETATION (use scientific names of plants)				Hydrophytic Vegetation Indicators:
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <i>Veratrum viride</i>	10		FAC	_____ Dominance Test is > 50% _____ Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
2. <i>Streptopus amplexifolius</i>	3		FACU	
3. <i>Calamagrostis canadensis</i>	90	✓	FAC	
4. <i>Equisetum arvense</i>	5		FAC	
5. <i>Sanguisorba canadensis</i>	1		FACW	
6. <i>Fragaria virginiana</i>	1		UPL	
7. <i>Dryopteris expansa</i>	4		FACU	
8. <i>Geranium erianthum</i>	2		FACU	
9. <i>Equisetum sylvaticum</i>	3		FAC	
10. <i>Thalictrum sparsiflorum</i>	1		FACU	
Total Cover: <u>120</u> 50% of total cover: <u>60</u> 20% of total cover: <u>24</u>				_____ % Bare Ground _____ % Cover of Wetland Bryophytes _____ Total Cover of Bryophytes _____ % Cover of Water Hydrophytic Vegetation Present (Y/N): <u>✓</u> Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>062614</u> Feature ID <u>W60HT021</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-4							Fibric	organics
4-6		40					Fibric	organics
	10 YR 4/3	60					Silt loam	
6-20	10 YR 5/4	100					Silt loam	few large rocks

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): N/A

Hydric Soil Present (Y/N): N

Notes: NO Hydric soils observed

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): _____	Depth (in): _____	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): _____	Depth (in): _____	
Saturation Present (Y/N): (includes capillary fringe)	Depth (in): _____	

Notes: NO Hydrology observed. LOW AREA HILLS SHOWN

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (R): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W6 01T021

Field Target: 126

Date: 06-25-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland? upland

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Moade

Wetland Scientist (print)

X

Joelle 06-25-14

Signature / Date

X

Joe Christopher

Field Crew Chief (print)

X

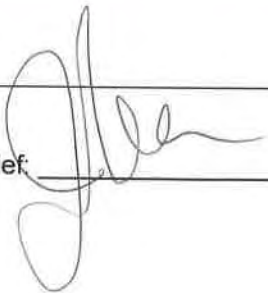
Joelle 6/25/14

Signature / Date

Vegetation Classification Data Form

Site Description		
Date: 06-25-14	Project Name & #: Alaska LNG 26221306	Field Target: 127
Investigators: Joe Christopher, Zoe Meade		Feature ID: W60HT022
Latitude: 62° 31' 22.46"	Longitude: 160° 14' 25.84"	Datum: WGS84
Logbook #: 003	Logbook Page #: 007	Picture #: P-N.S
Location Description:		
Approx. MP 129.5, west of Highway		
Common Species Observed (Scientific Name)		
Equisetum arvense	Picea glauca	
Calamagrostis canadensis	Betula nealaskana	
Salix bebbiana		
Percent Cover of Dominant Structure Level: 60% forested 40% tall shrub		
Habitat Description:		
upland mixed forest		
Alaska Vegetation Classification: Level I, Level II, Level III		
IC 2	HB 1 HB 2	
Notes:		

Field Crew Chief:



Field Scientist/Technician:



Vegetation Classification Data Form

Table I-Alaska vegetation classification to level III

Level I	Level II	Level III
I. Forest	A. Needleleaf (conifer) forest	(1) Closed needleleaf (conifer) forest (2) Open needleleaf (conifer) forest (3) Needleleaf (conifer) woodland
	B. Broadleaf forest	(1) Closed broadleaf forest (2) Open broadleaf forest (3) Broadleaf woodland
	C. Mixed forest	(1) Closed mixed forest (2) Open mixed forest (3) Mixed woodland
II. Scrub	A. Dwarf tree scrub	(1) Closed dwarf tree scrub (2) Open dwarf tree scrub (3) Dwarf tree scrub woodland
	B. Tall scrub	(1) Closed tall scrub (2) Open tall scrub
	C. Low scrub	(1) Closed low scrub (2) Open low scrub
	D. Dwarf scrub	(1) Dryas dwarf scrub (2) Ericaceous dwarf scrub (3) Willow dwarf scrub
III. Herbaceous	A. Graminoid herbaceous	(1) Dry graminoid herbaceous (2) Mesic graminoid herbaceous (3) Wet graminoid herbaceous (emergent)
	B. Forb herbaceous	(1) Dry forb herbaceous (2) Mesic forb herbaceous (3) Wet forb herbaceous (emergent)
	C. Bryoid herbaceous	(1) Mosses (2) Lichens
	D. Aquatic (nonemergent) herbaceous	(1) Freshwater aquatic herbaceous (2) Brackish water aquatic herbaceous (3) Marine aquatic herbaceous

Descriptions of levels I, II, III, and IV follow the classification table.

1a. Trees over 3 meters (10 ft) tall are present and have a canopy cover of 10 percent or more	I. Forest	2
1b. Trees over 3 meters (10 ft) tall are absent or nearly so. Less than 10 percent cover. (Dwarf trees, less than 3 meters (10 ft) tall may be present and abundant)		7
I. Forest		
2a. Over 75 percent of tree cover contributed by needleleaf (conifer) species	I.A Needleleaf forest	3
2b. Less than 75 percent of tree cover contributed by needleleaf (conifer) species		4
3a. Tree canopy of 60-100 percent cover	I.A.1 Closed needleleaf forest	
3b. Tree canopy of 25-59 percent cover	I.A.2 Open needleleaf forest	
3c. Tree canopy of 10-24 percent cover	I.A.3 Needleleaf woodland	
4a. Over 75 percent of tree cover contributed by broadleaf species	I.B Broadleaf forest	5
4b. Broadleaf or needleleaf species contribute 25 to 75 percent of the tree cover		6
5a. Tree canopy of 60-100 percent cover	I.B.1 Closed broadleaf forest	
5b. Tree canopy of 25-59 percent cover	I.B.2 Open broadleaf forest	
5c. Tree canopy of 10-24 percent cover	I.B.3 Broadleaf woodland	
6a. Tree canopy of 60-100 percent cover.	I.C.1 Closed mixed forest	
6b. Tree canopy of 25-59 percent cover.	I.C.2 Open mixed forest	
6c. Tree canopy of 10-24 percent cover	I.C.3 Mixed woodland	
7a. Vegetation with at least 25 percent cover of erect to decumbent shrubs or with at least 10 percent cover of dwarf trees (less than 3 meters (10 ft) tall)		
7b. Vegetation herbaceous (may have up to 25 percent shrub cover)		15

II. Scrub		
8a. Vegetation with at least 10 percent cover of dwarf trees	II A Dwarf tree scrub	9
8b. Vegetation with at least 25 percent cover of shrubs and less than 10 percent cover of dwarf trees		10
9a. Dwarf tree canopy of 60-100 percent cover	II.A.1 Closed dwarf tree scrub	
9b. Dwarf tree canopy of 25-59 percent cover	II.A.2 Open dwarf tree scrub	
9c. Dwarf tree canopy of 10-24 percent cover	II.A.3 Dwarf tree scrub woodland	
10a. Shrubs more than 1.5 meters (5 ft) tall	II B Tall scrub	11
10b. Shrubs less than 1.5 meters (5 ft) tall		12
11a. Shrub canopy cover greater than 75 percent	II.B.1 Closed tall scrub	
11b. Shrub canopy cover of 25-74 percent	II.B.2 Open tall scrub	
12a. Shrubs 20 centimeters to 1.5 meters tall	II.C Low scrub	13
12b. Shrubs under 20 centimeters in height	II.D Dwarf scrub	14
13a. Shrub canopy cover greater than 75 percent	II.C.1 Closed low scrub	
13b. Shrub canopy cover of 25-74 percent, or as low as 2 percent if little or no other vegetation cover present	II.C.2 Open low scrub	
14a. Dryas species dominant in the dwarf shrub layer	II.D.1 Dryas dwarf scrub	
14b. Ericaceous species dominant in the dwarf shrub layer	II.D.2 Ericaceous dwarf scrub	
14c. Willow species dominant in the dwarf shrub layer	II.D.2 Willow dwarf scrub	
III. Herbaceous		
15a. Terrestrial vegetation, or if growing in the water, dominated by emergent vegetation		16
15b. Dominant vegetation growing submerged in water or floating on the water surface, but not emerging above the water	III D Aquatic herbaceous	21

16a. Grasses, sedges, or rushes (graminoid) plants dominant	III A Graminoid herbaceous	17
16b. Forbs or bryophytes dominant		18
17a. Grasslands of well-drained, dry sites, such as south-facing bluffs, old beaches, and sand dunes. Typically (but not always) dominated by <i>Elymus</i> spp., <i>Festuca</i> spp., and <i>Deschampsia</i> spp.	III A.1 Dry graminoid herbaceous	
17b. On moist sites, but usually not with standing water. Usually dominated by <i>Calamagrostis</i> spp., <i>Carex</i> spp. or <i>Eriophorum</i> spp.; tussocks often present	III A.2 Mesic graminoid herbaceous	
17c. On wet sites, standing water present for part of the year; dominated by either sedges or grasses; includes wet tundra, bogs, marshes, and fens	III A.3 Wet graminoid herbaceous	
18a. Vegetation dominated by forbs (broadleaf herbs, ferns, or horsetails)	III B Forb herbaceous	19
18b. Vegetation dominated by mosses or lichens	III C Bryoid herbaceous	20
19a. On dry sites, usually rocky and well drained; mostly tundra sites	III B.1 Dry forb herbaceous	
19b. On moist sites but without standing water, mostly within forested areas	III B.2 Mesic forb herbaceous	
19c. On wet sites, usually with standing water for part of the year	III B.3 Wet forb herbaceous	
20a. Vegetation cover dominated by mosses	III C.1 Bryoid moss	
20b. Vegetation cover dominated by lichens	III C.2 Bryoid lichen	
21a. Vegetation submerged or floating in fresh water	III.D.1 Freshwater aquatic herbaceous	
21b. Vegetation submerged or floating in brackish water	III D.2 Brackish water aquatic herbaceous	
21c. Vegetation submerged or floating in salt water	III.D.3 Marine aquatic herbaceous	

Vegetation Classification Data Form QA/QC Checklist

This form is to be completed before leaving the field site.

Feature ID: W60 HT 022 Field Target: 127

Date: 06-25-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. General Information

- ☒ Location data recorded?
- ☒ Photo taken and photo number recorded?

2. Location Description

- ☒ Location of site recorded with enough detail to help relocate?

3. Common Species

- ☒ Scientific name of common species recorded?
- ☒ Percent cover of dominant structure level noted?

4. Habitat Description

- ☒ Habitat described?

5. Classification

- ☒ All three levels of classification recorded?

6. Field Log Book

- ☒ Field form entries consistent with log book?
- ☒ Logbook clearly identifies the Field Target ID and Feature ID?

X Zoe Meade

Field Technician (print)

X [Signature]

Signature

X [Signature]

Field Crew Chief (print)

X Ivo Christopher

Signature

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION <i>300ft study</i>			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/>		Field Target: <i>128</i>	Map #: <i>88</i> Map Date: <i>5/27/14</i>
Date: <i>06-25-</i>	Project Name & No.: <i>Alaska LNG 26221306</i>		Feature Id: <i>W60HT023</i>
Investigators: <i>Joe Christopher, Zoe Meade</i>			Team No.: <i>W60</i>
State: <i>Alaska</i>	Region: <i>Alaska</i>	Milepost: <i>129</i>	
Latitude: <i>62.5153</i>	Longitude: <i>-150.2521</i>	Datum: <i>WGS84</i>	
Logbook No.: <i>003</i>	Logbook Page No.: <i>006</i>	Picture No.: <i>P-N, S, pit plug</i>	

SITE PARAMETERS	
Subregion: <i>Interior</i>	Landform (hillslope, terrace, hummocks, etc.): <i>hummocks</i>
Slope (%): <i>3-5</i>	Local relief (concave, convex, none): <i>convex</i>
Pre-mapped Alaska LNG/NWI classification: <i>upland</i>	Soil Map Unit Name: <i>2/1</i>
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no explain in Notes)	
Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)	
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Significantly Disturbed? No <input checked="" type="checkbox"/> (If yes, explain in Notes)	
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Naturally Problematic? No <input checked="" type="checkbox"/> (If yes, explain in Notes.)	
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Wetland Type: <i>IC2, IIC2 upland</i>
Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Vioreck): <i>upland</i>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

Diagram
Page 6

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				Indicator Status	Dominant Species? (Y/N)	Absolute % Cover
Tree Stratum (Plot sizes: <u>26'</u>)						
1.	<i>Betula neoalaskana</i>		5	X	FACU	
2.	<i>Picea glauca</i>		15	X	FACU	
3.						
4.						
Total Cover: <u>20</u>						
50% of total cover: <u>10</u>			20% of total cover: <u>4</u>			
Sapling/Shrub Stratum (<u>26'</u>)			Indicator Status	Dominant Species? (Y/N)	Absolute % Cover	
1.	<i>Betula neoalaskana</i>		25	X	FACU	
2.	<i>Vaccinium uliginosum</i>		15	X	FAC	
3.	<i>Rosa acicularis</i>		8		FACU	
4.	<i>Spiraea stevenii</i>		1		FACU	
5.	<i>Ribes triste</i>		10		FAC	
6.						
7.						
8.						
9.						
Total Cover: <u>59</u>						
50% of total cover: <u>29.5</u>			20% of total cover: <u>11.8</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

% Dominant Species that are OBL, FACW, or FAC: 16.6 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by: _____

OBL species: _____ X 1 = _____

FACW species: _____ X 2 = _____

FAC species: 30 X 3 = 90

FACU species: 73 X 4 = 292

UPL species: 0 X 5 = 0

Column Totals: 163 (A) 382 (B)

PI = B/A = 3.70

VEGETATION (use scientific names of plants)				Indicator Status	Dominant Species? (Y/N)	Absolute % Cover
Herb Stratum (<u>26'</u>)						
1.	<i>Geranium erithrium</i>		1		FACU	
2.	<i>Veratrum viride</i>		4		FAC	
3.	<i>Cornus canadensis</i>		5		FACU	
4.	<i>Streptopus amplexifolius</i>		8	X	FACU	
5.	<i>Gymnocarpium dryopteris</i>		10	X	FACU	
6.	<i>Calamagrostis Canadensis</i>		1		FAC	
7.						
8.						
9.						
10.						
Total Cover: <u>29</u>						
50% of total cover: <u>14.5</u>			20% of total cover: <u>5.8</u>			

Hydrophytic Vegetation Indicators:

_____ Dominance Test is > 50%

_____ Prevalence Index is ≤ 3.0

_____ Morphological Adaptations¹ (Provide supporting data in Notes)

_____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

_____ % Bare Ground

_____ % Cover of Wetland Bryophytes

_____ Total Cover of Bryophytes

_____ % Cover of Water

Hydrophytic Vegetation Present (Y/N): N

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>6-25-14</u> Feature ID <u>W60HT023</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features			Texture	Notes	
	Color (moist)	%	Color (moist)	%	Type ¹			Loc ²
0-3							Fibric	Organics
3-5	2.5 Y 5/1						Ash	
5-14	10 YR 4/4						Silt loam	
14-16	10 YR 3/2						Silt loam	Dry

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): N/A

Hydric Soil Present (Y/N): N

Notes:
Refusal at 16", large rocks present

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) <u>X</u>
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): _____	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): _____	
Saturation Present (Y/N): <u>N</u> (includes capillary fringe)	Depth (in): _____	

Notes:
Plot taken in Low point of Area

WETLAND DETERMINATION DATA FORM

upland

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60 HT 023

Field Target: 128

Date: 6-25-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland? - *Upland*

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X *Zo Meade* 6-25-14

Signature / Date

X Joe Christopher

Field Crew Chief (print)

X 6/25/14

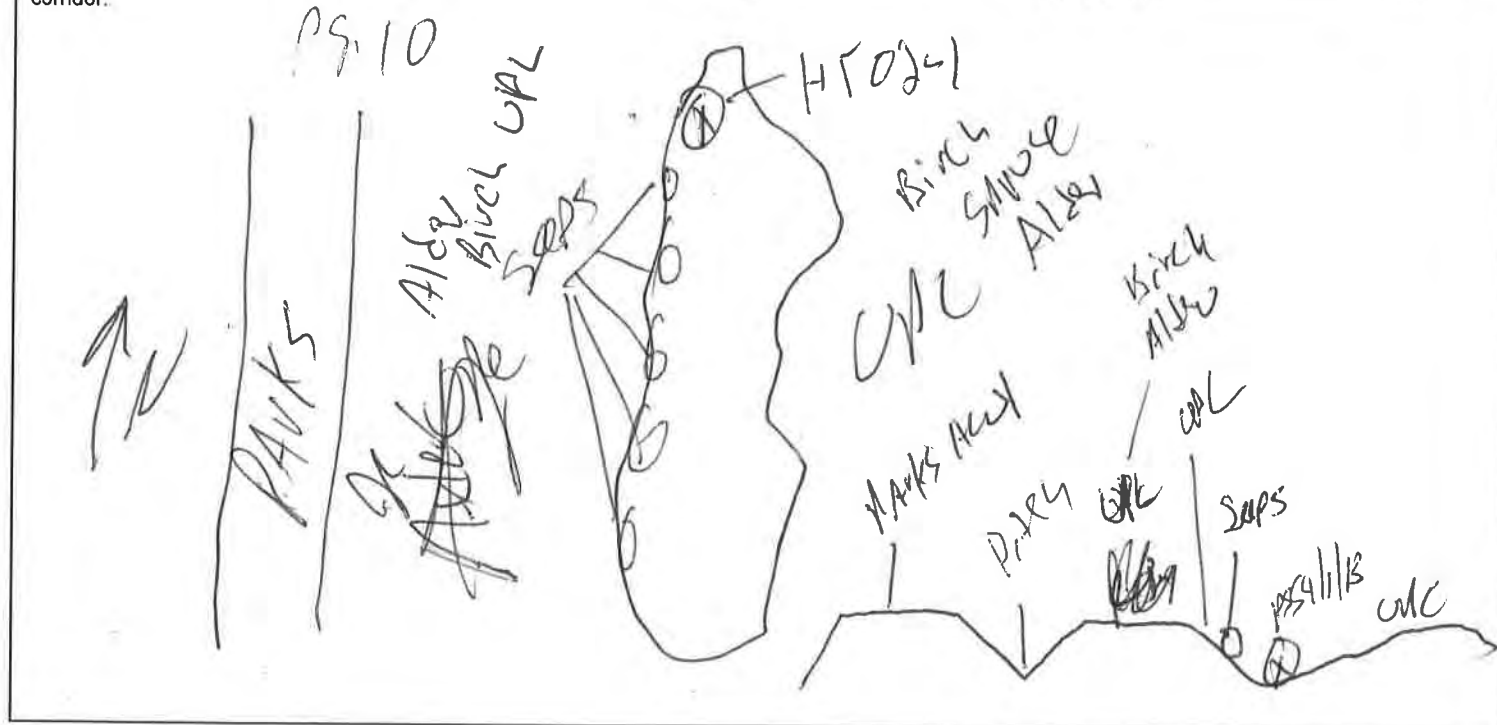
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION					300ft study					
Survey Type: Centerline			Access Road (explain)		Other (explain) X		Field Target: 104		Map #: 73 Map Date: 5/27/14	
Date: 06-26-14		Project Name & No.: Alaska LNG 26221306				Feature Id: W60HT024				
Investigators: Joe Christopher, Zoe Meade							Team No.: W60			
State: Alaska		Region: Alaska			Milepost: 150.5					
Latitude: 62° 46' 22"				Longitude: 150° 02' 43.05"			Datum: WGS84			
Logbook No.: 003		Logbook Page No.: 010			Picture No.: P_N, S, pit, plug					

SITE PARAMETERS	
Subregion: <u>interior</u>	Landform (hillslope, terrace, hummocks, etc.): <u>depressional</u>
Slope (%): <u>0-2</u>	Local relief (concave, convex, none): <u>concave</u>
Pre-mapped Alaska LNG/NWI classification: <u>PSS4/1B</u>	Soil Map Unit Name: <u>N/A</u>
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <u>X</u> No <u> </u> (if no explain in Notes)	Are "Normal Circumstances" present: Yes <u>X</u> No <u> </u> (If no, explain in Notes.)
Are Vegetation <u> </u> , Soil <u> </u> , or Hydrology <u> </u> Significantly Disturbed?	No <u>X</u> (If yes, explain in Notes)
Are Vegetation <u> </u> , Soil <u> </u> , or Hydrology <u> </u> Naturally Problematic?	No <u>X</u> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <u>X</u> No <u> </u>	Is the Sampled Area within a Wetland? Yes <u>X</u> No <u> </u>
Hydric Soil Present? Yes <u>X</u> No <u> </u>	Wetland Type: <u>PSS4/1B</u>
Wetland Hydrology Present? Yes <u>X</u> No <u> </u>	Alaska Vegetation Classification (Viereck): <u>IIA2, IIB2, IIC2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.



WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				Dominance Test worksheet:	
Tree Stratum (Plot sizes: <u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	No. of Dominant Species that are OBL, FACW, or FAC: <u>3</u> (A)	
1. <i>Picea mariana</i>	25	Y	FACW	Total Number of Dominant Species Across All Strata: <u>3</u> (B)	
2. <i>Conyza</i> tree & shrub				% Dominant Species that are OBL, FACW, or FAC: <u>100</u> (A/B)	
3. <i>Carex</i>					
4.					
Total Cover: _____				Prevalence Index worksheet:	
50% of total cover: _____ 20% of total cover: _____				Total % Cover of: _____ Multiply by: _____	
Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	OBL species: <u>36</u> X 1 = <u>36</u>	
1. <i>Betula nana</i>	5		FAC	FACW species: <u>37</u> X 2 = <u>74</u>	
2. <i>Rhododendron tomentosum</i>	2		FACW	FAC species: <u>10</u> X 3 = <u>30</u>	
3. <i>Empetrum nigrum</i>	2		FAC	FACU species: <u>2</u> X 4 = <u>8</u>	
4. <i>Vaccinium oxycoccus</i>	1		OBL	UPL species: <u>0</u> X 5 = <u>0</u>	
5. <i>Vaccinium uliginosum</i>	2		FAC	Column Totals: <u>85</u> (A) <u>148</u> (B)	
6. <i>Vaccinium vitis-idaea</i>	1		FAC	PI = B/A = <u>1.74</u>	
7.					
8.					
9.					
Total Cover: <u>38</u>					
50% of total cover: <u>19</u> 20% of total cover: <u>7.6</u>					

VEGETATION (use scientific names of plants)				Hydrophytic Vegetation Indicators:	
Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	<input checked="" type="checkbox"/> Dominance Test is > 50%	
1. <i>Rubus chamaemorus</i>	10	Y	FACW	<input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0	
2. <i>Cornus canadensis</i>	2		FACU	_____ Morphological Adaptations ¹ (Provide supporting data in Notes)	
3. <i>Carex utriculata</i>	35	Y	OBL	_____ Problematic Hydrophytic Vegetation ¹ (Explain)	
4.				¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.	
5.					
6.					
7.					
8.					
9.					
10.					
Total Cover: <u>47</u>				<u>0</u> % Bare Ground <u>100</u> % Cover of Wetland Bryophytes <u>100</u> Total Cover of Bryophytes <u>1</u> % Cover of Water	
50% of total cover: <u>23.5</u> 20% of total cover: <u>9.4</u>				Hydrophytic Vegetation Present (Y/N): <u>Y</u> Notes: (If observed, list morphological adaptations below):	

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>06/26/14</u> Feature ID <u>W60HT024</u>		Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)					
Depth (inches)	Matrix		Redox Features		Notes
	Color (moist)	%	Color (moist)	%	
0-20					Fibric Organics Saturated

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes: Thick sat Fibric Ouss.

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) <u>X</u>
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) <u>X</u>
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>1.5</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>1</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0</u>	

Notes: TOE IN DEPRESSION
- stressed/stunted Black spruce
Localized pockets of H₂O

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved <u>X</u> Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>25</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>7</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>47</u> Moss-Lichen <u>100</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>1</u> Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>X</u> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches <u>X</u> Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) <u>X</u> High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) <u>X</u> Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) <u>X</u> pH Reading <u>3.90</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed <u>X</u> Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <u>X</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check: [Signature]

GPS Technician QA/QC check: [Signature]

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT024

Field Target: 104

Date: 06-26-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X

Zoe Meade

Signature / Date

6/26/14

X Joe Christopher

Field Crew Chief (print)

X

Joe Christopher

Signature / Date

6/26/14

WETLAND DETERMINATION DATA FORM

FID: W60HT025

SITE DESCRIPTION				2000' Corridor	
Survey Type: Centerline		Access Road (explain)		Other (explain) <input checked="" type="checkbox"/>	
Field Target: 148		Map #: 103		Map Date: 5/27/14	
Date: 7/9/14		Project Name & No.: Alaska LNG 26221306		Feature Id: W60T1051 W60HT025	
Investigators: Joe Christopher, Zoe Meade, Abigail Fisher				Team No.: W60	
State: Alaska		Region: Alaska		Milepost: 661.7	
Latitude: 62° 20' 41.49"		Longitude: 150° 15' 50.77"		Datum: WGS84	
Logbook No.: 003		Logbook Page No.: 048-049		Picture No.: P. N.S. pit, plug	

SITE PARAMETERS	
Subregion: South central	Landform (hillslope, terrace, hummocks, etc.): depression
Slope (%): 0-3	Local relief (concave, convex, none): concave
Pre-mapped Alaska LNG/NWI classification: PSS 4/1/EM1C	Soil Map Unit Name: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No (if no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No	Wetland Type: PEM1 XC HT
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No	Alaska Vegetation Classification (Vioreck): IIIA3, IIC2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See MS 49 for sketch

→ GPS data recorded in the HT spread.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
<u>Tree Stratum</u> (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
<u>Sapling/Shrub Stratum</u> (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Chamaedaphne calyculata</i>	5	Y	FACW
2. <i>Picea mariana</i>	2		FACW
3. <i>Andromeda polifolia</i>	5	Y	FACW
4. <i>Betula nana</i>	4	Y	FAC
5. <i>Vaccinium oxycoccus</i>	1		OBL
6.			
7.			
8.			
9.			
Total Cover: <u>17</u> 50% of total cover: <u>8.5</u> 20% of total cover: <u>3.4</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 5 (A)
 Total Number of Dominant Species Across All Strata: 5 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: 46 X 1 = 46
 FACW species: 12 X 2 = 24
 FAC species: 4 X 3 = 12
 FACU species: 0 X 4 = 0
 UPL species: 0 X 5 = 0
 Column Totals: 62 (A) 82 (B)
 PI = B/A = 1.3

VEGETATION (use scientific names of plants)			
<u>Herb Stratum</u> (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Carex aquatilis</i>	35	Y	OBL
2. <i>Carex microglochin</i>	10	Y	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>45</u> 50% of total cover: <u>22.5</u> 20% of total cover: <u>9</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
— % Cover of Wetland Bryophytes
90 Total Cover of Bryophytes
0 % Cover of Water
Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

⑤

⑤

⑤

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <u>X</u> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>2</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>14</u> Dwarf shrub (<0.5m) <u>1</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>45</u> Moss-Lichen <u>90</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>3</u>	Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven <u>X</u> Moderately even _____	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>X</u> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) <u>X</u> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet <u>X</u> No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial/Quaternary Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated <u>X</u> Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <u>X</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT025 (40)
W60HT051 Field Target: 148 Date: 7/9/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X

Signature / Date

Zoe Meade 7/9/14

X

Field Crew Chief (print)

X

Signature / Date

Joe Christoph

7/4/14

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 106	Map #: 75 Map Date: 5/27/14
Date: 06-26-14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT026
Investigators: Joe Christopher, Zoe Meade			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 149.7	
Latitude: 62° 45' 56.51"		Longitude: 150° 04' 07.56"	Datum: WGS84
Logbook No.: 003	Logbook Page No.: 13	Picture No.: P-N, S, pit, plug	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): terrace
Slope (%): 0-3	Local relief (concave, convex, none): concave
Pre-mapped Alaska LNG/NWI classification: upland	Soil Map Unit Name: n/A
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (if no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/>	Wetland Type: upland
Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Viereck): IB-3 , IIB-1

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

PAGE 13

Site data correct,
but the greater polygon
is correct also.
CJG

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Betula neoalaskana</i>	80	Y	FACU
2. <i>Picea glauca</i>	8		FACU
3.			
4.			
Total Cover: <u>88</u>			
50% of total cover: <u>44</u> 20% of total cover: <u>17.6</u>			
Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Sanguisorba canadensis</i>			FACW
2. <i>Ainus ssp.</i>	15	Y	FAC
3. <i>Picea glauca</i>	3		FACU
4. <i>Betula neoalaskana</i>	3		FACU
5. <i>Fraxinus ssp.</i>	T		UPL
6. <i>Sorbus scopulina</i>	T		FACU
7.			
8.			
9.			
Total Cover: <u>21</u>			
50% of total cover: <u>10.5</u> 20% of total cover: <u>4.2</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

% Dominant Species that are OBL, FACW, or FAC: 25 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:

OBL species: 0 X 1 = 0

FACW species: 0 X 2 = 0

FAC species: 19 X 3 = 57

FACU species: 132 X 4 = 528

UPL species: 0 X 5 = 0

Column Totals: 151 (A) 585 (B)

PI = B/A = 3.87

FRAXINUS NOT IN US LIST.
(Known AS4)

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Gymnocarpium dryopteris</i>	10	Y	FACU
2. <i>Chamerion angustifolium</i>	1		FACU
3. <i>Dryopteris expansa</i>	25	Y	FACU
4. <i>Equisetum sylvaticum</i>	1		FAC
5. <i>Calamagrostis can.</i>	3		FAC
6. <i>Cornus canadensis</i>	2		FACU
7.			
8.			
9.			
10.			
Total Cover: <u>42</u>			
50% of total cover: <u>21</u> 20% of total cover: <u>8.4</u>			

Hydrophytic Vegetation Indicators:

_____ Dominance Test is > 50%

_____ Prevalence Index is ≤ 3.0

_____ Morphological Adaptations¹ (Provide supporting data in Notes)

_____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

0 % Cover of Wetland Bryophytes

1 Total Cover of Bryophytes

0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): N

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>06-26-14</u> Feature ID <u>W60 HI 020</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-5							Fibric	organics, dry
5-7								Rock/cobble
7-9	10 YR 5/1	100						Ash
9-20	10 YR 3/3	100					Silt loam	Dry

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): N/A

Hydric Soil Present (Y/N): N

Notes: no hydric soils observed

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	
Saturation Present (Y/N): <u>N</u> (includes capillary fringe)	Depth (in): <u>—</u>	

Notes: No hydrology indicators present

WETLAND DETERMINATION DATA FORM

upland

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (>1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____ Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site _____ Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (>2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT026

Field Target: 106

Date: 06-26-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland? Upland

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade
Wetland Scientist (print)

X Zoemeade 06-26-14
Signature / Date

X Joe Christophe
Field Crew Chief (print)

X [Signature] 6/26/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 107	Map #: 75 Map Date: 5/27
Date: 6/26/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT027
Investigators: SC/ZM			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 149.7	
Latitude: 62° 45' 56.25"		Longitude: 150° 04' 09.80'	Datum: WGS84
Logbook No.: 003	Logbook Page No.: 014	Picture No.: P-N, S, pit, plug	

SITE PARAMETERS	
Subregion: Interior	Landform (hillslope, terrace, hummocks, etc.): TERRACE/DEPRESSION
Slope (%): 0-1	Local relief (concave, convex, none): CONCAVE
Pre-mapped Alaska LNG/NWI classification: PEM1/SS1B	Soil Map Unit Name: A/A
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: PEM1/SS1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Viereck): III A3, IIC2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See page 14.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea mariana</i>	2		FACW
2.			
3.			
4.			
Total Cover: <u>2</u> 50% of total cover: <u>1</u> 20% of total cover: <u>0.4</u>			
Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea mariana</i>	3	Y	FACW
2. <i>Betula nana</i>	5	Y	FAC
3. <i>Empetrum nigrum</i>	10	Y	FAC
4. <i>Vaccinium uliginosum</i>	3		FAC
5. <i>Vaccinium oxycoccus</i>	2		OBL
6.			
7.			
8.			
9.			
Total Cover: <u>25</u> 50% of total cover: <u>12.5</u> 20% of total cover: <u>5</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 45 (B)

% Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: 117 Multiply by: 1

OBL species: 117 X 1 = 117

FACW species: 13 X 2 = 26

FAC species: 18 X 3 = 54

FACU species: 3 X 4 = 12

UPL species: 6 X 5 = 30

Column Totals: 151 (A) 209 (B)

PI = B/A = 1.38

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Rubus chamaemorus</i>	7		FACW
2. <i>Carex aquatilis</i>	15		OBL
3. <i>Pedicularis lobrydonica</i>	1		FACW
4. <i>Trichophorum caespitosum</i>	40	Y	OBL
5. <i>Cornus canadensis</i>	3		FACU
6. <i>Carex magellanica</i>	60	Y	OBL
7.			
8.			
9.			
10.			
Total Cover: <u>126</u> 50% of total cover: <u>63</u> 20% of total cover: <u>25.2</u>			

Hydrophytic Vegetation Indicators:

☒ Dominance Test is > 50%

☒ Prevalence Index is ≤ 3.0

 Morphological Adaptations¹ (Provide supporting data in Notes)

 Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

100 % Cover of Wetland Bryophytes

100 Total Cover of Bryophytes

25 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

w60 70

SOIL		Date <u>6/26/14</u> Feature ID <u>HT026</u>		Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)					
Depth (inches)	Matrix		Redox Features		Notes
	Color (moist)	%	Color (moist)	%	
0-16					Fine? Sand

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____	
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____	
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: ice Depth (inches): 16

Hydric Soil Present (Y/N): Y

Notes: ice at 16"

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) <u>X</u>	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) <u>X</u>
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: <u>4-5" standing H2O.</u>	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>4-5</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0</u>	
Notes: _____		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <u>X</u> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0.2</u> Sapling (<5 dbh, <6m tall) <u>0.5</u> Tall shrub (2-6m) <u>3</u> Short shrub (0.5-2m) <u>0</u> Dwarf shrub (<0.5m) <u>20</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>120</u> Moss-Lichen <u>100</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u> Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>X</u>		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>X</u> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover <u>X</u> 26-75% Scattered or Peripheral Cover <u>X</u> >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few <u>X</u> Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) <u>X</u> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded <u>X</u>	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) <u>X</u> pH Reading <u>5.12</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below <u>X</u> Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60H097

Field Target: 107

Date: 4/26/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?

☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

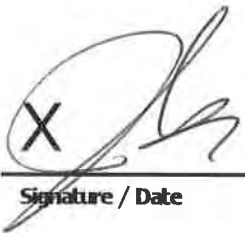
Wetland Scientist (print)

X  6/26/14

Signature / Date

X Joe Christopher

Field Crew Chief (print)

X  6/26/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 092	Map #: 64 Map Date: 9/27/14
Date: 08-27-14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT028
Investigators: Joe Christopher, Zoe Meade			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 166.9	
Latitude: 62° 55' 45.28"	Longitude: 149° 41' 48.59"	Datum: WGS84	
Logbook No.: 003	Logbook Page No.: 15	Picture No.: PM, S, pit, plug	

SITE PARAMETERS	
Subregion: Interior	Landform (hillslope, terrace, hummocks, etc.): Hillside
Slope (%): 0-5%	Local relief (concave, convex, none): convex
Pre-mapped Alaska LNG/NWI classification: upland	Soil Map Unit Name: LA
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes _____ No <input checked="" type="checkbox"/> (If no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology <input checked="" type="checkbox"/> Naturally Problematic?	No _____ (If yes, explain in Notes.) * see notes
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/>	Wetland Type: Upland
Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/> * see notes	Alaska Vegetation Classification (Viereck): IC2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See Pg. 15

* heavy rains with biased hydrology indicators
Flood Warnings for last 2 days.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Betula neoalaskana</i>	4	X	FACU
2. <i>Picea glauca</i>	15	X	FACU
3.			
4.			
Total Cover: <u>19</u> 50% of total cover: <u>9.5</u> 20% of total cover: <u>3.8</u>			
Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Viburnum edule</i>	3		FACU
2. <i>Sorbus scopulina</i>	T		FACU
3. <i>Alnus ssp.</i>	5	X	FAC
4. <i>Vaccinium uliginosum</i>	3		FAC
5. <i>Salix barclayii</i>	5	X	FAC
6. <i>Picea glauca</i>	1		FACU
7.			
8.			
9.			
Total Cover: <u>16.7</u> <u>3.4</u> 50% of total cover: <u>8.5</u> 20% of total cover: <u>3.2</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

% Dominant Species that are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:

OBL species: _____ X 1 = _____

FACW species: _____ X 2 = _____

FAC species: 53 X 3 = 159

FACU species: 71 X 4 = 284

UPL species: 174 X 5 = _____

Column Totals: 124 (A) 443 (B)

PI = B/A = 3.57

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Geranium erithrium</i>	2		FACU
2. <i>Chamerion angustifolium</i>	3		FACU
3. <i>Gymnocarpium dryopteris</i>	40	X	FACU
4. <i>Calamagrostis canadensis</i>	35	X	FAC
5. <i>Veratrum viride</i>	T		FAC
6. <i>Equisetum arvense</i>	1		FAC
7. <i>Rubus pedatus</i>	3		FAC
8. <i>Streptopus amplexifolius</i>	1		FAC
9. <i>Dryopteris expansa</i>	T		FACU
10. <i>Cornus canadensis</i>	3		FACU
Total Cover: <u>88</u> 50% of total cover: <u>44</u> 20% of total cover: <u>17.6</u>			

Hydrophytic Vegetation Indicators:

_____ Dominance Test is > 50%

_____ Prevalence Index is ≤ 3.0

_____ Morphological Adaptations¹ (Provide supporting data in Notes)

_____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

— % Cover of Wetland Bryophytes

5 Total Cover of Bryophytes

0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): ✓

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>062714</u> Feature ID <u>W60HT028</u>		Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)					
Depth (inches)	Matrix		Redox Features		Notes
	Color (moist)	%	Color (moist)	%	
0-1					Fibric organics; dry
1-3					large rock
3-17	10 YR 4/3	10			coarse sand - sandy loam, coarse
		90			gravel + coarse sand

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): N/A

Hydric Soil Present (Y/N): N

Notes: Soils saturated due to heavy rains over past few days
- Flood warnings posted

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>N/A</u>	Wetland Hydrology Present (Y/N): <u>N</u> *
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>4</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>3</u>	

Notes: * Water observed draining into pit, percolating downward into pit
water from heavy rains. Soils are well drained coarse sands/gravels

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____			
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____			
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____			
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____			
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____			
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____			
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____			
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____			
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____			
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____			

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT028

Field Target: W 092

Date: 06-27-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X Zmeade 6/27/14

Signature / Date

X Joe Christy

Field Crew Chief (print)

X [Signature] 6/27/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 093	Map #: 65 Map Date: 5/27
Date: 06-27-14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT029
Investigators: Joe Christopher, Zoe Meade			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 164	
Latitude: 62°53'53.95"		Longitude: 149°44'19.45"	Datum: WGS84
Logbook No.: 003	Logbook Page No.: 16	Picture No.: PLS, P/P	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): terrace
Slope (%): Plot 0-3 matrix 20-30%	Local relief (concave, convex, none): convex
Pre-mapped Alaska LNG/NWI classification: upland	Soil Map Unit Name: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology <input checked="" type="checkbox"/> Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/>	Wetland Type: upland
Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Viereck): IC2, IIC1

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See PAGE 16

Recent HEAVY RAINS + Flood warnings

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>2p</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea glauca</i>	7	X	FACU
2. <i>Betula neoalaskana</i>	3	X	FACU
3.			
4.			
Total Cover: <u>15</u> 10 50% of total cover: <u>7.5</u> 20% of total cover: <u>3.0</u>			
Sapling/Shrub Stratum ()	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Salix pulchra</i>	5	X	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>5</u> 50% of total cover: <u>2.5</u> 20% of total cover: <u>1</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

% Dominant Species that are OBL, FACW, or FAC: 40 (A/B) 50

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by: _____

OBL species: _____ X 1 = _____

FACW species: 8 X 2 = 16

FAC species: 92 X 3 = 276

FACU species: 27 X 4 = 108

UPL species: _____ X 5 = _____

Column Totals: 127 (A) 400 (B)

PI = B/A = 3.14

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Calamagrostis Canadensis</i>	80	X	FAC
2. <i>Vilatum viride</i>	1		FAC
3. <i>Chamerion angustifolium</i>	15		FACU
4. <i>Equisetum sylvaticum</i>	18		FAC
5. <i>Equisetum Arvense</i>	10		FAC
6. <i>Mertensia paniculata</i>	1		FACU
7. <i>Sanguisorba canadensis</i>	2		FACW
8. <i>Viola palustris</i>	1		FACW
9. <i>Streptopus amplexifolius</i>	1		FACU
10. <i>Rubus arcticus</i>	1		FAC
Total Cover: <u>130</u> 50% of total cover: <u>65</u> 20% of total cover: <u>26</u>			

Hydrophytic Vegetation Indicators:

_____ Dominance Test is > 50%

_____ Prevalence Index is ≤ 3.0

_____ Morphological Adaptations¹ (Provide supporting data in Notes)

_____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

1 % Cover of Wetland Bryophytes

3 Total Cover of Bryophytes

0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): N

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

062714

SOIL		Date	Feature ID	Soil Pit Required (Y/N)	
		06/17	W60HT029	Y	

SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-5							Fibric	
5-9	10YR 4/3	98					Silt loam	
		2						sm. gravels
9-14	10YR 4/4	70					Sandy silt	
		30						medium gravels

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____	
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____	
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: Rocks Depth (inches): 14

Hydric Soil Present (Y/N): N

Notes: No hydric soils observed

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	
Saturation Present (Y/N): <u>N</u> (includes capillary fringe)	Depth (in): <u>—</u>	

Notes: No Hydrology Observed

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemlc _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check: _____

GPS Technician QA/QC check: _____

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W404T029

Field Target: 13

Date: 8/27/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☐ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☐ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☐ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X 

Signature / Date

X 

Field Crew Chief (print)

X Joe Christopher

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION 300 ft study			
Survey Type: Centerline	Access Road (explain)	Other (explain) <u>X</u>	Field Target: <u>094</u> Map #: Map Date: <u>5/27/14</u>
Date: <u>06-27-14</u>	Project Name & No.: <u>Alaska LNG 26221306</u>		Feature Id: <u>W60HT030</u>
Investigators: <u>Joe Christopher, Zoe Meade</u>			Team No.: <u>W60</u>
State: <u>Alaska</u>	Region: <u>Alaska</u>	Milepost: <u>161</u>	
Latitude: <u>62°52'43.05"</u>		Longitude: <u>149°49'32.25"</u>	Datum: <u>WGS84</u>
Logbook No.: <u>003</u>	Logbook Page No.: <u>017</u>	Picture No.: <u>P-N, S, ground</u>	

SITE PARAMETERS	
Subregion: <u>interior</u>	Landform (hillslope, terrace, hummocks, etc.):
Slope (%): <u>PSS1/EM1B</u> <u>0-2%</u>	Local relief (concave, convex, none): <u>concave</u>
Pre-mapped Alaska LNG/NWI classification: <u>✓</u>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <u>X</u> No (if no explain in Notes)	Are "Normal Circumstances" present? Yes <u>X</u> No (if no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <u>X</u> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <u>X</u> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <u>X</u> No	Is the Sampled Area within a Wetland? Yes <u>X</u> No
Hydric Soil Present? Yes <u>X</u> No	Wetland Type: <u>PSS1/EM1B</u>
Wetland Hydrology Present? Yes <u>X</u> No	Alaska Vegetation Classification (Vioreck): <u>IIc2, III A3</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

The sketch shows a central wetland area labeled 'PSS1/EM1B' with 'PSS1/EM1B' written inside. To the left, there's a label 'DASE 17 U' and 'DARKS' at the bottom. To the right, 'Birch/spruce' and 'Alder' are written. A north arrow points upwards on the left side. There are also labels 'Hill' and 'Hr17' near the bottom center.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: <u>0</u>			
50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Spirea alba</i>	10	X	FACW
2. <i>Saxifraga</i>		X	FAC
3. <i>Saxifraga</i>	15	X	FACW
4.			
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>25</u>			
50% of total cover: <u>12.5</u> 20% of total cover: <u>5</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

% Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by: _____

OBL species: 45 X 1 = 45

FACW species: 25 X 2 = 50

FAC species: 3 X 3 = 9

FACU species: _____ X 4 = _____

UPL species: _____ X 5 = _____

Column Totals: 73 (A) 104 (B)

PI = B/A = 1.42

Permissible inclusion
surrounding matrix is
more of permissible, standing
H₂O @ 4"

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Carex aquatilis</i>	15	X	OBL
2. <i>Comarum palustre</i>	25	X	OBL
3. <i>Calamagrostis canadensis</i>	3		FAC
4. <i>Equisetum fluviatile</i>	5		OBL
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>48</u>			
50% of total cover: <u>24</u> 20% of total cover: <u>9.6</u>			

Hydrophytic Vegetation Indicators:

X Dominance Test is > 50%

X Prevalence Index is ≤ 3.0

____ Morphological Adaptations¹ (Provide supporting data in Notes)

____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

2 % Cover of Wetland Bryophytes

80 Total Cover of Bryophytes

30 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL							Date 06-27-14 Feature ID W60HT030	Soil Pit Required (Y/N) YN							
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)															
Depth (inches)	Matrix		Redox Features												
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²									
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ² Location: PL=Pore Lining, M=Matrix.															
HYDRIC SOIL INDICATORS									INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³						
Histosol or Histel (A1)	X		Alaska Gleyed (A13)				Alaska Color Change (TA4) ⁴								
Histic Epipedon (A2)			Alaska Redox (A14)				Alaska Alpine Swales (TA5)								
Black Histic (A3)			Alaska Gleyed Pores (A15)				Alaska Redox with 2.5Y Hue								
Hydrogen Sulfide (A4)							Alaska Gleyed without 5Y Hue or Redder Underlying Layer								
Thick Dark Surface (A12)							Other (Explain in Notes)								
³ One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic. ⁴ Give details of color change in Notes.															
Restrictive Layer (if present): Type: _____ Depth (inches): _____															
Hydric Soil Present (Y/N): Y															
Notes: assume histosol - due to vegetation, presence of ground water - checked with shovel test → NO mineral HISTOSOL TO 10" (SHOULDER DEPT)															
HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)									SECONDARY INDICATORS (2 or more required)						
Surface Water (A1)	X		Surface Soil Cracks (B6)				Water-stained Leaves (B9)				Stunted or Stressed Plants (D1)				
High Water Table (A2)	X		Inundation Visible on Aerial Imagery (B7)				Drainage Patterns (B10)				Geomorphic Position (D2)				
Saturation (A3)	X		Sparsely Vegetated Concave Surface (B8)				Oxidized Rhizospheres along Living Roots (C3)				Shallow Aquitard (D3)				
Water Marks (B1)			Marl Deposits (B15)				Presence of Reduced Iron (C4)				Microtopographic Relief (D4)				
Sediment Deposits (B2)			Hydrogen Sulfide Odor (C1)				Salt Deposits (C5)				FAC-Neutral Test (D5)				
Drift Deposits (B3)			Dry-Season Water Table (C2)				Notes: Standing H ₂ O IN AREAS, 4" IN SURROUNDING PERIMETER WHEN OPEN								
Algal Mat or Crust (B4)			Other (Explain in Notes):												
Iron Deposits (B5)															
Surface Water Present (Y/N): Y			Depth (in): 4			Wetland Hydrology Present (Y/N): Y									
Water Table Present (Y/N): Y			Depth (in): 0												
Saturation Present (Y/N): Y (includes capillary fringe)			Depth (in): 0												
Notes: 4" Standing H ₂ O In perimeter															

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <u>X</u> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>0</u> Dwarf shrub (<0.5m) <u>25</u> Tall herb (>1m) <u>0</u> Short herb (<1m) <u>48</u> Moss-Lichen <u>30</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u>		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven <u>X</u> Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>X</u> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover <u>X</u> >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches <u>X</u> Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) <u>X</u> Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) <u>X</u> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet <u>X</u> Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded <u>(X -> in perimeter wetland)</u>	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) <u>X</u> pH Reading <u>4.78</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated <u>X</u> Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT030

Field Target: 94

Date: 6/22/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ ³ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)? *NO soil pit/plug due to standing water*
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X *Zoe Meade*

Signature / Date

X *Joe Christoph*

Field Crew Chief (print)

X *[Signature]* 4/27/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 095	Map #: 67 Map Date: 5/27/14
Date: 06-28-14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT031
Investigators: Joe Christopher, Zoe Meade			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 160	
Latitude: 62° 52' 04.83"		Longitude: 149° 51' 06.87"	Datum: WGS84
Logbook No.: 003	Logbook Page No.: 019	Picture No.: P-E, W. ground	

SITE PARAMETERS	
Subregion: Interior	Landform (hillslope, terrace, hummocks, etc.): flood plain
Slope (%): 0-1% (20400 100%)	Local relief (concave, convex, none): none
Pre-mapped Alaska LNG/NWI classification: PSS1A	Soil Map Unit Name: NA
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	
Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (if no, explain in Notes.)	
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed? No <input checked="" type="checkbox"/> (If yes, explain in Notes)	
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic? No <input checked="" type="checkbox"/> (If yes, explain in Notes.)	
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/>	Wetland Type: upland
Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Viereck): IB1, IIc2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Populus balsamifera</i>	40	X	FACU
2.			
3.			
4.			
Total Cover: <u>40</u> 50% of total cover: <u>20</u> 20% of total cover: <u>8</u>			
Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Saxex Aleveensis</i>	25	X	FAC
2. <i>Picea glauca</i>	TR		FACU
3. <i>Salix Karstii</i>	25	X	FAC
4. <i>Schiff</i>			
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>50</u> 50% of total cover: <u>25</u> 20% of total cover: <u>10</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)
 Total Number of Dominant Species Across All Strata: 5 (B)
 % Dominant Species that are OBL, FACW, or FAC: 60 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: _____ X 1 = _____
 FACW species: _____ X 2 = _____
 FAC species: 48 X 3 = 144
 FACU species: 72 X 4 = 288
 UPL species: _____ X 5 = _____
 Column Totals: 120 (A) 432 (B)
 PI = B/A = 3.60

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Equisetum Arvense</i>	20	X	FAC
2. <i>Spala 10</i>			
3. <i>Chamaerion angustifolium</i>	3.		FAC
4. <i>Arythrium cyclosorum</i>	2.		FAC
5. <i>Geranium erianthum</i>	3.		FACU
6. <i>Pyrola aserifolia</i>	25	X	FACU
7. <i>Streptopus amplexifolius</i>	1.		FACU
8. <i>Gallium triflorum</i>	1.		FAC
9. <i>Heracleum maximum</i>	TR		FACU
10. <i>Lupinus Arctivus</i>	TR		FACU
Total Cover: <u>45.55</u> 50% of total cover: <u>22.5</u> 20% of total cover: <u>9.0</u> <div style="text-align: center;"> 27.5 11 </div>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☐ Prevalence Index is ≤ 3.0
☐ Morphological Adaptations¹ (Provide supporting data in Notes)
☐ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

☒ % Bare Ground
☐ % Cover of Wetland Bryophytes
☒ Total Cover of Bryophytes
☒ % Cover of Water
Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>02-28-14</u> Feature ID <u>W60HT031</u>				Soil Pit Required (Y/N) <u>N</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0.5"							Fine	dry organic det
1.5 +	Red							Rock / coarse / gravel

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS	INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____
Hydrogen Sulfide (A4) _____	Alaska Redox with 2.5Y Hue _____
Thick Dark Surface (A12) _____	Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
	Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: Rock Depth (inches): .5"

Hydric Soil Present (Y/N): N

Notes:
 Actual Flood plain - rock, coarse under .5" dry orgs.
 2 days HAM prior.

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): _____	Depth (in): _____	Wetland Hydrology Present (Y/N): <u>X</u>
Water Table Present (Y/N): _____	Depth (in): _____	
Saturation Present (Y/N): (includes capillary fringe)	Depth (in): _____	

Notes:
 No hydrology observed. Toe of slope in Flood plain.

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT031

Field Target: 095

Date: 06-28-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete? *unable to dig due to impermeable soils*
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland? *upland*

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X

Signature / Date

Zoe Meade

06-28-14

X

Field Crew Chief (print)

X

Signature / Date

Joe Christoph

[Signature] 6/28/14

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 47	Map #: 62 Map Date: 5/27/14
Date: 06-28-14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT032
Investigators: Joe Christopher, Zoe Meade			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 160	
Latitude: 62° 52' 04.47"		Longitude: 149° 51' 11.70"	Datum: WGS84
Logbook No.: 003	Logbook Page No.: 20	Picture No.: P-EL-W, pit, plug	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): TERNAL
Slope (%): 15-10% (South) 70 to 400%	Local relief (concave, convex, none): convex
Pre-mapped Alaska LNG/NWI classification: Upl	Soil Map Unit Name: M/A
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	
Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)	
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed? No <input checked="" type="checkbox"/> (If yes, explain in Notes)	
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic? No <input checked="" type="checkbox"/> (If yes, explain in Notes.)	

SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/>	Wetland Type: UPL
Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Viereck): IC2, IC2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: <u>2</u> (A) Total Number of Dominant Species Across All Strata: <u>65</u> (B) % Dominant Species that are OBL, FACW, or FAC: <u>33</u> (A/B) <u>40</u>
1. <i>Betula neolaskana</i>	25	X	FACU	
2. <i>Populus Balsamifera</i>	5	X	FACU	
3. <i>Picea glauca</i>	1		FACU	
4.				
Total Cover: <u>31</u> 50% of total cover: <u>15.5</u> 20% of total cover: <u>6.2</u>				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species: <u>—</u> X 1 = _____ FACW species: _____ X 2 = _____ FAC species: <u>61</u> X 3 = <u>183</u> FACU species: <u>49</u> X 4 = <u>196</u> UPL species: <u>9</u> X 5 = <u>45</u> Column Totals: <u>119</u> (A) <u>424</u> (B) PI = B/A = <u>3.56</u>
Sapling/Shrub Stratum (_____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <i>Empetrum nigrum</i>	35	X	FAC	
2. <i>Vaccinium-vitis idaea</i>	6		FAC	
3. <i>Betula nana</i>	3		FAC	
4. <i>Picea glauca</i>	4		FACU	
5. <i>Vaccinium uliginosum</i>	5		FAC	
6. <i>Sorbus scopulina</i>	3		FACU	
7. <i>Alnus ssp.</i>	12	X	FAC	
8. <i>Lycopodium complanatum</i>	9		UPL	
9.				
Total Cover: <u>77</u> 50% of total cover: <u>38.5</u> 20% of total cover: <u>15.4</u>				

VEGETATION (use scientific names of plants)				
Herb Stratum (_____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Hydrophytic Vegetation Indicators: _____ Dominance Test is > 50% _____ Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
1. <i>Cornus canadensis</i>	2	X	FACU	
2. <i>Lupinus arcticus</i>	3	X	FACU	
3. <i>Trientalis Europaea</i>	7		FACU	
4. <i>Geocaulon lividum</i>	2		FACU	
5. <i>Gymnocarpium dryopteris</i>	4	X	FACU	_____ % Bare Ground <u>NA</u> % Cover of Wetland Bryophytes _____ Total Cover of Bryophytes _____ % Cover of Water Hydrophytic Vegetation Present (Y/N): <u>✓</u> Notes: (If observed, list morphological adaptations below):
6.				
7.				
8.				
9.				
10.				
Total Cover: <u>11</u> 50% of total cover: <u>5.5</u> 20% of total cover: <u>2.2</u>				

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>6/28/19</u> Feature ID <u>W60 HT032</u>		Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)					
Depth (inches)	Matrix		Redox Features		Notes
	Color (moist)	%	Color (moist)	%	
0-2					Episodic DVI
2-4		80			Rock/gravel DVI
2-4	10-12 4/4	20			Sandy loam Lower sand

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS	INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____
Hydrogen Sulfide (A4) _____	Alaska Color Change (TA4) ⁴ _____
Thick Dark Surface (A12) _____	Alaska Alpine Swales (TA5) _____
	Alaska Redox with 2.5Y Hue _____
	Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
	Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: 4 Depth (inches): Rock/gravel

Hydric Soil Present (Y/N): N

Notes: NO Hydric soils observed

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: <u>NO Field Indicators of Hydrology</u>	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u> </u>	Wetland Hydrology Present (Y/N): <u>P</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): <u> </u>	
Saturation Present (Y/N): <u>N</u> (includes capillary fringe)	Depth (in): <u> </u>	

Notes: NO Hydrology observed

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____			
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____			
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____			
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____			
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____			
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____			
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____			
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____			
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____			
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____			

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check: _____

GPS Technician QA/QC check: _____

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W604T032

Field Target: 97

Date: 6/28/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked? N/A no hyd soil

4. Hydrology

- ☒ Appropriate hydrology indicators are marked? none
- ☒ Surface water, water table, and saturation depths are recorded if present? none

5. Functions and Values N/A up

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X *Zoe Meade* 06/28/14

Signature / Date

X Joe Christopher

Field Crew Chief (print)

X *[Signature]* 6/28/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION				300' study	
Survey Type: Centerline		Access Road (explain)		Other (explain) <input checked="" type="checkbox"/>	
Field Target: 089		Map #: 61 Map Date: 6/26/14			
Date: 07-01-2014		Project Name & No.: Alaska LNG 26221306		Feature Id: W60 HT 033	
Investigators: Joe Christopher, Zoe Meade				Team No.: W60	
State: Alaska		Region: Alaska		Milepost: 606.3 (LNG)	
Latitude: 62° 58' 23.41"		Longitude: 149° 37' 53.20"		Datum: WGS84	
Logbook No.: 003		Logbook Page No.: 241		Picture No.: P-N, -S, -P/P	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): Depression
Slope (%): 0-3	Local relief (concave, convex, none): CONCAVE
Pre-mapped Alaska LNG/NWI classification: PSS1/SS1B	Soil Map Unit Name: M/A
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No (If no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No (If no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No	Wetland Type: PSS1/EM1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No	Alaska Vegetation Classification (Vioreck): IIC2, IIIA3

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

Point collected @ edge of 300' corridor to stay off RR property
The data represents the wetland the Q will cross.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				Dominance Test worksheet:
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	No. of Dominant Species that are OBL, FACW, or FAC: <u>0</u> (A)
1.				Total Number of Dominant Species Across All Strata: <u>5</u> (B)
2.				% Dominant Species that are OBL, FACW, or FAC: <u>100</u> (A/B)
3.				
4.				
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>				Prevalence Index worksheet:
Sapling/Shrub Stratum (<u>26'</u>)				Total % Cover of: _____ Multiply by: _____ OBL species: <u>66</u> X 1 = <u>66</u> FACW species: <u>13</u> X 2 = <u>26</u> FAC species: <u>24</u> X 3 = <u>72</u> <u>132</u> FACU species: _____ X 4 = _____ UPL species: _____ X 5 = _____ Column Totals: <u>133</u> (A) <u>164</u> (B) PI = B/A = <u>1.59</u> <u>1.82</u>
1. <i>Picea Mariana</i>	<u>2</u>		FACW	<p><i>Dasifora fruticosa</i> T</p> <p>In the plot</p> <p>- Emergent Late¹ has more</p> <p>AGB (coverage) but the shrub</p> <p>'Late' appears to be the dominant</p> <p>layer in the habitat matrix</p>
2. <i>Betula nana</i>	<u>5</u>	<u>X</u>	FAC	
3. <i>Rhododendron tomentosum</i>	<u>1</u>		FACW	
4. <i>Empetrum nigrum</i>	<u>4</u>	<u>X</u>	FAC	
5. <i>Saxifraga oppositifolia</i>	<u>1</u>		FACW	
6. <i>Vaccinium oxycoccus</i>	<u>5</u>	<u>X</u>	OBL	
7. <i>Spirea stevenii</i>	<u>1</u>		FACW	
8. <i>Saxifraga oppositifolia</i>	<u>1</u>		FACW	
9. <i>Andromeda polifolia</i>	<u>2</u>		FACW	
10. <i>Vaccinium ovalifolium</i>	<u>20</u>		FAC	
Total Cover: <u>40</u> 50% of total cover: <u>20</u> 20% of total cover: <u>8</u>				
VEGETATION (use scientific names of plants)				Hydrophytic Vegetation Indicators:
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	<input checked="" type="checkbox"/> Dominance Test is > 50% <input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
1. <i>Carex vaginata</i>	<u>40</u>	<u>X</u>	OBL	<p>_____ % Bare Ground</p> <p>_____ % Cover of Wetland Bryophytes</p> <p><u>100</u> Total Cover of Bryophytes</p> <p><u>1</u> % Cover of Water</p> <p>Hydrophytic Vegetation Present (Y/N): <u>Y</u></p> <p>Notes: (If observed, list morphological adaptations below):</p>
2. <i>Comarum palustre</i>	<u>1</u>		OBL	
3. <i>Equisetum arvense</i>	<u>10</u>		FAC	
4. <i>Viola</i>	<u>1</u>		—	
5. <i>Carex microglochin</i>	<u>20</u>	<u>X</u>	OBL	
6. <i>Calamagrostis canadensis</i>	<u>5</u>		FAC	
7. <i>Rubus arcticus</i>	<u>1</u>		FAC	
8. <i>Carex ssp.</i>	<u>1</u>		—	
9. <i>Sanguisorba canadensis</i>	<u>7</u>		FACW	
10. <i>Pedicularis ssp.</i>	<u>1</u>		—	
Total Cover: <u>83</u> 50% of total cover: <u>41.5</u> 20% of total cover: <u>16.6</u>				

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>07-01-14</u> Feature ID <u>W60HT033</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Notes
	Color (moist)	%	Color (moist)	%				
0-10							Fibric	organic
10-20							hemic	organic

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes: Hydric soils observed, H2S smell

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) <u>X</u>
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) <u>X</u>	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) <u>X</u>
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) <u>X</u>	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>1</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>4</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0</u>	

Notes: Localized surface water in pockets, H2S smell

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>200</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <u>X</u> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>2</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>20</u> Dwarf shrub (<0.5m) <u>10</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>83</u> Moss-Lichen <u>100</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>1</u>		Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <u>X</u> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) <u>X</u> High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic <u>X</u> Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet <u>X</u> Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) <u>X</u> Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) <u>X</u> pH Reading <u>5.13</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Pemeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <u>X</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT033

Field Target: 089

Date: 07-01-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X *Zoe Meade* 07-01-14

Signature / Date

X Joe Christopher

Field Crew Chief (print)

X *[Signature]* 7/1/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION 300' study			
Survey Type: Centerline		Access Road (explain)	Other (explain) <u>X</u>
Field Target: <u>090</u>		Map #: <u>62</u> Map Date: <u>4/26/14</u>	
Date: <u>07-01-14</u>	Project Name & No.: <u>Alaska LNG 26221306</u>		Feature Id: <u>W60HT034</u>
Investigators: <u>Joe Christopher, Zoe Meade</u>			Team No.: <u>W60</u>
State: <u>Alaska</u>	Region: <u>Alaska</u>	Milepost: <u>607.6 (LNG)</u>	
Latitude: <u>62° 57' 23.34"</u>		Longitude: <u>149° 39' 01.64"</u>	Datum: <u>WGS84</u>
Logbook No.: <u>003</u>	Logbook Page No.: <u>25</u>	Picture No.: <u>P-N.S. pit, plug</u>	

SITE PARAMETERS	
Subregion: <u>interior</u>	Landform (hillslope, terrace, hummocks, etc.):
Slope (%): <u>0-3</u>	Local relief (concave, convex, none): <u>convex</u>
Pre-mapped Alaska LNG/NWI classification: <u>Upland</u>	Soil Map Unit Name: <u>U1A</u>
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <u>X</u> No (if no explain in Notes)	
Are "Normal Circumstances" present? Yes <u>X</u> No (if no, explain in Notes.)	
Are Vegetation, Soil, or Hydrology Significantly Disturbed? No <u>X</u> (If yes, explain in Notes)	
Are Vegetation, Soil, or Hydrology Naturally Problematic? No <u>X</u> (If yes, explain in Notes.)	
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <u>X</u> No	Is the Sampled Area within a Wetland? Yes <u>X</u> No
Hydric Soil Present? Yes <u>X</u> No	Wetland Type: <u>PSS1/Em1B</u>
Wetland Hydrology Present? Yes <u>X</u> No	Alaska Vegetation Classification (Vioreck): <u>II C2, III A2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: <u>0</u>			
50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea mariana</i> glauca	3		FACW
2. <i>Betula nana</i>	70	Y	FAC
3. <i>Vaccinium uliginosum</i>	15		FAC
4. <i>Rhododendron tomentosum</i>	1		FACW
5. <i>Empetrum nigrum</i>	3		FAC
6. <i>Vaccinium oxycoccus</i>	2		OBL
7. <i>Andromeda polifolia</i>	1		FACW
8.			
9.			
Total Cover: <u>95</u>			
50% of total cover: <u>47.5</u> 20% of total cover: <u>19</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)
 Total Number of Dominant Species Across All Strata: 3 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: 2 X 1 = 2
 FACW species: 5 X 2 = 10
 FAC species: 110 X 3 = 330
 FACU species: 1 X 4 = 4
 UPL species: 0 X 5 = 0
 Column Totals: 118 (A) 346 (B)
 PI = B/A = 2.93

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Rubus chamaemorus</i>	35		FACW
2. <i>Calamagrostis canadensis</i>	15	Y	FAC
3. <i>Equisetum arvense</i>	7	Y	FAC
4. <i>Trientalis europaea</i>	TR		FACU
5. <i>Pedicularis labradorica</i>	TR		FACW
6. <i>Cornus canadensis</i>	1		FACU
7. <i>Rubus arcticus</i>	TR		FACW
8. <i>Pinguicula villosa</i>	TR		OBL
9.			
10.			
Total Cover: <u>28</u>			
50% of total cover: <u>14</u> 20% of total cover: <u>5.6</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
N/A % Cover of Wetland Bryophytes
100 Total Cover of Bryophytes
0 % Cover of Water
Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7-1-14</u>		Feature ID <u>W60HT034</u>		Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-20	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>Fibric</u>	<u>organics</u>

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) <u> </u>	Alaska Color Change (TA4) ⁴ <u> </u>
Histic Epipedon (A2) <u> </u>	Alaska Redox (A14) <u> </u>	Alaska Alpine Swales (TA5) <u> </u>
Black Histic (A3) <u> </u>	Alaska Gleyed Pores (A15) <u> </u>	Alaska Redox with 2.5Y Hue <u> </u>
Hydrogen Sulfide (A4) <u> </u>		Alaska Gleyed without 5Y Hue or Redder Underlying Layer <u> </u>
Thick Dark Surface (A12) <u> </u>		Other (Explain in Notes) <u> </u>

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: Depth (inches):

Hydric Soil Present (Y/N): Y

Notes: Hydric soils observed

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____	_____		
Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>N/A</u>	Wetland Hydrology Present (Y/N): <u>Y</u>	
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>3</u>		
Saturation Present (Y/N): (includes capillary fringe) <u>X</u>	Depth (in): <u>0</u>		
Notes:			

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <input checked="" type="checkbox"/> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <input type="checkbox"/> Sapling (<5 dbh, <6m tall) <input checked="" type="checkbox"/> Tall shrub (2-6m) <input type="checkbox"/> Short shrub (0.5-2m) <input type="checkbox"/> Dwarf shrub (<0.5m) <input checked="" type="checkbox"/> Tall herb (≥1m) <input type="checkbox"/> Short herb (<1m) <input checked="" type="checkbox"/> Moss-Lichen <input checked="" type="checkbox"/> Floating <input type="checkbox"/> Submerged <input type="checkbox"/>		
Number of Wetland Types (M): <input checked="" type="checkbox"/> Evenness of Wetland Type Distribution (M): Even <input checked="" type="checkbox"/> Highly Uneven _____ Moderately even _____		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) <input checked="" type="checkbox"/>		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <input checked="" type="checkbox"/> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <input checked="" type="checkbox"/> High (>25) _____		
Presence of Islands (M): Absent (none) <input checked="" type="checkbox"/> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site _____ Open _____ Small Scattered Patches _____ Continuous Cover <input checked="" type="checkbox"/>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <input checked="" type="checkbox"/> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) <input checked="" type="checkbox"/> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat <input checked="" type="checkbox"/> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <input checked="" type="checkbox"/> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <input checked="" type="checkbox"/> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <input checked="" type="checkbox"/> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <input checked="" type="checkbox"/> Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent <input checked="" type="checkbox"/> Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <input checked="" type="checkbox"/> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <input checked="" type="checkbox"/> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <input checked="" type="checkbox"/> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading <input checked="" type="checkbox"/> N/A _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <input checked="" type="checkbox"/> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <input checked="" type="checkbox"/> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <input checked="" type="checkbox"/> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated <input checked="" type="checkbox"/> Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <input checked="" type="checkbox"/>	
Watershed Land Use: 0-5% Rural <input checked="" type="checkbox"/> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <input checked="" type="checkbox"/> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W90HT034

Field Target: 090

Date: 7-1-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X *Zoe Meade* 7-1-14

Signature / Date

X *Joe Christopher*

Field Crew Chief (print)

X *[Signature]* 7/1/14

Signature / Date

SITE DESCRIPTION

300' study

Logbook No.: 003	Logbook Page No.: 026	Picture No.: P-N, S, pit, plug
------------------	-----------------------	--------------------------------

SITE PARAMETERS

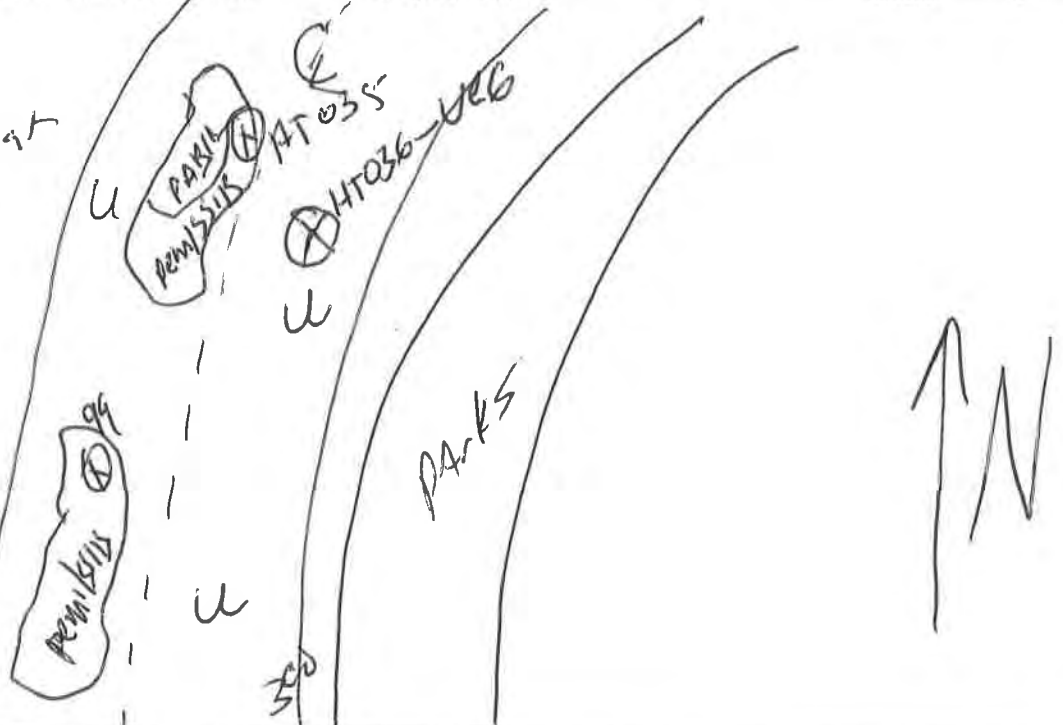
Are Vegetation____, Soil____, or Hydrology____ Naturally Problematic? No X (If yes, explain in Notes.)

SUMMARY OF FINDINGS

Wetland Hydrology Present? Yes X No

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

Tons of Bear
Sign. Fresh scat
+ Bedding Areas
Est. sow + cubs.
were jumped
from here
(FT98) AS
we walked down
path lead toward
FT99
Did put 99 to 99-30



WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Salix pulchra</i>	3	Y	FACW
2. <i>Alnus ssp.</i>	1		FAC
3. <i>Picea glauca</i>	TR		FACU
4. <i>Spirea stevenii</i>	TR		FACU
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>4</u> 50% of total cover: <u>2</u> 20% of total cover: <u>0.8</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

% Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by: _____

OBL species: 103 X 1 = 103

FACW species: 3 X 2 = 6

FAC species: 7 X 3 = 21

FACU species: 2 X 4 = 8

UPL species: 0 X 5 = 0

Column Totals: 115 (A) 138 (B)

PI = B/A = 1.2

Plot had Low Shrub Dominance but matrix of Area had Shrub Dominance
→ pem/ss

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Comarum palustre</i>	18		OBL
2. <i>Equisetum fluviale</i>	15		OBL
3. <i>Trientalis europaea</i>	1		FACU
4. <i>Carex aquatilis</i>	70	Y	OBL
5. <i>Mertensia paniculata</i>	TR		FACU
6. <i>Calamagrostis canadensis</i>	5		FAC
7. <i>Heracleum maximum</i>	1		FACU
8. <i>Veratrum viride</i>	1		FAC
9. <i>Chamerion angustifolium</i>	TR		FACU
10.			
Total Cover: <u>111</u> 50% of total cover: <u>55.5</u> 20% of total cover: <u>22.2</u>			

Hydrophytic Vegetation Indicators:

X Dominance Test is > 50%

X Prevalence Index is ≤ 3.0

____ Morphological Adaptations¹ (Provide supporting data in Notes)

____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

N/A % Cover of Wetland Bryophytes

100 Total Cover of Bryophytes

0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

standing water in adjacent beaver pond ≈ 100 ft.

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/1/14</u>		Feature ID <u>48041038</u>		Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0 - 20							Fibric	SLg

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: none Depth (inches): N/A

Hydric Soil Present (Y/N): Y

Notes: NO H₂S odor

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) <u>X</u>	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>adjacent pond 1 ft (+)</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>3</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0</u>	

Notes: Depression

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <u>X</u> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>3</u> Tall shrub (2-6m) <u>1</u> Short shrub (0.5-2m) <u>0</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>111</u> Moss-Lichen <u>100</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u>	Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even <u>1</u>	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) <u>X</u>		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>N/A</u> <25% Scattered/Peripheral Cover <u>X</u> 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches <u>X</u> Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) <u>X</u> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet <u>X</u> Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow <u>X</u> Unrestricted Outflow _____ <u>Beaver Agm</u>	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below <u>X</u> Only Connected Above _____ Connected Upstream & Downstream <u>X</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT035

Field Target: 098

Date: 07-01-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X zoe meade

Wetland Scientist (print)

X zmeade 7-1-14

Signature / Date

X Joe Christopher

Field Crew Chief (print)

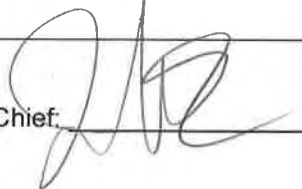
X [Signature] 7/1/14

Signature / Date

Vegetation Classification Data Form

Site Description		
Date: 7-1-14	Project Name & #: Alaska LNG 26221306	Field Target: 098
Investigators: Joe Christopher, Zoe Meade		Feature ID: W60HT036
Latitude: 62° 51' 46.92"	Longitude: 149° 52' 19.26"	Datum: WGS84
Logbook #: 003	Logbook Page #: 027	Picture #: P-N, S
Location Description:		
SE of FT 098 - hillside		
Common Species Observed (Scientific Name)		
Betula neoalaskana		
Gymnocarpium dryopteris	Viburnum edule	
Picea glauca	Cornus canadensis	
Veratrum viride	Calamagrostis canadensis	
Streptopus amplexifolius	Dryopteris expansa	
Percent Cover of Dominant Structure Level: 40% forrest		
Habitat Description:		
upland mixed forrest, low open shrub understory		
Alaska Vegetation Classification: Level I, Level II, Level III		
IC2	II C2	
Notes:		
10-15% sippe		

Field Crew Chief:



Field Scientist/Technician

Zoe Meade

Vegetation Classification Data Form

Table I-Alaska vegetation classification to level III

Level I	Level II	Level III
I. Forest	A. Needleleaf (conifer) forest	(1) Closed needleleaf (conifer) forest (2) Open needleleaf (conifer) forest (3) Needleleaf (conifer) woodland
	B. Broadleaf forest	(1) Closed broadleaf forest (2) Open broadleaf forest (3) Broadleaf woodland
	C. Mixed forest	(1) Closed mixed forest (2) Open mixed forest (3) Mixed woodland
II. Scrub	A. Dwarf tree scrub	(1) Closed dwarf tree scrub (2) Open dwarf tree scrub (3) Dwarf tree scrub woodland
	B. Tall scrub	(1) Closed tall scrub (2) Open tall scrub
	C. Low scrub	(1) Closed low scrub (2) Open low scrub
	D. Dwarf scrub	(1) Dryas dwarf scrub (2) Ericaceous dwarf scrub (3) Willow dwarf scrub
III. Herbaceous	A. Graminoid herbaceous	(1) Dry graminoid herbaceous (2) Mesic graminoid herbaceous (3) Wet graminoid herbaceous (emergent)
	B. Forb herbaceous	(1) Dry forb herbaceous (2) Mesic forb herbaceous (3) Wet forb herbaceous (emergent)
	C. Bryoid herbaceous	(1) Mosses (2) Lichens
	D. Aquatic (nonemergent) herbaceous	(1) Freshwater aquatic herbaceous (2) Brackish water aquatic herbaceous (3) Marine aquatic herbaceous

Descriptions of levels I, II, III, and IV follow the classification table

1a. Trees over 3 meters (10 ft) tall are present and have a canopy cover of 10 percent or more	I Forest	2
1b. Trees over 3 meters (10 ft) tall are absent or nearly so. Less than 10 percent cover. (Dwarf trees, less than 3 meters [10 ft] tall may be present and abundant)		7
I Forest		
2a. Over 75 percent of tree cover contributed by needleleaf (conifer) species	I A Needleleaf forest	3
2b. Less than 75 percent of tree cover contributed by needleleaf (conifer) species		4
3a. Tree canopy of 60-100 percent cover	I A 1 Closed needleleaf forest	
3b. Tree canopy of 25-59 percent cover	I A 2 Open needleleaf forest	
3c. Tree canopy of 10-24 percent cover	I A 3 Needleleaf woodland	
4a. Over 75 percent of tree cover contributed by broadleaf species	I B Broadleaf forest	5
4b. Broadleaf or needleleaf species contribute 25 to 75 percent of the tree cover		6
5a. Tree canopy of 60-100 percent cover	I B 1 Closed broadleaf forest	
5b. Tree canopy of 25-59 percent cover	I B 2 Open broadleaf forest	
5c. Tree canopy of 10-24 percent cover	I B 3 Broadleaf woodland	
6a. Tree canopy of 60-100 percent cover	I C 1 Closed mixed forest	
6b. Tree canopy of 25-59 percent cover	I C 2 Open mixed forest	
6c. Tree canopy of 10-24 percent cover	I C 3 Mixed woodland	
7a. Vegetation with at least 25 percent cover of erect to decumbent shrubs or with at least 10 percent cover of dwarf trees (less than 3 meters [10 ft] tall)		8
7b. Vegetation herbaceous (may have up to 25 percent shrub cover)		15

II. Scrub		
8a. Vegetation with at least 10 percent cover of dwarf trees	II A Dwarf tree scrub	9
8b. Vegetation with at least 25 percent cover of shrubs and less than 10 percent cover of dwarf trees		10
9a. Dwarf tree canopy of 60-100 percent cover	II A.1 Closed dwarf tree scrub	
9b. Dwarf tree canopy of 25-59 percent cover	II A.2 Open dwarf tree scrub	
9c. Dwarf tree canopy of 10-24 percent cover	II A 3 Dwarf tree scrub woodland	
10a. Shrubs more than 1.5 meters (5 ft) tall	II B Tall scrub	11
10b. Shrubs less than 1.5 meters (5 ft) tall		12
11 a. Shrub canopy cover greater than 75 percent	II B 1 Closed tall scrub	
11 b. Shrub canopy cover of 25-74 percent	II B 2 Open tall scrub	
12a. Shrubs 20 centimeters to 1.5 meters tall	II C Low scrub	13
12b. Shrubs under 20 centimeters in height	II D Dwarf scrub	14
13a. Shrub canopy cover greater than 75 percent	II C 1 Closed low scrub	
13b. Shrub canopy cover of 25-74 percent, or as low as 2 percent if little or no other vegetation cover present	II C 2 Open low scrub	
14a. Dryas species dominant in the dwarf shrub layer	II D 1 Dryas dwarf scrub	
14b. Ericaceous species dominant in the dwarf shrub layer	II D 2 Ericaceous dwarf scrub	
14c. Willow species dominant in the dwarf shrub layer	II D 2 Willow dwarf scrub	
III. Herbaceous		
15a. Terrestrial vegetation, or if growing in the water, dominated by emergent vegetation		16
15b. Dominant vegetation growing submerged in water or floating on the water surface, but not emerging above the water	III D Aquatic herbaceous	21

16a. Grasses, sedges, or rushes (graminoid) plants dominant	III A Graminoid herbaceous	17
16b. Forbs or bryophytes dominant		18
17a. Grasslands of well-drained, dry sites, such as south-facing bluffs, old beaches, and sand dunes. Typically (but not always) dominated by <i>Elymus</i> spp., <i>Festuca</i> spp., and <i>Deschampsia</i> spp.	III A 1 Dry graminoid herbaceous	
17b. On moist sites, but usually not with standing water. Usually dominated by <i>Calamagrostis</i> spp., <i>Carex</i> spp. or <i>Eriophorum</i> spp.; tussocks often present	III A 2 Mesic graminoid herbaceous	
17c. On wet sites, standing water present for part of the year; dominated by either sedges or grasses; includes wet tundra bogs, marshes, and fens	III A 3 Wet graminoid herbaceous	
18a. Vegetation dominated by forbs (broadleaf herbs, ferns, or horsetails)	III B Forb herbaceous	19
18b. Vegetation dominated by mosses or lichens	III C Bryoid herbaceous	20
19a. On dry sites, usually rocky and well drained; mostly tundra sites	III B 1 Dry forb herbaceous	
19b. On moist sites but without standing water, mostly within forested areas	III B 2 Mesic forb herbaceous	
19c. On wet sites, usually with standing water for part of the year	III B 3 Wet forb herbaceous	
20a. Vegetation cover dominated by mosses	III C 1 Bryoid moss	
20b. Vegetation cover dominated by lichens	III C 2 Bryoid lichen	
21a. Vegetation submerged or floating in fresh water	III D 1 Freshwater aquatic herbaceous	
21 b. Vegetation submerged or floating in brackish water	III D 2 Brackish water aquatic herbaceous	
21c. Vegetation submerged or floating in salt water	III D 3 Marine aquatic herbaceous	

Vegetation Classification Data Form QA/QC Checklist

This form is to be completed before leaving the field site.

Feature ID: W60HT036 Field Target: 098 Date: 07-01-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. General Information

- ☒ Location data recorded?
- ☒ Photo taken and photo number recorded?

2. Location Description

- ☒ Location of site recorded with enough detail to help relocate?

3. Common Species

- ☒ Scientific name of common species recorded?
- ☒ Percent cover of dominant structure level noted?

4. Habitat Description

- ☒ Habitat described?

5. Classification

- ☒ All three levels of classification recorded?

6. Field Log Book

- ☒ Field form entries consistent with log book?
- ☒ Logbook clearly identifies the Field Target ID and Feature ID?

X Zoe Meade

Field Technician (print)

X

Signature

7-1-14

X Toe Christoph

Field Crew Chief (print)

X

Signature

7/1/14

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION				2000' study	
Survey Type: Centerline		Access Road (explain)		Other (explain) <input checked="" type="checkbox"/>	
Field Target: 099		Map #: 08		Map Date: 05-27	
Date: 07-02-14		Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT037	
Investigators: Joe Christopher, Zoe Meade, Abigail Fisher				Team No.: W60	
State: Alaska		Region: Alaska		Milepost: 617.9	
Latitude: 62° 51' 47.01"		Longitude: 149° 52' 27.05"		Datum: WGS84	
Logbook No.: 003		Logbook Page No.: 28		Picture No.: P-N.S. pit, plug	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.):
Slope (%): 0-2	Local relief (concave, convex, none): concave
Pre-mapped Alaska LNG/NWI classification: PEMSS1/B	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No (if no explain in Notes)	Are "Normal Circumstances" present? Yes <input checked="" type="checkbox"/> No (If no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No	Wetland Type: PSS1/EM1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No	Alaska Vegetation Classification (Vioreck): IBI, IIIA2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

Site sketch on pg. 28 in logbook 003

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Salex barclayii</i>	65	Y	FAC
2. <i>Picea glauca</i>	12		FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>67</u> 50% of total cover: <u>33.5</u> 20% of total cover: <u>13.4</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)
 Total Number of Dominant Species Across All Strata: 3 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by:
 OBL species: 7 X 1 = 7
 FACW species: 0 X 2 = 0
 FAC species: 112 X 3 = 336
 FACU species: 2 X 4 = 8
 UPL species: 0 X 5 = 0
 Column Totals: 121 (A) 351 (B)
 PI = B/A = 2.90

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Comarum palustre</i>	7		OBL
2. <i>Equisetum arvense</i>	12	Y	FAC
3. <i>Calamagrostis canadensis</i>	35	Y	FAC
4. <i>Viola palustris</i>	TR		FACW
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>54</u> 50% of total cover: <u>27</u> 20% of total cover: <u>10.8</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

5 % Bare Ground
N/A % Cover of Wetland Bryophytes
2 Total Cover of Bryophytes
0 % Cover of Water
Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7-2-14</u> Feature ID <u>W60 HT037</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0 - 9							Fibric	organics
9 - 20	10 YR 2/2						Silt loam	wood/root fragments

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) <u>X</u>	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): N/A

Hydric Soil Present (Y/N): Y

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>N/A</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>9</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>2</u> Tall shrub (2-6m) <u>65</u> Short shrub (0.5-2m) <u>0</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>54</u> Moss-Lichen <u>2</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u> Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>X</u>		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <u>X</u> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open <u>X</u> Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) <u>X</u> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty <u>X</u> Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent <u>X</u> Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated <u>X</u> Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT037

Field Target: 099

Date: 07-02-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade
Wetland Scientist (print)

X Zoe Meade 07-02-14
Signature / Date

X Joe Christopher
Field Crew Chief (print)

X [Signature] 7/2/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/>		Field Target: <u>W0</u>	Map #: <u>20</u> Map Date: <u>5/27/14</u>
Date: <u>7/2/14</u>	Project Name & No.: <u>Alaska LNG 26221306</u>		Feature Id: <u>W60HT038</u>
Investigators: <u>Joe Christopher, Zoe Meade, Abigail Fisher</u>			Team No.: <u>W60</u>
State: <u>Alaska</u>	Region: <u>Alaska</u>	Milepost: <u>619.4 (LNG)</u>	
Latitude: <u>62° 50' 26.87"</u>		Longitude: <u>149° 53' 21.92"</u>	Datum: <u>WGS84</u>
Logbook No.: <u>003</u>	Logbook Page No.: <u>29</u>	Picture No.: <u>P-N, S, pit, plug</u>	

SITE PARAMETERS	
Subregion: <u>Scrub center</u>	Landform (hillslope, terrace, hummocks, etc.): <u>Depression</u>
Slope (%): <u>0-3</u>	Local relief (concave, convex, none): <u>Concave</u>
Pre-mapped Alaska LNG/NWI classification: <u>PEM1/SS1B</u>	Soil Map Unit Name: <u>N/A</u>
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Wetland Type: <u>PEM1/SS1B F</u>
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Alaska Vegetation Classification (Vioreck): <u>IIA³ IC2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See page 29

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>50'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: <u>0</u>			
50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
Sapling/Shrub Stratum (<u>50'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Betula nana</i>	15	Y	FAC
2. <i>Myrica gale</i>	35	Y	OBL
3. <i>Dasaphora fruticosa</i>	4		FAC
4. <i>Picea glauca</i>	8		FACU
5. <i>Vaccinium oxycoccus</i>	1		OBL
6. <i>Spiraea stevenii</i>	5		FACU
7. <i>Andromeda polifolia</i>	TR		FACW
8.			
9.			
Total Cover: <u>66</u>			
50% of total cover: <u>34</u> 20% of total cover: <u>13.6</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 4 (A)
 Total Number of Dominant Species Across All Strata: 4 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:
 Total % Cover of: 156 Multiply by: 158
 OBL species: 3 X 1 = 6
 FACW species: 23 X 2 = 69
 FAC species: 13 X 3 = 52
 FACU species: 1 X 4 = 4
 UPL species: 1 X 5 = 5
 Column Totals: 197 (A) 285 (B)
 PI = B/A = 1.45

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>50'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Equisetum arvense</i>	2		FAC
2. <i>Carex aquatilis</i>	40	Y	OBL
3. <i>Carex microglochin</i>	80	Y	OBL
4. <i>Pedicularis labradorica</i>	2		FACW
5. <i>Comarum palustre</i>	2		OBL
6. <i>Rubus chamaemorus</i>	1		FACW
7. <i>Trientalis europaea</i>	TR		FACU
8. <i>Drosera rotundifolia</i>	TR		OBL
9. <i>Rubus arcticus</i>	2		FAC
10.			
Total Cover: <u>129</u>			
50% of total cover: <u>64.5</u> 20% of total cover: <u>25.8</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
— % Cover of Wetland Bryophytes
80% Total Cover of Bryophytes
2 % Cover of Water
Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7-2-14</u> Feature ID <u>W60HT 038</u>		Soil Pit Required (Y/N) <u>Y</u>			
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features			Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹		
0-22	—	—	—	—	—	Fibric	organics

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains.
 ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS	INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>Y</u>	Alaska Gleyed (A13) _____ Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____ Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____ Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____	Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____	Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): N/A

Hydric Soil Present (Y/N): Y

Notes: hydric soil observed

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		HYDROLOGY SECONDARY INDICATORS (2 or more required)								
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) <u>X</u>							
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>							
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____							
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) <u>X</u>							
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>							
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:								
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____									
Iron Deposits (B5) _____	_____									
<table border="1"> <tr> <td>Surface Water Present (Y/N): <u>Y</u></td> <td>Depth (in): <u>1</u></td> <td rowspan="3">Wetland Hydrology Present (Y/N): <u>Y</u></td> </tr> <tr> <td>Water Table Present (Y/N): <u>Y</u></td> <td>Depth (in): <u>1</u></td> </tr> <tr> <td>Saturation Present (Y/N): (includes capillary fringe) <u>Y</u></td> <td>Depth (in): <u>0</u></td> </tr> </table>		Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>1</u>	Wetland Hydrology Present (Y/N): <u>Y</u>	Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>1</u>	Saturation Present (Y/N): (includes capillary fringe) <u>Y</u>	Depth (in): <u>0</u>		
Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>1</u>	Wetland Hydrology Present (Y/N): <u>Y</u>								
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>1</u>									
Saturation Present (Y/N): (includes capillary fringe) <u>Y</u>	Depth (in): <u>0</u>									
Notes: <u>Spaced structure, toe of slope in depression</u>										

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <input checked="" type="checkbox"/> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>8</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>60</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>8</u> Short herb (<1m) <u>129</u> Moss-Lichen <u>80</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u>		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven <input checked="" type="checkbox"/> Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <input checked="" type="checkbox"/> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <input checked="" type="checkbox"/> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <input checked="" type="checkbox"/> High (>25) _____		
Presence of Islands (M): Absent (none) <input checked="" type="checkbox"/> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open <input checked="" type="checkbox"/> Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <input checked="" type="checkbox"/> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) <input checked="" type="checkbox"/> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <input checked="" type="checkbox"/> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <input checked="" type="checkbox"/> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <input checked="" type="checkbox"/> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet <input checked="" type="checkbox"/> Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <input checked="" type="checkbox"/> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <input checked="" type="checkbox"/> Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <input checked="" type="checkbox"/> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <input checked="" type="checkbox"/> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <input checked="" type="checkbox"/> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) <input checked="" type="checkbox"/> pH Reading <u>4.75</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <input checked="" type="checkbox"/> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <input checked="" type="checkbox"/> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <input checked="" type="checkbox"/> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <input checked="" type="checkbox"/> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <input checked="" type="checkbox"/>	
Watershed Land Use: 0-5% Rural <input checked="" type="checkbox"/> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <input checked="" type="checkbox"/> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT038

Field Target: 100

Date: 7/2/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps


- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

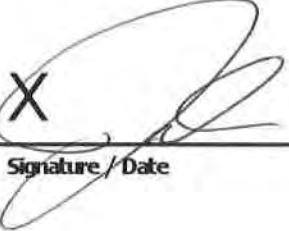
Wetland Scientist (print)

X  7/2/14

Signature / Date

X Joe Christopher

Field Crew Chief (print)

X  7/2/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/>		Field Target: 100	Map #: 69 Map Date: 5/27/14
Date: 7/2/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W00 HT039
Investigators: Joe Christopher, Zoe Meade, Abigail Fisher			Team No.: W00
State: Alaska	Region: Alaska	Milepost: 619.5 (LNG) → 7157.5 Parks	
Latitude: 62° 50' 24.91"		Longitude: 149° 53' 19.85"	Datum: WGS84
Logbook No.: 003	Logbook Page No.: 29/30	Picture No.: P-N, S, pit, plug	

SITE PARAMETERS	
Subregion: South Central	Landform (hillslope, terrace, hummocks, etc.): hillslope
Slope (%): 7-10	Local relief (concave, convex, none): convex
Pre-mapped Alaska LNG/NWI classification: upland	Soil Map Unit Name: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (if no, explain in Notes.)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Wetland Type: upland
Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Viereck): EC3, II B2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Betula neoalaskana</i>	65	Y	FACU
2. <i>Populus balsamifera</i>	2		FACU
3.			
4.			
Total Cover: <u>67</u> 50% of total cover: <u>33.5</u> 20% of total cover: <u>13.4</u>			
Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Alnus</i> ssp.	35	Y	FAC
2. <i>Picea glauca</i>	TR		FACU
3. <i>Ribes triste</i>	5		FAC
4.			
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>40</u> 50% of total cover: <u>20</u> 20% of total cover: <u>8</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 1 (A)
 Total Number of Dominant Species Across All Strata: 3 (B)
 % Dominant Species that are OBL, FACW, or FAC: 33 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: 0 X 1 = 0
 FACW species: 0 X 2 = 0
 FAC species: 50 X 3 = 150
 FACU species: 166 X 4 = 664
 UPL species: 0 X 5 = 0
 Column Totals: 216 (A) 814 (B)
 PI = B/A = 3.77

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Gymnocarpium dryopteris</i>	75	Y	FACU
2. <i>Dryopteris expansa</i>	20		FACU
3. <i>Chamerion angustifolium</i>	1		FACU
4. <i>Calamagrostis canadensis</i>	10		FAC
5. <i>Streptopus amplexifolius</i>	3		FACU
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>109</u> 50% of total cover: <u>54.5</u> 20% of total cover: <u>21.8</u>			

Hydrophytic Vegetation Indicators:
 _____ Dominance Test is > 50%
 _____ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

_____ % Bare Ground
 _____ % Cover of Wetland Bryophytes
 _____ % Total Cover of Bryophytes
 _____ % Cover of Water
Hydrophytic Vegetation Present (Y/N): N
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/2/14</u> Feature ID <u>W60HJ039</u>		Soil Pit Required (Y/N) <u>Y</u>			
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features			Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹		
0-2							Fibric organic
2-20	10YR 8/3	100					Coarse sandy loam

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes)

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: — Depth (inches): N/A

Hydric Soil Present (Y/N): N

Notes: no hydric soils observed

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes):		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in):	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in):	
Saturation Present (Y/N): <u>N</u> (includes capillary fringe)	Depth (in):	

Notes: no field indicators of hydrology observed

WETLAND DETERMINATION DATA FORM

upland

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT039

Field Target: 100

Date: 7/2/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X  7/2/14

Signature / Date

X Joe Christophe

Field Crew Chief (print)

X  7/2/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: <u>101</u>	Map #: <u>S2</u> Map Date: <u>5/27/14</u>
Date: <u>7/2/14</u>	Project Name & No.: Alaska LNG 26221306		Feature Id: <u>W60H8040</u>
Investigators: <u>Joe Christopher, Zoe Meade, Awiqayle Fisher</u>			Team No.: <u>W60</u>
State: <u>Alaska</u>	Region: <u>Alaska</u>	Milepost: <u>620.3</u>	
Latitude: <u>62.8326</u>		Longitude: <u>-149.8480</u>	Datum: <u>WGS84</u>
Logbook No.: <u>003</u>	Logbook Page No.: <u>30</u>	Picture No.: <u>P-N, S, pit, plug</u>	

SITE PARAMETERS	
Subregion: <u>South Central</u>	Landform (hillslope, terrace, hummocks, etc.): _____
Slope (%): <u>0-1</u>	Local relief (concave, convex, none): <u>concave</u>
Pre-mapped Alaska LNG/NWI classification: <u>PEM1/SS1B</u>	Soil Map Unit Name: <u>MA</u>
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	
Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (if no, explain in Notes.)	
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed? No <input checked="" type="checkbox"/> (If yes, explain in Notes)	
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic? No <input checked="" type="checkbox"/> (If yes, explain in Notes.)	

SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: <u>PEM1/SS1BF</u>
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Vioreck): <u>IIIA3, IIC2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See PAS 30

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Myrica gale</i>	45	Y	OBL
2. <i>Betula nana</i>	5		FAC
3. <i>Dasiphora fruticosa</i>	1		FAC
4. <i>Andromeda polifolia</i>	TR 2		FACW
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>53</u> 50% of total cover: <u>26.5</u> 20% of total cover: <u>10.6</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)
 Total Number of Dominant Species Across All Strata: 2 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: 143 x 1 = 143
 FACW species: 2 x 2 = 4
 FAC species: 13 x 3 = 39
 FACU species: 0 x 4 = 0
 UPL species: 0 x 5 = 0
 Column Totals: 158 (A) 186 (B)
 PI = B/A = 1.18

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Carex magellanica</i>	20		OBL
2. <i>Comarum palustre</i>	5		OBL
3. <i>viola</i> ssp.	TR		FACW
4. <i>Trichophorum cespitosum</i>	70	Y	OBL
5. <i>Tridentalis arcticus</i>	5		FAC
6. <i>Equisetum fluviatile</i>	3		OBL
7. <i>Equisetum pratense</i>	TR		FACW
8. <i>Cal can.</i>	2		FAC
9.			
10.			
Total Cover: <u>105</u> 50% of total cover: <u>52.5</u> 20% of total cover: <u>21</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
N/A % Cover of Wetland Bryophytes
95 Total Cover of Bryophytes
8 % Cover of Water
Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/2/14</u> Feature ID <u>W60HT040</u>		Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)					
Depth (inches)	Matrix		Redox Features		Notes
	Color (moist)	%	Color (moist)	%	
0-22					Fibric organics SAT.

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains, ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): N/A

Hydric Soil Present (Y/N): Y

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) <u>X</u>
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) <u>X</u>
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) <u>X</u>			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>2</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <input checked="" type="checkbox"/> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>53</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>106</u> Moss-Lichen <u>95</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u>		Evenness of Wetland Type Distribution (M): Even <input checked="" type="checkbox"/> Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <input checked="" type="checkbox"/> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover <input checked="" type="checkbox"/> N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <input checked="" type="checkbox"/> High (>25) _____		
Presence of Islands (M): Absent (none) <input checked="" type="checkbox"/> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <input checked="" type="checkbox"/>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <input checked="" type="checkbox"/> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) <input checked="" type="checkbox"/> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <input checked="" type="checkbox"/> Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <input checked="" type="checkbox"/> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet <input checked="" type="checkbox"/> Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <input checked="" type="checkbox"/> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded <input checked="" type="checkbox"/>	
Evidence of Sedimentation (P): No Evidence Observed <input checked="" type="checkbox"/> Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <input checked="" type="checkbox"/> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <input checked="" type="checkbox"/> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <input checked="" type="checkbox"/> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) <input checked="" type="checkbox"/> pH Reading <u>5.21</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <input checked="" type="checkbox"/> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <input checked="" type="checkbox"/> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <input checked="" type="checkbox"/> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <input checked="" type="checkbox"/> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <input checked="" type="checkbox"/>	
Watershed Land Use: 0-5% Rural <input checked="" type="checkbox"/> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <input checked="" type="checkbox"/> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT040

Field Target: 101

Date: 7/2/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

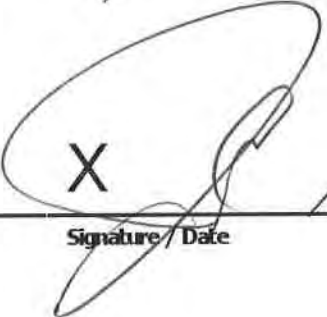
Wetland Scientist (print)

X  7/2/14

Signature / Date

X Joe Christopher

Field Crew Chief (print)

X  7/2/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: <u>102</u>	Map #: <u>71</u> Map Date: <u>5/17</u>
Date: <u>7/2/14</u>	Project Name & No.: <u>Alaska LNG 26221306</u>		Feature Id: <u>W60HT041</u>
Investigators: <u>Christopher Z Meade AFisher</u>			Team No.: <u>W60</u>
State: <u>Alaska</u>	Region: <u>Alaska</u>	Milepost: <u>621.4</u>	
Latitude: <u>62° 49' 16.52"</u>		Longitude: <u>149° 55' 10.67"</u>	Datum: <u>WGS84</u>
Logbook No.: <u>003</u>	Logbook Page No.: <u>31</u>	Picture No.: <u>P-W60HT041-P1, Pugin, S</u>	

SITE PARAMETERS	
Subregion: <u>South central</u>	Landform (hillslope, terrace, hummocks, etc.): <u>Flat</u>
Slope (%): <u>0-1</u>	Local relief (concave, convex, none): <u>Flat</u>
Pre-mapped Alaska LNG/NWI classification: <u>PEMIF</u>	Soil Map Unit Name: _____
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	
Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)	
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: <u>PEM1/SS1F</u>
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Vioreck): <u>III<3, II<2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

PAGE 31

III A 3, II C 2

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: _____			
50% of total cover: _____ 20% of total cover: _____			
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Betula nana</i>	20	X	FAC
2. <i>Empetrum nigrum</i>	5		FAC
3. <i>Vaccinium oxycoccus</i>	3		OBL
4. <i>Picea glauca</i>	5		FACU
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>33</u>			
50% of total cover: <u>16.5</u> 20% of total cover: <u>6.6</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

% Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by: _____

OBL species: 104 X 1 = 104

FACW species: 6 X 2 = 12

FAC species: 35 X 3 = 105

FACU species: 5 X 4 = 20

UPL species: — X 5 = —

Column Totals: 150 (A) 241 (B)

PI = B/A = 1.6

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Drosera rotundifolia</i>	1		OBL
2. <i>Carex magellanica</i>	40	X	OBL
3. <i>Eriophorum vaginatum</i>	3		FACW
4. <i>Pedicularis labradorica</i>	1		FACW
5. <i>Trichophorum cespitosum</i>	60	X	OBL
6. <i>Rubus chamaemorus</i>	7		FACW
7. <i>Cornus suecica</i>	10		FAC
8.			
9.			
10.			
Total Cover: <u>117</u>			
50% of total cover: <u>58.5</u> 20% of total cover: <u>23.4</u>			

Hydrophytic Vegetation Indicators:

☒ Dominance Test is > 50%

☒ Prevalence Index is ≤ 3.0

____ Morphological Adaptations¹ (Provide supporting data in Notes)

____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

— % Cover of Wetland Bryophytes

50 Total Cover of Bryophytes

50 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>07/2/14</u> Feature ID <u>W60HT041</u>		Soil Pit Required (Y/N) <u>X</u>				
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features			Texture	Notes	
	Color (moist)	%	Color (moist)	%	Type ¹			Loc ²
<u>0-10</u>							<u>Fine</u>	<u>Saturated</u>
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ² Location: PL=Pore Lining, M=Matrix.								
HYDRIC SOIL INDICATORS						INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³		
Histosol or Histel (A1) <u>X</u>			Alaska Gleyed (A13) _____			Alaska Color Change (TA4) ⁴ _____		
Histic Epipedon (A2) _____			Alaska Redox (A14) _____			Alaska Alpine Swales (TA5) _____		
Black Histic (A3) _____			Alaska Gleyed Pores (A15) _____			Alaska Redox with 2.5Y Hue _____		
Hydrogen Sulfide (A4) _____						Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____		
Thick Dark Surface (A12) _____						Other (Explain in Notes) _____		
³ One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.								
⁴ Give details of color change in Notes.								
Restrictive Layer (if present): Type: <u>N/A</u> Depth (inches): <u>N/A</u>								
Hydric Soil Present (Y/N): <u>X</u>								
Notes:								

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) <u>X</u>	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) <u>X</u>
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>✓</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes):		
Iron Deposits (B5) _____			
Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>2-4"</u>	Wetland Hydrology Present (Y/N): <u>✓</u>	
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0</u>		
Saturation Present (Y/N): (includes capillary fringe) <u>Y</u>	Depth (in): <u>0</u>		
Notes: <u>top of mountain</u>			

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <input checked="" type="checkbox"/> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>5</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>28</u> Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) <u>122</u> Moss-Lichen <u>50</u> Floating <u>0</u> Submerged <u>20</u>		
Number of Wetland Types (M): <u>2</u>		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven <input checked="" type="checkbox"/> Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <input checked="" type="checkbox"/> High Density (60-80%) _____ Very High Density (80-100%) <input checked="" type="checkbox"/>		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover <input checked="" type="checkbox"/> >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <input checked="" type="checkbox"/> High (>25) _____		
Presence of Islands (M): Absent (none) <input checked="" type="checkbox"/> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site _____ Open _____ Small Scattered Patches _____ Continuous Cover <input checked="" type="checkbox"/>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <input checked="" type="checkbox"/> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) <input checked="" type="checkbox"/> High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat <input checked="" type="checkbox"/> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <input checked="" type="checkbox"/> Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <input checked="" type="checkbox"/> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded <input checked="" type="checkbox"/>	
Evidence of Sedimentation (P): No Evidence Observed <input checked="" type="checkbox"/> Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <input checked="" type="checkbox"/> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <input checked="" type="checkbox"/> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <input checked="" type="checkbox"/> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) <input checked="" type="checkbox"/> pH Reading <u>4.33</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <input checked="" type="checkbox"/> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <input checked="" type="checkbox"/> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <input checked="" type="checkbox"/> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <input checked="" type="checkbox"/> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <input checked="" type="checkbox"/>	
Watershed Land Use: 0-5% Rural <input checked="" type="checkbox"/> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) <input checked="" type="checkbox"/>	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60 HT 041

Field Target: 102

Date: 7/2/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X *Zoe Meade* 7/2/14

Signature / Date

X Joe Christophe

Field Crew Chief (print)

X *[Signature]* 7/2/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: <u>103</u>	Map #: <u>72</u> Map Date: <u>5/27/14</u>
Date: <u>07-03-14</u>	Project Name & No.: <u>Alaska LNG 26221306</u>		Feature Id: <u>W6HTD 42</u>
Investigators: <u>Joe Christopher, Zoe Meade, Awigayle Fisher</u>			Team No.: <u>W60</u>
State: <u>Alaska</u>	Region: <u>Alaska</u>	Milepost: <u>623.25</u>	
Latitude: <u>62°48' 16.95"</u>		Longitude: <u>149°57' 58.76"</u>	Datum: <u>WGS84</u>
Logbook No.: <u>003</u>	Logbook Page No.: <u>32</u>	Picture No.: <u>P_N, S, pit, plug</u>	

SITE PARAMETERS	
Subregion: <u>South central</u>	Landform (hillslope, terrace, hummocks, etc.): _____
Slope (%): <u>0-3</u>	Local relief (concave, convex, none): <u>concave</u>
Pre-mapped Alaska LNG/NWI classification: <u>PSS 4/1 B</u>	Soil Map Unit Name: <u>N/A</u>
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: <u>PSS 1 B</u>
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Vioreck): <u>II C2, III A3</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See Pgs 32

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				Dominance Test worksheet:	
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	No. of Dominant Species that are OBL, FACW, or FAC: <u>3</u> (A)	
1.				Total Number of Dominant Species Across All Strata: <u>3</u> (B)	
2.				% Dominant Species that are OBL, FACW, or FAC: <u>100</u> (A/B)	
3.					
4.					
Total Cover: <u>0</u>				Prevalence Index worksheet:	
50% of total cover: <u>0</u> 20% of total cover: <u>0</u>				Total % Cover of: <u>80</u> Multiply by: <u>1</u>	
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	OBL species: <u>80</u> X 1 = <u>80</u>	
1. <i>Myrica gale</i>	80	Y	OBL	FACW species: <u>10</u> X 2 = <u>20</u>	
2. <i>Betula nana</i>	10		FAC	FAC species: <u>29</u> X 3 = <u>87</u>	
3. <i>Spiraea stevenii</i>	15		FACU	FACU species: <u>15</u> X 4 = <u>60</u>	
4. <i>Picea mariana</i>	10		FACW	UPL species: <u>0</u> X 5 = <u>0</u>	
5. <i>Empetrum nigrum</i>	3		FAC	Column Totals: <u>134</u> (A) <u>247</u> (B)	
6. <i>Vaccinium uliginosum</i>	7		FAC	PI = B/A = <u>1.84</u>	
7. <i>Andromeda polifolia</i>	TR		FACW		
8.					
9.					
Total Cover: <u>12.5</u>					
50% of total cover: <u>62.5</u> 20% of total cover: <u>2.5</u>					

VEGETATION (use scientific names of plants)				Hydrophytic Vegetation Indicators:	
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	<input checked="" type="checkbox"/> Dominance Test is > 50%	
1. <i>Equisetum arvense</i>	4	Y	FAC	<input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0	
2. <i>Calamagrostis canadensis</i>	5	Y	FAC	<u> </u> Morphological Adaptations ¹ (Provide supporting data in Notes)	
3. <i>Comarum palustre</i>	TR		OBL	<u> </u> Problematic Hydrophytic Vegetation ¹ (Explain)	
4. <i>Trientalis arctica</i>	TR		FAC	¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.	
5.					
6.					
7.					
8.					
9.					
10.					
Total Cover: <u>9</u>				<u>0</u> % Bare Ground <u>N/A</u> % Cover of Wetland Bryophytes <u>90</u> Total Cover of Bryophytes <u>0</u> % Cover of Water	
50% of total cover: <u>4.5</u> 20% of total cover: <u>1.8</u>				Hydrophytic Vegetation Present (Y/N): <u>Y</u> Notes: (If observed, list morphological adaptations below):	

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/2/14</u>	Feature ID <u>W60HT042</u>	Soil Pit Required (Y/N) <u>Y</u>				
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
<u>0-20</u>	<u> </u>	<u>—</u>	<u> </u>	<u>—</u>	<u> </u>	<u> </u>	<u>Fibric</u>	<u>organic</u>

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS³
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____	_____	Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____	_____	Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): N/A

Hydric Soil Present (Y/N): Y

Notes: _____

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes):		
Iron Deposits (B5) _____			
Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>0</u>	Wetland Hydrology Present (Y/N): <u>Y</u>	
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>2</u>		
Saturation Present (Y/N): (includes capillary fringe) <u>Y</u>	Depth (in): <u>0</u>		
Notes:			

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>10</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>112</u> Dwarf shrub (<0.5m) <u>3</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>9</u> Moss-Lichen <u>90</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u>		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>X</u>
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <u>X</u> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open <u>X</u> Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) <u>X</u> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <u>X</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60 HT 042

Field Target: 103

Date: 7/3/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☐ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X *Zoe Meade* 7/3/14

Signature / Date

X Joe Christoph

Field Crew Chief (print)

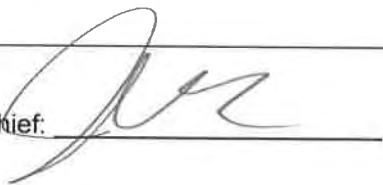
X *[Signature]* 7/3/14

Signature / Date

Vegetation Classification Data Form

Site Description		
Date: 7/3/14	Project Name & #: Alaska LNG 26221306	Field Target: 103
Investigators: JC, ZM, AF		Feature ID: W60HT043
Latitude: 62°	Longitude: 149°	Datum: WGS84
Logbook #: 003	Logbook Page #: 33	Picture #: P-N, S
Location Description:		
500 ft W of HT 103 in upland mixed forest		
Common Species Observed (Scientific Name)		
Alnus ssp.	Oplopanax horridus	
Betula neoglaskana	Sambucus racemosa	
Arythrum cyclosorum		
Gymnocarpium dryopteris		
Percent Cover of Dominant Structure Level: 30% Bet neo.		
Habitat Description:		
Mixed forest		
Alaska Vegetation Classification: Level I, Level II, Level III		
IC2	II B1	
Notes:		

Field Crew Chief:



Field Scientist/Technician

Zoemede

Vegetation Classification Data Form

Table I-Alaska vegetation classification to level III

Level I	Level II	Level III
I. Forest	A. Needleleaf (conifer) forest	(1) Closed needleleaf (conifer) forest (2) Open needleleaf (conifer) forest (3) Needleleaf (conifer) woodland
		(1) Closed broadleaf forest (2) Open broadleaf forest (3) Broadleaf woodland
		(1) Closed mixed forest (2) Open mixed forest (3) Mixed woodland
	B. Broadleaf forest	
	C. Mixed forest	
	D. Dwarf tree scrub	
II. Scrub	A. Dwarf tree scrub	(1) Closed dwarf tree scrub (2) Open dwarf tree scrub (3) Dwarf tree scrub woodland
		(1) Closed tall scrub (2) Open tall scrub
		(1) Closed low scrub (2) Open low scrub
	B. Tall scrub	
	C. Low scrub	
	D. Dwarf scrub	
III. Herbaceous	A. Graminoid herbaceous	(1) Dry graminoid herbaceous (2) Mesic graminoid herbaceous (3) Wet graminoid herbaceous (emergent)
		(1) Dry forb herbaceous (2) Mesic forb herbaceous (3) Wet forb herbaceous (emergent)
		(1) Mosses (2) Lichens
	B. Forb herbaceous	
	C. Bryoid herbaceous	
	D. Aquatic (nonemergent) herbaceous	

Descriptions of levels I, II, III, and IV follow the classification table.

1a. Trees over 3 meters (10 ft) tall are present and have a canopy cover of 10 percent or more	I Forest	2
1b. Trees over 3 meters (10 ft) tall are absent or nearly so. Less than 10 percent cover. (Dwarf trees, less than 3 meters [10 ft] tall may be present and abundant)		7
I Forest		
2a. Over 75 percent of tree cover contributed by needleleaf (conifer) species	I A Needleleaf forest	3
2b. Less than 75 percent of tree cover contributed by needleleaf (conifer) species		4
3a. Tree canopy of 60-100 percent cover	I A.1 Closed needleleaf forest	
3b. Tree canopy of 25-59 percent cover	I A.2 Open needleleaf forest	
3c. Tree canopy of 10-24 percent cover	I A.3 Needleleaf woodland	
4a. Over 75 percent of tree cover contributed by broadleaf species	I B Broadleaf forest	5
4b. Broadleaf or needleleaf species contribute 25 to 75 percent of the tree cover		8
5a. Tree canopy of 60-100 percent cover	I B.1 Closed broadleaf forest	
5b. Tree canopy of 25-59 percent cover	I B.2 Open broadleaf forest	
5c. Tree canopy of 10-24 percent cover	I B.3 Broadleaf woodland	
6a. Tree canopy of 60-100 percent cover	I C.1 Closed mixed forest	
6b. Tree canopy of 25-59 percent cover	I C.2 Open mixed forest	
6c. Tree canopy of 10-24 percent cover	I C.3 Mixed woodland	
7a. Vegetation with at least 25 percent cover of erect to decumbent shrubs or with at least 10 percent cover of dwarf trees (less than 3 meters [10 ft] tall)		15
7b. Vegetation herbaceous (may have up to 25 percent shrub cover)		

II. Scrub		
8a. Vegetation with at least 10 percent cover of dwarf trees	II A Dwarf tree scrub	9
8b. Vegetation with at least 25 percent cover of shrubs and less than 10 percent cover of dwarf trees		10
9a. Dwarf tree canopy of 60-100 percent cover	II A.1 Closed dwarf tree scrub	
9b. Dwarf tree canopy of 25-59 percent cover	II A.2 Open dwarf tree scrub	
9c. Dwarf tree canopy of 10-24 percent cover	II A.3 Dwarf tree scrub woodland	
10a. Shrubs more than 1.5 meters (5 ft) tall	II B Tall scrub	11
10b. Shrubs less than 1.5 meters (5 ft) tall		12
11 a. Shrub canopy cover greater than 75 percent	II B.1 Closed tall scrub	
11 b. Shrub canopy cover of 25-74 percent	II B.2 Open tall scrub	
12a. Shrubs 20 centimeters to 1.5 meters tall	II C Low scrub	13
12b. Shrubs under 20 centimeters in height	II D Dwarf scrub	14
13a. Shrub canopy cover greater than 75 percent	II C.1 Closed low scrub	
13b. Shrub canopy cover of 25-74 percent, or as low as 2 percent if little or no other vegetation cover present	II C.2 Open low scrub	
14a. Dryas species dominant in the dwarf shrub layer	II D.1 Dryas dwarf scrub	
14b. Ericaceous species dominant in the dwarf shrub layer	II D.2 Ericaceous dwarf scrub	
14c. Willow species dominant in the dwarf shrub layer	II D.2 Willow dwarf scrub	
III. Herbaceous		
15a. Terrestrial vegetation, or if growing in the water, dominated by emergent vegetation		16
15b. Dominant vegetation growing submerged in water or floating on the water surface, but not emerging above the water	III D Aquatic herbaceous	21

16a. Grasses, sedges, or rushes (graminoid) plants dominant	III A Graminoid herbaceous	17
16b. Forbs or bryophytes dominant		18
17a. Grasslands of well-drained, dry sites, such as south-facing bluffs, old beaches, and sand dunes. Typically (but not always) dominated by <i>Elymus</i> spp., <i>Festuca</i> spp., and <i>Deschampsia</i> spp.	III A.1 Dry graminoid herbaceous	
17b. On moist sites, but usually not with standing water. Usually dominated by <i>Calamagrostis</i> spp., <i>Carex</i> spp. or <i>Eriophorum</i> spp.; tussocks often present	III A.2 Mesic graminoid herbaceous	
17c. On wet sites, standing water present for part of the year; dominated by either sedges or grasses; includes wet tundra, bogs, marshes, and fens	III A.3 Wet graminoid herbaceous	
18a. Vegetation dominated by forbs (broadleaf herbs, ferns, or horsetails)	III B Forb herbaceous	19
18b. Vegetation dominated by mosses or lichens	III C Bryoid herbaceous	20
19a. On dry sites, usually rocky and well drained; mostly tundra sites	III B.1 Dry forb herbaceous	
19b. On moist sites but without standing water, mostly within forested areas	III B.2 Mesic forb herbaceous	
19c. On wet sites, usually with standing water for part of the year	III B.3 Wet forb herbaceous	
20a. Vegetation cover dominated by mosses	III C.1 Bryoid moss	
20b. Vegetation cover dominated by lichens	III C.2 Bryoid lichen	
21a. Vegetation submerged or floating in fresh water	III D.1 Freshwater aquatic herbaceous	
21 b. Vegetation submerged or floating in brackish water	III D.2 Brackish water aquatic herbaceous	
21c. Vegetation submerged or floating in salt water	III D.3 Marine aquatic herbaceous	

Vegetation Classification Data Form QA/QC Checklist

This form is to be completed before leaving the field site.

Feature ID: W604T043 Field Target: 103 Date: 7/3/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. General Information

- ☒ Location data recorded?
- ☒ Photo taken and photo number recorded?

2. Location Description

- ☒ Location of site recorded with enough detail to help relocate?

3. Common Species

- ☒ Scientific name of common species recorded?
- ☒ Percent cover of dominant structure level noted?

4. Habitat Description

- ☒ Habitat described?

5. Classification

- ☒ All three levels of classification recorded?

6. Field Log Book

- ☒ Field form entries consistent with log book?
- ☒ Logbook clearly identifies the Field Target ID and Feature ID?

X Zoe Muade

Field Technician (print)

X  7/3/14

Signature

X Joe Charles

Field Crew Chief (print)

X  7/3/14

Signature

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION				2000' corridor	
Survey Type: Centerline <u>40</u> Access Road (explain) _____ Other (explain) <u>X</u>		Field Target: <u>108</u>		Map #: <u>76</u> Map Date: <u>5/21/14</u>	
Date: <u>7/2/14</u>		Project Name & No.: Alaska LNG 26221306		Feature Id: <u>W60HT044</u>	
Investigators: <u>Joe Christopher, Zoe Meade, Abigail Fisher</u>				Team No.: <u>W60</u>	
State: <u>Alaska</u>		Region: <u>Alaska</u>		Milepost: <u>628.45</u>	
Latitude: <u>62° 45' 29.44"</u>		Longitude: <u>150° 08' 36.91"</u>		Datum: <u>WGS84</u>	
Logbook No.: <u>003</u>		Logbook Page No.: <u>33</u>		Picture No.: <u>P-N.S.pit, plug</u>	

SITE PARAMETERS	
Subregion: <u>South central</u>	Landform (hillslope, terrace, hummocks, etc.): <u>Depression / meadow</u>
Slope (%): <u>0-1</u>	Local relief (concave, convex, none): <u>concave</u>
Pre-mapped Alaska LNG/NWI classification: <u>Pemi / SS / I3</u>	Soil Map Unit Name: <u>41A</u>
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <u>X</u> No _____ (if no explain in Notes)	
Are "Normal Circumstances" present: Yes <u>X</u> No _____ (if no, explain in Notes.)	
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed? No <u>X</u> (If yes, explain in Notes)	
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic? No <u>X</u> (If yes, explain in Notes.)	
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <u>X</u> No _____	Is the Sampled Area within a Wetland? Yes <u>X</u> No _____
Hydric Soil Present? Yes <u>X</u> No _____	Wetland Type: <u>PEMI / PSS 1 B</u> → <u>PEMI / SS 1 B</u>
Wetland Hydrology Present? Yes <u>X</u> No _____	Alaska Vegetation Classification (Viereck): <u>III A3, II C2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

P: 33 See map

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea</i>	1		FACW
2.			
3.			
4.			
Total Cover: <u>1</u> 50% of total cover: <u>0.5</u> 20% of total cover: <u>0.2</u>			
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Betula nana</i>	10	Y	FAC
2. <i>Picea mariana</i>	5	Y	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>15</u> 10 <u>15</u> <u>16</u> 50% of total cover: <u>7.5</u> 5 <u>7.5</u> 20% of total cover: <u>3.2</u> 2 <u>3</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

% Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: 85 Multiply by: 1

OBL species: 85 X 1 = 85

FACW species: 5 X 2 = 10

FAC species: 17 X 3 = 51

FACU species: 0 X 4 = 0

UPL species: 0 X 5 = 0

Column Totals: 107 (A) 146 (B)

PI = B/A = 1.36

Tree stratum added to shrub stratum
since there was < 5% cover

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Trichophorum caespitosum</i>	85	Y	OBL
2. <i>Iris setosa</i>	TR		FAC
3. <i>Pedicularis labradorica</i>	TR		FACW
4. <i>Calamagrostis canadensis</i>	3		FACW
* 5. <i>Platanthera aquilonis</i>	TR		FACW
6. <i>Drosera rotundifolia</i>	TR		OBL
7. <i>Viola</i> spp.	TR		FACW
8. <i>Cornus suecica</i>	4		FAC
9.			
10.			
Total Cover: <u>92</u> 50% of total cover: <u>46</u> 20% of total cover: <u>18.4</u>			

Hydrophytic Vegetation Indicators:

☒ Dominance Test is > 50%

☒ Prevalence Index is ≤ 3.0

☐ Morphological Adaptations¹ (Provide supporting data in Notes)

☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

N/A % Cover of Wetland Bryophytes

100 Total Cover of Bryophytes

0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

name may have changed

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/3/14</u> Feature ID <u>W60HT044</u>		Soil Pit Required (Y/N) <u>Y</u>			
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features			Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹		
0-22	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>Fibric organics</u>

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) <u> </u>	Alaska Color Change (TA4) ⁴ <u> </u>
Histic Epipedon (A2) <u> </u>	Alaska Redox (A14) <u> </u>	Alaska Alpine Swales (TA5) <u> </u>
Black Histic (A3) <u> </u>	Alaska Gleyed Pores (A15) <u> </u>	Alaska Redox with 2.5Y Hue <u> </u>
Hydrogen Sulfide (A4) <u> </u>		Alaska Gleyed without 5Y Hue or Redder Underlying Layer <u> </u>
Thick Dark Surface (A12) <u> </u>		Other (Explain in Notes) <u> </u>

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: Depth (inches):

Hydric Soil Present (Y/N): Y

Notes: Field Indicators of hydric soil observed

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) <u>X</u>
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) <u>X</u>
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes):		
Iron Deposits (B5) _____			
Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>Y</u>	
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>4</u>		
Saturation Present (Y/N): (includes capillary fringe) <u>Y</u>	Depth (in): <u>0</u>		
Notes: Depression @ toe of small slope			

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>10</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved <u>8</u> Emergent-Non-persistent _____ Emergent-Persistent <u>X</u> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>1</u> Sapling (<5 dbh, <6m tall) <u>45</u> Tall shrub (2-6m) _____ Short shrub (0.5-2m) <u>10</u> Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) <u>92</u> Moss-Lichen <u>100</u> Floating _____ Submerged _____		
Number of Wetland Types (M): <u>1</u> Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) <u>X</u>		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) <u>X</u> Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) <u>X</u> High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) <u>X</u> Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated <u>X</u> Wetlands within 400m, Not Connected _____ Only Connected Below <u>X</u> Only Connected Above _____ Connected Upstream & Downstream _____ Unknown <u>2000</u>	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT044

Field Target: 108

Date: 7/3/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X  7/3/14

Signature / Date

X Joe Christopher

Field Crew Chief (print)

X  7/3/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 109	Map #: 77 Map Date: 8/27/14
Date: 7/3/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT045
Investigators: JC, ZM, AF			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 631	
Latitude: 62.73765	Longitude: -150.14656	Datum: WGS84	
Logbook No.: 003	Logbook Page No.: 34-35	Picture No.: P-N.S. pit, plug	

SITE PARAMETERS	
Subregion: south central	Landform (hillslope, terrace, hummocks, etc.): Terrace / Seeps
Slope (%): 3-5	Local relief (concave, convex, none): Concave
Pre-mapped Alaska LNG/NWI classification: Upland	Soil Map Unit Name: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	
Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (if no, explain in Notes.)	
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: PEM1/SS1B (Seeps)
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Viereck): IIA2 II C2 II C2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See pg 33-35 for
Notes & Drawings

* Paper birch was salt in
the tree layer to account
for groups in plot & matrix

with morphological adaptation (changed to FAC)
to growing in Seeps PEM1/SS1B.

* See W60HT045-OP for notes on AdS, R4SB

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Betula neoalaskana</i>	5	Y	FAC
2. <i>Betula neoalaskana</i>	3	Y	FACU
3. <i>Picea glauca</i>	3	Y	FACU
4.			
Total Cover: <u>11</u> 50% of total cover: <u>5.5</u> 20% of total cover: <u>2.2</u>			
Sapling/Shrub Stratum (<u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Spiraea stevenii</i>	10	Y	FACU
2. <i>Alnus</i> ssp.	15	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>25</u> 50% of total cover: <u>12.5</u> 20% of total cover: <u>5</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 4 (A)
 Total Number of Dominant Species Across All Strata: 57 (B)
 % Dominant Species that are OBL, FACW, or FAC: 80 (A/B)
57

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: 29 X 1 = 29
 FACW species: 1 X 2 = 2
 FAC species: 75 X 3 = 225
 FACU species: 17 X 4 = 68
 UPL species: 0 X 5 = 0
 Column Totals: 122 (A) 324 (B)
 PI = B/A = 2.66
 * morphological adaptation - multiple trunks
 → See note on front page.

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Comarum palustre</i>	25	Y	OBL
2. <i>Equisetum sylvaticum</i>	7		FAC
3. <i>Cornus canadensis</i>	1		FACU
4. <i>Calamagrostis canadensis</i>	45	Y	FAC
5. <i>Chamerion angustifolium</i>	7		FAC
6. <i>Carex magellanica</i>	4		OBL
7. <i>Equisetum arvense</i>	3		FAC
8. <i>Rubus chamaemorus</i>	1		FACW
9. <i>Viola</i> ssp.	TR		
10.			
Total Cover: <u>86</u> 50% of total cover: <u>43</u> 20% of total cover: <u>17.2</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
N/A % Cover of Wetland Bryophytes
40 Total Cover of Bryophytes
0 % Cover of Water
Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/3/14</u> Feature ID <u>W604T 045</u>		Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)					
Depth (Inches)	Matrix		Redox Features		Notes
	Color (moist)	%	Color (moist)	%	
0-9					Fibric organics,
9-20	10 YR 2/2	100			Silt loam

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) <u>X</u>	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) <u>X</u>
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) <u>X</u>	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) <u>X</u>
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: <u>seeps present But NO Standing H₂O.</u>	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>6</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>4</u>	

Notes: Birch are adapted But stressed
- Ads. R45B

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <u>X</u> Aquatic Bed _____			
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>11</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>15</u> Short shrub (0.5-2m) <u>10</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>86</u> Moss-Lichen <u>40</u> Floating <u>0</u> Submerged <u>0</u>			
Number of Wetland Types (M): <u>1</u>		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven <u>X</u> Moderately even _____	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) <u>X</u>			
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____			
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____			
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A <u>X</u>			
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open <u>X</u> Small Scattered Patches _____ Continuous Cover _____			
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____			
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>X</u>			
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____			

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty <u>X</u> Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet <u>X</u> Intermittent Inlet/Intermittent Outlet <u>X</u> Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>Y</u> Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>Y</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow <u>X</u>	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) <u>X</u> Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading <u>5.5</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed <u>X</u> Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown <u>X</u>	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT045

Field Target: 109

Date: 7/3/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X

Signature / Date

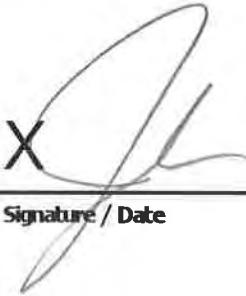
 7/3/14

X Joe Christoph

Field Crew Chief (print)

X

Signature / Date

 7/3/14

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: <u>110</u>	Map #: <u>77</u> Map Date: <u>5/27/14</u>
Date: <u>7/3/14</u>	Project Name & No.: <u>Alaska LNG 26221306</u>		Feature Id: <u>W60HT046</u>
Investigators: <u>Joe Christopher, Zoe Meade, Abigail Fisher</u>			Team No.: <u>W60</u>
State: <u>Alaska</u>	Region: <u>Alaska</u>	Milepost: <u>631</u>	
Latitude: <u>62° 44' 14.46"</u>		Longitude: <u>150° 08' 50.71"</u>	Datum: <u>WGS84</u>
Logbook No.: <u>003</u>	Logbook Page No.: <u>36/37</u>	Picture No.: <u>P-N-3, P-P</u>	

SITE PARAMETERS	
Subregion: <u>South central</u>	Landform (hillslope, terrace, hummocks, etc.): <u>Slope/Terrace</u>
Slope (%): <u>0 - 5</u>	Local relief (concave, convex, none): <u>Convex</u>
Pre-mapped Alaska LNG/NWI classification: <u>PSS1/EM1B</u>	Soil Map Unit Name: <u>N/A</u>
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)

SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: <u>PSS1/EM1B</u>
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Viereck): <u>IIC2, IIIA2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See map 36

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
Sapling/Shrub Stratum (<u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Myrica gale</i>	<u>60</u>	<u>X</u>	<u>OBL</u>
2. <i>Betula nana</i>	<u>7</u>		<u>FAC</u>
3. <i>Spiraea stevenii</i>	<u>5</u>		<u>FACU</u>
4.			
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>72</u> 50% of total cover: <u>36</u> 20% of total cover: <u>14.4</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)
 Total Number of Dominant Species Across All Strata: 2 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: 103 Multiply by:
 OBL species: 103 X 1 = 103
 FACW species: 0 X 2 = 0
 FAC species: 22 X 3 = 66
 FACU species: 5 X 4 = 20
 UPL species: 0 X 5 = 0
 Column Totals: 130 (A) 189 (B)
 PI = B/A = 1.45

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Calamagrostis canadensis</i>	<u>10</u>		<u>FAC</u>
2. <i>Carex microglochin</i>	<u>40</u>	<u>X</u>	<u>OBL</u>
3. <i>Equisetum arvense</i>	<u>5</u>		<u>FAC</u>
4. <i>Comarum palustre</i>	<u>3</u>		<u>OBL</u>
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>58</u> 50% of total cover: <u>29</u> 20% of total cover: <u>11.6</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
— % Cover of Wetland Bryophytes
100 Total Cover of Bryophytes
0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>07/18/14</u> Feature ID <u>W60HI 045</u>		Soil Pit Required (Y/N) <u>Y</u>			
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (Inches)	Matrix		Redox Features			Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹		
0-20							Fibric organics - wet

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): _____	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>2</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>72</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>0</u> Moss-Lichen <u>0</u> Floating _____ Submerged _____		
Number of Wetland Types (M): <u>1</u> Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <u>X</u> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site _____ Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) <u>X</u> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope <u>X</u> Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet <u>X</u> No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow <u>X</u>	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed <u>X</u> Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below <u>X</u> Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT046

Field Target: 110

Date: 7/3/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade
Wetland Scientist (print)

X [Signature] 7/3/14
Signature / Date

X Joe Christoph
Field Crew Chief (print)

X [Signature] 7/3/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/>		Field Target: 149	Map #: 151 Map Date: 3/17/14
Date: 7/9/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60T1052 W60HT047
Investigators: Joe Christopher, Zoe Meade, Abigayle Fisher			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 661.7	
Latitude: 62° 20' 40.00"	Longitude: 150° 16' 16.87"	Datum: WGS84	
Logbook No.: 003	Logbook Page No.: 050/049	Picture No.: P-N, S, pit, plug	

SITE PARAMETERS	
Subregion: South central	Landform (hillslope, terrace, hummocks, etc.): hummocks
Slope (%): 0 - 3	Local relief (concave, convex, none): none
Pre-mapped Alaska LNG/NWJ classification: PSS 4/B PF04B 2/2	Soil Map Unit Name: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Wetland Type: PF04/SS1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Alaska Vegetation Classification (Viereck): I A 2, I C 2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

site sketch on pg. 049 }
data on pg. 50 } Log book 003

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)

Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea mariana</i>	50	Y	FACW
2.			
3.			
4.			

Total Cover: 50

50% of total cover: 25 20% of total cover: 10

Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Vaccinium vitis-idaea</i>	5		FAC
2. <i>Vaccinium oxycoccus</i>	TR		OBL
3. <i>Betula nana</i>	TR		FACW
4. <i>Rhododendron tomentosum</i>	4		FACW
5. <i>Empetrum nigrum</i>	3		FAC
6. <i>Vaccinium uliginosum</i>	35	Y	FAC
7. <i>Betula neoalaskana</i>	1		FACU
8. <i>Picea mariana</i>	3		FACW
9.			

Total Cover: 51

50% of total cover: 25.5 20% of total cover: 10.2

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

% Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:

OBL species: 5 X 1 = 5

FACW species: 122 X 2 = 244

FAC species: 44 X 3 = 132

FACU species: 2 X 4 = 8

UPL species: 0 X 5 = 0

Column Totals: 173 (A) 389 (B)

PI = B/A = 2.25

VEGETATION (use scientific names of plants)

Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Rubus chamaemorus</i>	65	Y	FACW
2. <i>Geocaulon lividum</i>	1		FACU
3. <i>Equisetum sylvaticum</i>	1		FAC
4. <i>Carex microglochin</i>	5		OBL
5.			
6.			
7.			
8.			
9.			
10.			

Total Cover: 72

50% of total cover: 36 20% of total cover: 14.4

Hydrophytic Vegetation Indicators:

☒ Dominance Test is > 50%

☒ Prevalence Index is ≤ 3.0

____ Morphological Adaptations¹ (Provide supporting data in Notes)

____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

— % Cover of Wetland Bryophytes

100 Total Cover of Bryophytes

0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

7

W60HT047
~~W60T1052~~

Space started somewhat.

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved <u>X</u> Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>50</u> Sapling (<5 dbh, <6m tall) <u>4</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>42</u> Dwarf shrub (<0.5m) <u>5</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>72</u> Moss-Lichen <u>100</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u> Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven <u>X</u> Moderately even _____		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>X</u> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open <u>X</u> Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) <u>X</u> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat <u>X</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial/Quaternary Soils Sediment Created _____	
Micorelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) <u>X</u> Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above <u>X</u> Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60T1052 ^{W60HT047} Field Target: 149 Date: 7/9/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X *Zoe Meade* 7/9/14

Signature / Date

X *Zoe Meade*

Field Crew Chief (print)

X *[Signature]* 7/9/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION				2000' corridor	
Survey Type: Centerline		Access Road (explain)		Other (explain) <input checked="" type="checkbox"/>	
Field Target: 112		Map #: 79		Map Date: 5/27/14	
Date: 7/5/14		Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT048	
Investigators: Joe Christopher, Zoe Meade, Abigayle Fisher				Team No.: W60	
State: Alaska		Region: Alaska		Milepost: 640.35	
Latitude: 62° 37' 34.63"		Longitude: 150° 13' 42.64"		Datum: WGS84	
Logbook No.: 003		Logbook Page No.: 38		Picture No.: P-N, S. pit, plug	

SITE PARAMETERS	
Subregion: South central	Landform (hillslope, terrace, hummocks, etc.): Flood plain
Slope (%):	Local relief (concave, convex, none): Concave
Pre-mapped Alaska LNG/NWI classification: PSS1A	Soil Map Unit Name: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No (if no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No	Is the Sampled Area within a Wetland? Yes No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes No <input checked="" type="checkbox"/>	Wetland Type: upland
Wetland Hydrology Present? Yes No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Vioreck): IB1

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

PA 838

UPLAND Flood PLAIN near
Gravel ADDT Access to
Water Source @ Troublesome Creek

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Populus balsamifera</i>	70	Y	FACU
2.			
3.			
4.			
Total Cover: <u>70</u> 50% of total cover: <u>35</u> 20% of total cover: <u>14</u>			
Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Alnus ssp.</i>	4		FAC
2. <i>Saxex scouleriana</i>	20	Y	FAC
3. <i>Ribes triste</i>	1		FAC
4. <i>Rosa asicularis</i>	5		FACU
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>30</u> 50% of total cover: <u>15</u> 20% of total cover: <u>6</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)
 Total Number of Dominant Species Across All Strata: 4 (B)
 % Dominant Species that are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: 0 X 1 = 0
 FACW species: 0 X 2 = 0
 FAC species: 41 X 3 = 123
 FACU species: 75 X 4 = 300
 UPL species: 0 X 5 = 0
 Column Totals: 116 (A) 423 (B)
 PI = B/A = 3.65

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Equisetum arvense</i>	6	Y	FAC
2. <i>Calamagrostis canadensis</i>	10	Y	FAC
3. <i>Chamaerion angustifolium</i>	TR		FAC
4. <i>Galium triflorum</i>	TR		FAC
5. <i>Dryopteris expansa</i>	TR		FACU
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>16</u> 50% of total cover: <u>8</u> 20% of total cover: <u>3.2</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☐ Prevalence Index is ≤ 3.0
☐ Morphological Adaptations¹ (Provide supporting data in Notes)
☐ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

80 % Bare Ground
0 % Cover of Wetland Bryophytes
0 % Total Cover of Bryophytes
0 % Cover of Water
Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/5/14</u> Feature ID <u>W60HT048</u>				Soil Pit Required (Y/N) <u>X</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Notes
	Color (moist)	%	Color (moist)	%				
0-3	—	—	—	—	—	—	coarse sand/gravel	
3+	—	—	—	—	—	—	Large cobble - refusal	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: Large cobble Depth (inches): 3

Hydric Soil Present (Y/N): N

Notes: _____

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	
Saturation Present (Y/N): <u>N</u> (includes capillary fringe)	Depth (in): <u>—</u>	
Notes: _____		

WETLAND DETERMINATION DATA FORM

Upland

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent- Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____ Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT048

Field Target: 112

Date: 7/5/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X  7/5/14

Signature / Date

X Tom Christopherson

Field Crew Chief (print)

X  7/5/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline		Access Road (explain)	Other (explain) <u>X</u>
Date: <u>7/5/14</u>		Project Name & No.: <u>Alaska LNG 26221306</u>	Field Target: <u>118</u> Map #: <u>84</u> Map Date: <u>5/27</u>
Investigators: <u>JC, Z.M. AF</u>		Feature Id: <u>W60HT049</u>	
State: <u>Alaska</u>		Region: <u>Alaska</u>	Team No.: <u>W60</u>
Latitude: <u>62° 32' 45.40"</u>		Milepost: <u>646.8</u>	Datum: <u>WGS84</u>
Longitude: <u>150° 15' 02.27"</u>		Logbook No.: <u>003</u>	
Logbook Page No.: <u>39</u>		Picture No.: <u>P-N, S, pit, plug</u>	

SITE PARAMETERS	
Subregion: <u>South central</u>	Landform (hillslope, terrace, hummocks, etc.): <u>Flat</u>
Slope (%): <u>0-3</u>	Local relief (concave, convex, none): <u>none</u>
Pre-mapped Alaska LNG/NWI classification: <u>PFO 4/SS1B</u>	Soil Map Unit Name: <u>N/A</u>
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <u>X</u> No (if no explain in Notes)	Are "Normal Circumstances" present: Yes <u>X</u> No (If no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <u>X</u> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <u>X</u> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <u>X</u> No	Is the Sampled Area within a Wetland? Yes <u>X</u> No
Hydric Soil Present? Yes <u>X</u> No	Wetland Type: <u>PFO 4/SS1B</u>
Wetland Hydrology Present? Yes <u>X</u> No	Alaska Vegetation Classification (Vioreck): <u>IA3, IIB2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

PAG 39 sample area ~ 20' tail, classified as PFO 4/SS1B

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
<u>Tree Stratum</u> (Plot sizes: <u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea mariana</i>	15	Y	FACW
2.			
3.			
4.			
Total Cover: <u>15</u> 50% of total cover: <u>7.5</u> 20% of total cover: <u>3</u>			
<u>Sapling/Shrub Stratum</u> (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Alnus</i> spp.	10	Y	FAC
2. <i>Betula nana</i>	20	Y	FAC
3. <i>Empetrum nigrum</i>	3		FAC
4. <i>Vaccinium uliginosum</i>	7		FAC
5. <i>Chamaedaphne calyculata</i>	7		FACW
6.			
7.			
8.			
9.			
Total Cover: <u>47</u> 50% of total cover: <u>23.5</u> 20% of total cover: <u>9.4</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 4 (A)
 Total Number of Dominant Species Across All Strata: 4 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: 60 x 1 = 60
 FACW species: 32 x 2 = 64
 FAC species: 40 x 3 = 120
 FACU species: 0 x 4 = 0
 UPL species: 0 x 5 = 0
 Column Totals: 132 (A) 244 (B)
 PI = B/A = 1.85

VEGETATION (use scientific names of plants)			
<u>Herb Stratum</u> (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Carex aquatilis</i>	60	Y	OBL
2. <i>Rubus chamaemorus</i>	10		FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>70</u> 50% of total cover: <u>35</u> 20% of total cover: <u>14</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

_____ % Bare Ground
 _____ % Cover of Wetland Bryophytes
100 Total Cover of Bryophytes
 _____ % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/5/14</u> Feature ID <u>W60HT049</u>		Soil Pit Required (Y/N) <u>Y</u>			
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features			Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹		
0-18						Fibric	organics saturated
18							Refusal large roots

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____	
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____	
Thick Dark Surface (A12) _____		Other (Explain in Notes)	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: large roots Depth (inches): 18

Hydric Soil Present (Y/N): Y

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>Y</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes):		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u> </u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>6</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>5</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved <u>X</u> Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>15</u> Sapling (<5 dbh, <6m tall) <u>00</u> Tall shrub (2-6m) <u>10</u> Short shrub (0.5-2m) <u>37</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>20</u> Moss-Lichen <u>100</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u> Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>X</u>		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) <u>X</u> Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open <u>X</u> Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) <u>X</u> High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat <u>X</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <u>X</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: WG0HT049

Field Target: 118

Date: 7/5/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X Zoe Meade 7/5/14

Signature / Date

X Joe Christoph

Field Crew Chief (print)

X [Signature] 7/5/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION				2000' corridor	
Survey Type: Centerline		Access Road (explain)		Other (explain) <input checked="" type="checkbox"/>	
Field Target: 119		Map #: 84		Map Date: 5/27/14	
Date: 7/5/14		Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT050	
Investigators: Joe Christopher, Zoe Meade, Abigail Fisher				Team No.: W60	
State: Alaska		Region: Alaska		Milepost: 64.6.8 (LNG)	
Latitude: 62° 32' 47.26"		Longitude: 150° 14' 58.82"		Datum: WGS84	
Logbook No.: 003		Logbook Page No.: 40		Picture No.: P-N, S, pit, plug	

SITE PARAMETERS	
Subregion: South central	Landform (hillslope, terrace, hummocks, etc.): Flat
Slope (%): 0-3	Local relief (concave, convex, none): none
Pre-mapped Alaska LNG/NWI classification: upland	Soil Map Unit Name: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No (If no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation <input checked="" type="checkbox"/> , Soil, or Hydrology Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No	Wetland Type: PFO 1/4/551B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No	Alaska Vegetation Classification (Viereck): IC2, II B2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

Birch Dominated. Morphological Adaptations, problematic
PS. 40

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea mariana</i>	5		FACW
2. <i>Betula neoalaskana</i> *	30	Y	FAC
3.			
4.			
Total Cover: <u>35</u> 50% of total cover: <u>17.5</u> 20% of total cover: <u>7</u>			
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Alnus</i> ssp.	25	Y	FAC
2. <i>Spiraea steverii</i>	2		FACU
3. <i>Ribes triste</i>	2		FAC
4.			
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>29</u> 50% of total cover: <u>14.5</u> 20% of total cover: <u>5.8</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)
 Total Number of Dominant Species Across All Strata: 4 (B)
 % Dominant Species that are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: 4 X 1 = 4
 FACW species: 5 X 2 = 10
 FAC species: 74 X 3 = 222
 FACU species: 2523 X 4 = 10092
 UPL species: 0 X 5 = 0
 Column Totals: 108106 (A) 336328 (B)
 PI = B/A = 3.1 JTB

*Convers Det Neo
to FAC due to
morph. Adaptations*

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Comarum palustre</i>	4		OBL
2. <i>Gymnocarpium dryopteris</i>	8		FACU
3. <i>Cornus canadensis</i>	2		FACU
4. <i>Dryopteris expansa</i>	10	Y	FACU
5. <i>Streptopus amplexifolius</i>	1		FACU
6. <i>Equisetum arvense</i>	15	Y	FAC
7. <i>Equisetum sylvaticum</i>	2		FAC
8.			
9.			
10.			
Total Cover: <u>42</u> 50% of total cover: <u>21</u> 20% of total cover: <u>8.4</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☐ Prevalence Index is ≤ 3.0
☒ Morphological Adaptations¹ (Provide supporting data in Notes)
☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

5 % Bare Ground
— % Cover of Wetland Bryophytes
20 Total Cover of Bryophytes
0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/5/14</u> Feature ID <u>W60H7050</u>		Soil Pit Required (Y/N) <u>Y</u>				
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (Inches)	Matrix		Redox Features			Texture	Notes	
	Color (moist)	%	Color (moist)	%	Type ¹			Loc ²
0-20	<u> </u>	<u>-</u>	<u> </u>	<u>-</u>	<u> </u>	<u> </u>	<u>Fibric</u>	<u>organic</u>

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains.
 ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: NA Depth (inches): 12

Hydric Soil Present (Y/N): Y

Notes: _____

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____	_____		
Surface Water Present (Y/N): <u>—</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>Y</u>	
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>4</u>		
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>3</u>		
Notes: _____			

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved <u>X</u> Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>35</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>25</u> Short shrub (0.5-2m) <u>4</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>42</u> Moss-Lichen <u>5</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>1</u> Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>X</u> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open <u>X</u> Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) <u>X</u> High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat <u>X</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <u>X</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

3m

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT050

Field Target: 119

Date: 7/5/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade
Wetland Scientist (print)

X [Signature] 7/5/14
Signature / Date

X Joe Christoph
Field Crew Chief (print)

X [Signature] 7/5/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION 300' corridor			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/>		Field Target: 123	Map #: 85 Map Date: 5/27/14
Date: 7/5/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT 051
Investigators: Joe Christopher, Zoe Meade, Abigayle Fisher			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 647.8	
Latitude: 62° 31' 58.84"		Longitude: 150° 14' 13.85"	Datum: WGS84
Logbook No.: 003	Logbook Page No.: 040	Picture No.: P-N, S, water	

SITE PARAMETERS	
Subregion: South central	Landform (hillslope, terrace, hummocks, etc.): Depression
Slope (%): 1-3	Local relief (concave, convex, none): Concave
Pre-mapped Alaska LNG/NWI classification: Upland	Soil Map Unit Name: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Wetland Type: PEM1/C
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Alaska Vegetation Classification (Vioreck): III A3

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

PAGE 40

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: <u>0</u>			
50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
Sapling/Shrub Stratum (<u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Salix barclayi</i>	TR	N	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
Total Cover: _____			
50% of total cover: _____ 20% of total cover: _____			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

% Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:

OBL species: 75 X 1 = 75

FACW species: 10 X 2 = 20

FAC species: 71 X 3 = 213

FACU species: - X 4 = -

UPL species: - X 5 = -

Column Totals: 156 (A) 308 (B)

PI = B/A = 1.97

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Comarum palustre</i>	35	N	OBL
2. <i>Carex aquatilis</i>	25		OBL
3. <i>Equisetum arvense</i>	18		FAC
4. <i>Equisetum sylvaticum</i>	31		FAC
5. <i>Viola palustris</i>	10		FACW
6. <i>Carex magellanica</i>	5		OBL
7. <i>Carex limosa</i>	10		OBL
8. <i>Calamagrostis Canadensis</i>	50	Y	FAC
9.			
10.			
Total Cover: <u>156</u>			
50% of total cover: <u>78</u> 20% of total cover: <u>31.2</u>			

Hydrophytic Vegetation Indicators:

Y Dominance Test is > 50%

X Prevalence Index is ≤ 3.0

____ Morphological Adaptations¹ (Provide supporting data in Notes)

____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

____ % Bare Ground

____ % Cover of Wetland Bryophytes

20 Total Cover of Bryophytes

30 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

138
18
156

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/2/14</u>	Feature ID <u>N60HT051</u>	Soil Pit Required (Y/N) <u>X</u>				
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains.
 ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS	INDICATORS FOR PROBLEMATIC HYDRIC SOILS³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____ Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____ Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____ Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____	Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____	Other (Explain in Notes) <u>X</u>

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes:
Assumed Hydric Based on Standing H₂O + S-Singer

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) <u>X</u>
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes):		
Iron Deposits (B5) _____			
Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>2-4"</u>	Wetland Hydrology Present (Y/N): <u>Y</u>	
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0</u>		
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0</u>		
Notes: <u>Depression</u>			

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <u>X</u> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>15</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>TR</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>15</u> Moss-Lichen <u>20</u> Floating <u>1</u> Submerged <u>1</u>		
Number of Wetland Types (M): <u>1</u>		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>1</u>
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) <u>1</u>		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover <u>X</u> >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site _____ Open <u>X</u> Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) <u>X</u> High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking <u>1</u> Histosol:Fibric _____ Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty <u>X</u> Mineral: Clayey _____ <i>Assumed</i>	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet <u>X</u> Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded <u>X</u>	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) <u>X</u> Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) <u>X</u> pH Reading <u>5.29</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below <u>X</u> Only Connected Above _____ Connected Upstream & Downstream <u>X</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60H1051

Field Target: 123

Date: 7/5/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X

Zoe Meade 7/5/14

Signature / Date

X

Tue Churlyk

Field Crew Chief (print)

X

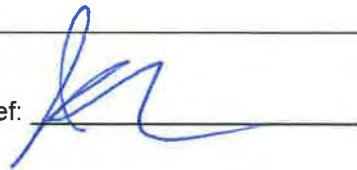
Tue Churlyk 7/5/14

Signature / Date

Vegetation Classification Data Form

Site Description		
Date: 7/5/14	Project Name & #: Alaska LNG 26221306	Field Target: W60HT052
Investigators: JC, ZM, AF		Feature ID: 124
Latitude: 62° 31' 58.35"	Longitude: 150° 14' 11.36"	Datum: WGS84
Logbook #: 003	Logbook Page #: 041	Picture #: P_N, S
Location Description:		
E of 123 - on centerline		
Common Species Observed (Scientific Name)		
Betula neoalaskana	Veratrum viride	
Picea glauca	Sambucus racemosa	
Vaccinium uliginosum	Sorbus scopulina	
Viburnum edule	Alnus ssp	
Percent Cover of Dominant Structure Level: 25% pic gla, Bet neo		
Habitat Description:		
Mixed forrest		
Alaska Vegetation Classification: Level I, Level II, Level III		
IC2	II B2	
Notes:		
3-7% hillside slope, 30' birch		

Field Crew Chief:



Field Scientist/Technician



Vegetation Classification Data Form

Table I-Alaska vegetation classification to level III

Level I	Level II	Level III
I. Forest	A. Needleleaf (conifer) forest	(1) Closed needleleaf (conifer) forest (2) Open needleleaf (conifer) forest (3) Needleleaf (conifer) woodland
	B. Broadleaf forest	(1) Closed broadleaf forest (2) Open broadleaf forest (3) Broadleaf woodland
	C. Mixed forest	(1) Closed mixed forest (2) Open mixed forest (3) Mixed woodland
II. Scrub	A. Dwarf tree scrub	(1) Closed dwarf tree scrub (2) Open dwarf tree scrub (3) Dwarf tree scrub woodland
	B. Tall scrub	(1) Closed tall scrub (2) Open tall scrub
	C. Low scrub	(1) Closed low scrub (2) Open low scrub
	D. Dwarf scrub	(1) Dryas dwarf scrub (2) Ericaceous dwarf scrub (3) Willow dwarf scrub
III. Herbaceous	A. Graminoid herbaceous	(1) Dry graminoid herbaceous (2) Mesic graminoid herbaceous (3) Wet graminoid herbaceous (emergent)
	B. Forb herbaceous	(1) Dry forb herbaceous (2) Mesic forb herbaceous (3) Wet forb herbaceous (emergent)
	C. Bryoid herbaceous	(1) Mosses (2) Lichens
	D. Aquatic (nonemergent) herbaceous	(1) Freshwater aquatic herbaceous (2) Brackish water aquatic herbaceous (3) Marine aquatic herbaceous

Descriptions of levels I, II, III, and IV follow the classification table

1a. Trees over 3 meters (10 ft) tall are present and have a canopy cover of 10 percent or more	I. Forest	2
1b. Trees over 3 meters (10 ft) tall are absent or nearly so. Less than 10 percent cover (Dwarf trees, less than 3 meters [10 ft] tall may be present and abundant)		7
I. Forest		
2a. Over 75 percent of tree cover contributed by needleleaf (conifer) species	I.A Needleleaf forest	3
2b. Less than 75 percent of tree cover contributed by needleleaf (conifer) species		4
3a. Tree canopy of 60-100 percent cover	I.A.1 Closed needleleaf forest	
3b. Tree canopy of 25-59 percent cover	I.A.2 Open needleleaf forest	
3c. Tree canopy of 10-24 percent cover	I.A.3 Needleleaf woodland	
4a. Over 75 percent of tree cover contributed by broadleaf species	I.B Broadleaf forest	5
4b. Broadleaf or needleleaf species contribute 25 to 75 percent of the tree cover		6
5a. Tree canopy of 60-100 percent cover	I.B.1 Closed broadleaf forest	
5b. Tree canopy of 25-59 percent cover	I.B.2 Open broadleaf forest	
5c. Tree canopy of 10-24 percent cover	I.B.3 Broadleaf woodland	
6a. Tree canopy of 60-100 percent cover	I.C.1 Closed mixed forest	
6b. Tree canopy of 25-59 percent cover	I.C.2 Open mixed forest	
6c. Tree canopy of 10-24 percent cover	I.C.3 Mixed woodland	
7a. Vegetation with at least 25 percent cover of erect to decumbent shrubs or with at least 10 percent cover of dwarf trees (less than 3 meters [10 ft] tall)		8
7b. Vegetation herbaceous (may have up to 25 percent shrub cover)		15

II. Scrub		
8a. Vegetation with at least 10 percent cover of dwarf trees	II.A Dwarf tree scrub	9
8b. Vegetation with at least 25 percent cover of shrubs and less than 10 percent cover of dwarf trees		10
9a. Dwarf tree canopy of 60-100 percent cover	II.A.1 Closed dwarf tree scrub	
9b. Dwarf tree canopy of 25-59 percent cover	II.A.2 Open dwarf tree scrub	
9c. Dwarf tree canopy of 10-24 percent cover	II.A.3 Dwarf tree scrub woodland	
10a. Shrubs more than 1.5 meters (5 ft) tall	II.B Tall scrub	11
10b. Shrubs less than 1.5 meters (5 ft) tall		12
11a. Shrub canopy cover greater than 75 percent	II.B.1 Closed tall scrub	
11b. Shrub canopy cover of 25-74 percent	II.B.2 Open tall scrub	
12a. Shrubs 20 centimeters to 1.5 meters tall	II.C Low scrub	13
12b. Shrubs under 20 centimeters in height	II.D Dwarf scrub	14
13a. Shrub canopy cover greater than 75 percent	II.C.1 Closed low scrub	
13b. Shrub canopy cover of 25-74 percent, or as low as 2 percent if little or no other vegetation cover present	II.C.2 Open low scrub	
14a. Dryas species dominant in the dwarf shrub layer	II.D.1 Dryas dwarf scrub	
14b. Ericaceous species dominant in the dwarf shrub layer	II.D.2 Ericaceous dwarf scrub	
14c. Willow species dominant in the dwarf shrub layer	II.D.3 Willow dwarf scrub	
III. Herbaceous		
15a. Terrestrial vegetation, or if growing in the water, dominated by emergent vegetation		16
15b. Dominant vegetation growing submerged in water or floating on the water surface, but not emerging above the water	III.D Aquatic herbaceous	21

16a. Grasses, sedges, or rushes (graminoid) plants dominant	III.A Graminoid herbaceous	17
16b. Forbs or bryophytes dominant		18
17a. Grasslands of well-drained, dry sites, such as south-facing bluffs, old beeches, and sand dunes. Typically (but not always) dominated by <i>Elymus</i> spp., <i>Festuca</i> spp., and <i>Deschampsia</i> spp.	III.A.1 Dry graminoid herbaceous	
17b. On moist sites, but usually not with standing water. Usually dominated by <i>Calamagrostis</i> spp., <i>Carex</i> spp. or <i>Eriophorum</i> spp.; tussocks often present	III.A.2 Mesic graminoid herbaceous	
17c. On wet sites, standing water present for part of the year; dominated by either sedges or grasses; includes wet tundra, bogs, marshes, and fens	III.A.3 Wet graminoid herbaceous	
18a. Vegetation dominated by forbs (broadleaf herbs, ferns, or horsetails)	III.B Forb herbaceous	19
18b. Vegetation dominated by mosses or lichens	III.C Bryoid herbaceous	20
19a. On dry sites, usually rocky and well drained; mostly tundra sites	III.B.1 Dry forb herbaceous	
19b. On moist sites but without standing water, mostly within forested areas	III.B.2 Mesic forb herbaceous	
19c. On wet sites, usually with standing water for part of the year	III.B.3 Wet forb herbaceous	
20a. Vegetation cover dominated by mosses	III.C.1 Bryoid moss	
20b. Vegetation cover dominated by lichens	III.C.2 Bryoid lichen	
21a. Vegetation submerged or floating in fresh water	III.D.1 Freshwater aquatic herbaceous	
21b. Vegetation submerged or floating in brackish water	III.D.2 Brackish water aquatic herbaceous	
21c. Vegetation submerged or floating in salt water	III.D.3 Marine aquatic herbaceous	

Vegetation Classification Data Form QA/QC Checklist

This form is to be completed before leaving the field site.

Feature ID: W60HT052 Field Target: 124 Date: 7/5/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. General Information

- ☒ Location data recorded?
- ☒ Photo taken and photo number recorded?

2. Location Description

- ☒ Location of site recorded with enough detail to help relocate?

3. Common Species

- ☒ Scientific name of common species recorded?
- ☒ Percent cover of dominant structure level noted?

4. Habitat Description

- ☒ Habitat described?

5. Classification

- ☒ All three levels of classification recorded?

6. Field Log Book

- ☒ Field form entries consistent with log book?
- ☒ Logbook clearly identifies the Field Target ID and Feature ID?

X Zoe Meade

Field Technician (print)

X

Signature

7/5/14

X Tue Christoph

Field Crew Chief (print)

X

Signature

7/5/14

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/>		Field Target: 138	Map #: <input type="checkbox"/> Map Date: 5/27/14
Date: 7/8/14	Project Name & No.: Alaska LNG 26221306		Feature Id: WG0 HT060 053
Investigators: Joe Christopher, Zoe Meade, Abigail Fisher			Team No.: WG0
State: Alaska	Region: Alaska	Milepost: 123 (PH)	
Latitude: 62° 25' 52.59"	Longitude: 150° 16' 07.58"	Datum: WGS84	
Logbook No.: 003	Logbook Page No.: 47	Picture No.: P-N.S. pit, plug	

SITE PARAMETERS	
Subregion: South Central	Landform (hillslope, terrace, hummocks, etc.): depression
Slope (%): 0 - 2	Local relief (concave, convex, none): concave
Pre-mapped Alaska LNG/NWI classification: PEM1B	Soil Map Unit Name: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Wetland Type: PSS1/EM1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Alaska Vegetation Classification (Vioreck): IIA2 , III A3

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

PS. 47
 90' EWT Corridor

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
<u>Tree Stratum</u> (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
<u>Sapling/Shrub Stratum</u> (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Chamaedaphne calyculata</u>	<u>65</u>	<u>Y</u>	<u>FACW</u>
2. <u>Betula nana</u>	<u>5</u>		<u>FAC</u>
3. <u>Vaccinium oxycoccus</u>	<u>1</u>		<u>OBL</u>
4. <u>Vaccinium uliginosum</u>	<u>2</u>		<u>FAC</u>
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>73</u> 50% of total cover: <u>36.5</u> 20% of total cover: <u>14.6</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

% Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by: _____

OBL species: 41 X 1 = 41

FACW species: 65 X 2 = 130

FAC species: 7 X 3 = 21

FACU species: 0 X 4 = 0

UPL species: 0 X 5 = 0

Column Totals: 113 (A) 192 (B)

PI = B/A = 1.67

VEGETATION (use scientific names of plants)			
<u>Herb Stratum</u> (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Carex microglochin</u>	<u>40</u>	<u>Y</u>	<u>OBL</u>
2. <u>Menyanthes trifoliata</u>	<u>TR</u>		<u>OBL</u>
3. <u>Pedicularis labradorica</u>	<u>TR</u>		
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>40</u> 50% of total cover: <u>20</u> 20% of total cover: <u>8</u>			

Hydrophytic Vegetation Indicators:

X Dominance Test is > 50%

X Prevalence Index is ≤ 3.0

____ Morphological Adaptations¹ (Provide supporting data in Notes)

____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

— % Cover of Wetland Bryophytes

80 Total Cover of Bryophytes

0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

53 (19)

SOIL		Date <u>7/8/14</u> Feature ID <u>W60HT060</u>		Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)					
Depth (inches)	Matrix		Redox Features		Notes
	Color (moist)	%	Color (moist)	%	
0-20	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>Fibric</u> <u>organics</u>

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) <u> </u>	Alaska Color Change (TA4) ⁴ <u> </u>	
Histic Epipedon (A2) <u> </u>	Alaska Redox (A14) <u> </u>	Alaska Alpine Swales (TA5) <u> </u>	
Black Histic (A3) <u> </u>	Alaska Gleyed Pores (A15) <u> </u>	Alaska Redox with 2.5Y Hue <u> </u>	
Hydrogen Sulfide (A4) <u> </u>		Alaska Gleyed without 5Y Hue or Redder Underlying Layer <u> </u>	
Thick Dark Surface (A12) <u> </u>		Other (Explain in Notes) <u> </u>	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: Depth (inches):

Hydric Soil Present (Y/N): Y

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u> </u>	Surface Soil Cracks (B6) <u> </u>	Water-stained Leaves (B9) <u> </u>	Stunted or Stressed Plants (D1) <u> </u>
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) <u> </u>	Drainage Patterns (B10) <u> </u>	Geomorphic Position (D2) <u> </u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) <u> </u>	Oxidized Rhizospheres along Living Roots (C3) <u> </u>	Shallow Aquitard (D3) <u> </u>
Water Marks (B1) <u> </u>	Marl Deposits (B15) <u> </u>	Presence of Reduced Iron (C4) <u> </u>	Microtopographic Relief (D4) <u> </u>
Sediment Deposits (B2) <u> </u>	Hydrogen Sulfide Odor (C1) <u> </u>	Salt Deposits (C5) <u> </u>	FAC-Neutral Test (D5) <u>X</u> <u> </u>
Drift Deposits (B3) <u> </u>	Dry-Season Water Table (C2) <u> </u>	Notes: <u> </u>	
Algal Mat or Crust (B4) <u> </u>	Other (Explain in Notes): <u> </u>		
Iron Deposits (B5) <u> </u>			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u> </u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>3</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0</u>	
Notes: <u> </u>		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>72</u> Dwarf shrub (<0.5m) <u>1</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>40</u> Moss-Lichen <u>80</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>3</u>		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>X</u>
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>X</u> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover <u>X</u> >75% Scattered or Peripheral Cover <u>N/A</u>		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) <u>X</u> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____	
Micorelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>V</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <u>X</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT060 ^{53 JA}

Field Target: 138

Date: 7/8/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade
Wetland Scientist (print)

X *Zoe Meade* 7/8/14
Signature / Date

X Joe Christensen
Field Crew Chief (print)

X *Joe Christensen* 7/8/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION 2000' study			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/>		Field Target: 130	Map #: 90 Map Date: 5/27/14
Date: 7/6/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT054
Investigators: Joe Christopher, Zoe Meade, Abigail Fisher			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 651.5	
Latitude: 62° 29' 18.85"		Longitude: 150° 16' 21.58"	Datum: WGS84
Logbook No.: 003	Logbook Page No.: 042	Picture No.: P-N, S, pit, plug	

SITE PARAMETERS	
Subregion: South central	Landform (hillslope, terrace, hummocks, etc.): depression
Slope (%): 0-2	Local relief (concave, convex, none): concave
Pre-mapped Alaska LNG/NWI classification: PSS1/EM1B	Soil Map Unit Name: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Wetland Type: PEM/SS1F
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Alaska Vegetation Classification (Viereck): IIIA3, IIC2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

Site sketch and notes on page 042 of Logbook 003
Disturbed powerline R.O.W to west.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: <u>0</u>			
50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Betula nana</i>	25	Y	FAC
2. <i>Salix pulchra</i>	10	Y	FACW
3. <i>Spiraea stevenii</i>	3		FACU
4.			
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>38</u>			
50% of total cover: <u>19</u> 20% of total cover: <u>7.6</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

% Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:

OBL species: 80 X 1 = 80

FACW species: 10 X 2 = 20

FAC species: 110 X 3 = 330

FACU species: 3 X 4 = 12

UPL species: 0 X 5 = 0

Column Totals: 203 (A) 442 (B)

PI = B/A = 2.17

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Comarum palustre</i>	30		OBL
2. <i>Equisetum arvense</i>	40	Y	FAC
3. <i>Carex aquatilis</i>	30		OBL
4. <i>Carex canescens</i>	10		OBL
5. <i>Carex magellanica</i>	10		OBL
6. <i>Calamagrostis canadensis</i>	45	Y	FAC
7.			
8.			
9.			
10.			
Total Cover: <u>165</u>			
50% of total cover: <u>82.5</u> 20% of total cover: <u>33</u>			

Hydrophytic Vegetation Indicators:

☒ Dominance Test is > 50%

☒ Prevalence Index is ≤ 3.0

____ Morphological Adaptations¹ (Provide supporting data in Notes)

____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

100 % Cover of Wetland Bryophytes

100 Total Cover of Bryophytes

8 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/6/14</u> Feature ID <u>W60HT054</u>		Soil Pit Required (Y/N) <u>X</u>				
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features			Texture	Notes	
	Color (moist)	%	Color (moist)	%	Type ¹			Loc ²
0-20							Fibric	Saturated organics

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____	
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____	
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes: SPAGNUM MOG

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) <u>X</u>
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): _____	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0</u>	

Notes: Depression & Drainage Through Depression.

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES	
P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <u>X</u> Aquatic Bed _____	
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>38</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>165</u> Moss-Lichen <u>110</u> Floating <u>0</u> Submerged <u>0</u>	
Number of Wetland Types (M): <u>1</u>	Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) <u>X</u>	
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover <u>X</u> 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover <u>X</u> N/A _____	
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____	
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____	
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>	
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____	
Vegetative Interspersion (P): Low (large patches, concentric rings) <u>X</u> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____	
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____	

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet <u>X</u> Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded <u>X</u>	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) <u>X</u> Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow <u>X</u> Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) <u>X</u> Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading <u>5.79</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above <u>X</u> Connected Upstream & Downstream <u>X</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT054

Field Target: 130

Date: 7/6/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

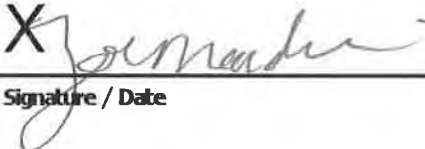
- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X  7/6/14

Signature / Date

X Joe Christian

Field Crew Chief (print)

X  7/6/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION				outside 2000' corridor	
Survey Type: Centerline		Access Road (explain)		Other (explain) <input checked="" type="checkbox"/>	Field Target: 132
Map #: 92		Map Date: 5/27/14			
Date: 7/6/14	Project Name & No.: Alaska LNG 26221306			Feature Id: W60HT057055	
Investigators: JC, ZM, AF				Team No.: W60	
State: Alaska	Region: Alaska		Milepost: 126.1 (Parks)		
Latitude: 62° 28' 38.43"		Longitude: 150° 16' 18.12"		Datum: WGS84	
Logbook No.: 003		Logbook Page No.: 044		Picture No.: P-N.S. pit, plug	

SITE PARAMETERS	
Subregion: South central	Landform (hillslope, terrace, hummocks, etc.): depression
Slope (%): 0-2	Local relief (concave, convex, none): concave
Pre-mapped Alaska LNG/NWI classification: PSS1B	Soil Map Unit Name: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No (if no explain in Notes)	
Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No (if no, explain in Notes.)	
Are Vegetation, Soil, or Hydrology Significantly Disturbed? No <input checked="" type="checkbox"/> (If yes, explain in Notes)	
Are Vegetation, Soil, or Hydrology Naturally Problematic? No <input checked="" type="checkbox"/> (If yes, explain in Notes.)	
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No	Wetland Type: PEM1F
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No	Alaska Vegetation Classification (Viereck): III A3

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

pg 44 Logbook 003
point located outside 2000' Corridor

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)

Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Betula neoalaskana</i>	<u>2</u>		FACU
2. <i>Picea glauca</i>	<u>1</u>		FACU
3.			
4.			

Total Cover: 3
 50% of total cover: 1.5 20% of total cover: 0.6

Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Alnus</i> esp.	<u>3</u>	<u>Y</u>	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			

Total Cover: 6
 50% of total cover: 3 20% of total cover: 1.2

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)
 Total Number of Dominant Species Across All Strata: 3 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:
 OBL species: 40 X 1 = 40
 FACW species: 15 X 2 = 30
 FAC species: 113 X 3 = 339
 FACU species: 3 X 4 = 12
 UPL species: 0 X 5 = 0
 Column Totals: 171 (A) 421 (B)
 PI = B/A = 2.46

Tree stratum added to shrub stratum
 since there was <5% cover

VEGETATION (use scientific names of plants)

Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Comarum palustre</i>	<u>40</u>	<u>Y</u>	OBL
2. <i>Equisetum arvense</i>	<u>20</u>		FAC
3. <i>Calamagrostis canadensis</i>	<u>90</u>	<u>Y</u>	FAC
4. <i>Viola palustris</i>	<u>15</u>		FACW
5.			
6.			
7.			
8.			
9.			
10.			

Total Cover: 165
 50% of total cover: 82.5 20% of total cover: 33

Hydrophytic Vegetation Indicators:

☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
10 % Cover of Wetland Bryophytes
10 Total Cover of Bryophytes
30 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/6/14</u>		Feature ID <u>W60HTJ057</u>		Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-10							Fibric	
10-20	10YR 2/1	100					Silt loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) <u>X</u>	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) <u>X</u>
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>2-4</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0</u>	
Notes: <u>Tussocks</u>		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>3</u> Sapling (<5 dbh, <6m tall) <u>6</u> Tall shrub (2-6m) <u>3</u> Short shrub (0.5-2m) <u>0</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>90</u> Short herb (<1m) <u>15</u> Moss-Lichen <u>10</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>1</u>	Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>X</u> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site _____ Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) <u>X</u> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty <u>X</u> Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded <u>X</u>	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) <u>X</u> Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) <u>X</u> pH Reading <u>4.83</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated <u>X</u> Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT0575 JA Field Target: 132 Date: 7/6/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X

Signature / Date

Zoe Meade 7/6/14

X

Field Crew Chief (print)

Soe Christopher

X

Signature / Date

Soe Christopher 7/6/14

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION				2000' corridor	
Survey Type: Centerline		Access Road (explain)		Other (explain) <input checked="" type="checkbox"/>	
Field Target: 139		Map #: 97 Map Date: 5/27/14			
Date: 7/6/14		Project Name & No.: Alaska LNG 26221306		Feature Id: W60HT050056	
Investigators: JC, LM, AF				Team No.: W60	
State: Alaska		Region: Alaska		Milepost: 656	
Latitude: 62°25'35.82"		Longitude: 150°16'03.36"		Datum: WGS84	
Logbook No.: 003		Logbook Page No.: 045		Picture No.: P.N.S. pit. plug	

SITE PARAMETERS	
Subregion: South central	Landform (hillslope, terrace, hummocks, etc.): Flat
Slope (%): 0-1	Local relief (concave, convex, none): none
Pre-mapped Alaska LNG/NWI classification: PEM1B	Soil Map Unit Name: n/a
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No (if no explain in Notes)	
Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No (if no, explain in Notes.)	
Are Vegetation, Soil, or Hydrology Significantly Disturbed? No <input checked="" type="checkbox"/> (If yes, explain in Notes)	
Are Vegetation, Soil, or Hydrology Naturally Problematic? No <input checked="" type="checkbox"/> (If yes, explain in Notes)	
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No	Wetland Type: PSS1E M1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No	Alaska Vegetation Classification (Viereck): III C2, III A X.2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

P45 for Sketch

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)					
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: <u>3</u> (A) Total Number of Dominant Species Across All Strata: <u>3</u> (B) % Dominant Species that are OBL, FACW, or FAC: <u>100</u> (A/B)	
1.					
2.					
3.					
4.					
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>					
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species: <u>52</u> X 1 = <u>52</u> FACW species: <u>61</u> X 2 = <u>122</u> FAC species: <u>8</u> X 3 = <u>24</u> FACU species: <u>0</u> X 4 = <u>0</u> UPL species: <u>0</u> X 5 = <u>0</u> Column Totals: <u>124</u> (A) <u>198</u> (B) PI = B/A = <u>1.64</u>	
1. <i>Chamaedaphne calyculata</i>	<u>20</u>	<u>Y</u>	<u>FACW</u>		
2. <i>Rhododendron tomentosum</i>	<u>20</u>	<u>Y</u>	<u>FACW</u>		
3. <i>Empetrum nigrum</i>	<u>5</u>		<u>FAC</u>		
4. <i>Betula nana</i>	<u>3</u>		<u>FAC</u>		
5. <i>Picea mariana</i>	<u>5</u>		<u>FACW</u>		
6. <i>Vaccinium oxycoccus</i>	<u>2</u>		<u>OBL</u>		
7. <i>Vaccinium vitis-idaea</i>	<u>TR</u>		<u>FAC</u>		
8.					
9.					
Total Cover: <u>55</u> 50% of total cover: <u>27.5</u> 20% of total cover: <u>11</u>					

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Hydrophytic Vegetation Indicators: <input checked="" type="checkbox"/> Dominance Test is > 50% <input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
1. <i>Carex microchaeta</i>	<u>10</u>		<u>FACW</u>	
2. <i>Carex microglochin</i>	<u>50</u>	<u>Y</u>	<u>OBL</u>	
3. <i>Rubus Chamdemarous</i>	<u>6</u>		<u>FACW</u>	
4.				
5.				
6.				
7.				
8.				
9.				
10.				_____ % Bare Ground _____ % Cover of Wetland Bryophytes _____ % Total Cover of Bryophytes _____ % Cover of Water Hydrophytic Vegetation Present (Y/N): <u>Y</u> Notes: (If observed, list morphological adaptations below):
Total Cover: <u>66</u> 50% of total cover: <u>33</u> 20% of total cover: <u>13.2</u>				

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/6/14</u> Feature ID <u>W60HI 058</u>		Soil Pit Required (Y/N) <u>Y</u>				
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features			Texture	Notes	
	Color (moist)	%	Color (moist)	%	Type ¹			Loc ²
0-20							Fibric	Organics, saturated

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____	
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____	
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes: _____

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) <u>X</u>
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) <u>X</u>
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): _____	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0</u>	

Notes: Stunted grass (shrub)

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>0.5</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>52.4</u> Dwarf shrub (<0.5m) <u>2</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>6.6</u> Moss-Lichen <u>10.0</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u>	Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>X</u>	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <u>X</u> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) <u>X</u> High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial/Quaternary Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) <u>X</u> Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <u>X</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT586 Field Target: 139 Date: 7/6/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X

Signature / Date

[Signature] 7/6/14

X

Field Crew Chief (print)

X

Signature / Date

[Signature] 7/6/14

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) <input checked="" type="checkbox"/>		Field Target: 202	Map #: 1 Map Date: 8/29/14
Date: 9/3/2014	Project Name & No.: Alaska LNG 26221306		Feature Id: W60 HT 052 57 (1)
Investigators: JC, JA			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 664.6	
Latitude: 62° 21' 14.69		Longitude: 150° 16' 28.25	Datum: WGS84
Logbook No.: W60 - B	Logbook Page No.: 1	Picture No.: W60	

SITE PARAMETERS	
Subregion: South central	Landform (hillslope, terrace, hummocks, etc.):
Slope (%): 0	Local relief (concave, convex, none): concave
Pre-mapped Alaska LNG/NWI classification: N/A	Soil Map Unit Name: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (if no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: PEM1/SS1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Vioreck): IIIA3/II C2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

Full
W60-3 P1
LogBook

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea mariana</i>			
2.			
3.			
4.			
Total Cover: _____ 50% of total cover: _____ 20% of total cover: _____			
Sapling/Shrub Stratum (_____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea mariana</i>	51.		Fac W
2. <i>Rhododendrum greenlandicum</i>	51.		Fac
3. <i>Betula nana</i>	71.		Fac
4. <i>Chamaedaphne calyculata</i>	301.	Y	Fac W
5. <i>Empetrum nigrum</i>	31.		Fac
6. <i>Picea glauca</i>	51.		Fac U
7.			
8.			
9.			
Total Cover: <u>551.</u> 50% of total cover: <u>275.5</u> 20% of total cover: <u>110.2</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)
 Total Number of Dominant Species Across All Strata: 2 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: 63 X 1 = 63
 FACW species: 35 X 2 = 70
 FAC species: 16 X 3 = 48
 FACU species: 5 X 4 = 20
 UPL species: 0 X 5 = 0
 Column Totals: 119 (A) 201 (B)
 PI = B/A = 1.68

VEGETATION (use scientific names of plants)			
Herb Stratum (_____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Carex limosa</i>	60	Y	Obl
2. <i>Carex microglochin</i>	31.		Obl
3. <i>Calamagrostis canadensis</i>	11.		Fac
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>6041.</u> 50% of total cover: <u>3021.</u> 20% of total cover: <u>1208</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
NA % Cover of Wetland Bryophytes
100 Total Cover of Bryophytes
0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

057 82

SOIL		Date <u>9/3/14</u> Feature ID <u>W100311 852</u>				Soil Pit Required (Y/N) <u>X</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-20							Fabric	Saturated

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer
Thick Dark Surface (A12) _____		Other (Explain in Notes)

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: None Depth (inches): Na

Hydric Soil Present (Y/N): Y

Notes:
Hydric soils observed

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) <u>X</u>
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) <u>X</u>	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) <u>X</u>
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes):		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>Na</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0"</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0"</u>	

Notes:
Hydrology observed

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES	
P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <input checked="" type="checkbox"/> Aquatic Bed _____	
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>10</u> Tall shrub (2-6m) <u>—</u> Short shrub (0.5-2m) <u>42</u> Dwarf shrub (<0.5m) <u>3</u> Tall herb (≥1m) <u>64</u> Short herb (<1m) <u>—</u> Moss-Lichen <u>100</u> Floating <u>—</u> Submerged <u>—</u>	
Number of Wetland Types (M): <u>3</u>	Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven <input checked="" type="checkbox"/> Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <input checked="" type="checkbox"/> Very High Density (80-100%) _____	
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <input checked="" type="checkbox"/> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____	
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <input checked="" type="checkbox"/> High (>25) _____	
Presence of Islands (M): Absent (none) <input checked="" type="checkbox"/> One or Few _____ Several to Many _____ N/A _____	
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <input checked="" type="checkbox"/>	
Dead Woody Material (P): Low Abundance (0-25% of surface) <input checked="" type="checkbox"/> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____	
Vegetative Interspersion (P): Low (large patches, concentric rings) <input checked="" type="checkbox"/> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____	
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <input checked="" type="checkbox"/> Riverine _____ Estuarine Fringe _____	

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <input checked="" type="checkbox"/> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <input checked="" type="checkbox"/> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <input checked="" type="checkbox"/> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <input checked="" type="checkbox"/> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <input checked="" type="checkbox"/> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <input checked="" type="checkbox"/> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <input checked="" type="checkbox"/> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <input checked="" type="checkbox"/> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <input checked="" type="checkbox"/> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <input checked="" type="checkbox"/> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <input checked="" type="checkbox"/> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	


LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <input checked="" type="checkbox"/> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <input checked="" type="checkbox"/>	
Watershed Land Use: 0-5% Rural <input checked="" type="checkbox"/> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) <input checked="" type="checkbox"/>	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W6015057 

Field Target: 202

Date: 9/3/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☐ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Wetland Scientist (print)

X

Signature / Date

X

Field Crew Chief (print)

X

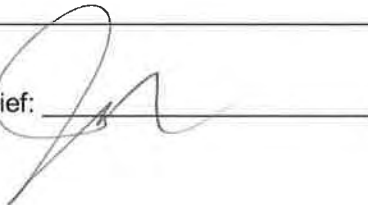
Signature / Date

Jennifer Anderson 9/3/14

Vegetation Classification Data Form

Site Description		
Date: 9/3/14	Project Name & #: Alaska LNG 26221306	Field Target: 202
Investigators: SC/SA		Feature ID: W60 HTO 508
Latitude:	Longitude:	Datum: WGS84
Logbook #: W60-14	Logbook Page #: 2	Picture #: W60 NE, SW
Location Description:		
Upland knoll		
Common Species Observed (Scientific Name)		
Alnus sp	Betula neoalaskana	
Gymnocarpium dryopteris	Lycopodium sp	
Shepherdia canadensis		
Picea glauca		
Percent Cover of Dominant Structure Level:		
Habitat Description:		
Mixed forest (open)		
Alaska Vegetation Classification: Level I, Level II, Level III		
IC2, FC2		
Notes:		

Field Crew Chief:



Field Scientist/Technician



Vegetation Classification Data Form

Table I-Alaska vegetation classification to level III

Level I	Level II	Level III
I Forest	A Needleleaf (conifer) forest	(1) Closed needleleaf (conifer) forest (2) Open needleleaf (conifer) forest (3) Needleleaf (conifer) woodland
	B Broadleaf forest	(1) Closed broadleaf forest (2) Open broadleaf forest (3) Broadleaf woodland
	C Mixed forest	(1) Closed mixed forest (2) Open mixed forest (3) Mixed woodland
II Scrub	A Dwarf tree scrub	(1) Closed dwarf tree scrub (2) Open dwarf tree scrub (3) Dwarf tree scrub woodland
	B Tall scrub	(1) Closed tall scrub (2) Open tall scrub
	C Low scrub	(1) Closed low scrub (2) Open low scrub
	D Dwarf scrub	(1) Dryas dwarf scrub (2) Ericaceous dwarf scrub (3) Willow dwarf scrub
III Herbaceous	A Graminoid herbaceous	(1) Dry graminoid herbaceous (2) Mesic graminoid herbaceous (3) Wet graminoid herbaceous (emergent)
	B Forb herbaceous	(1) Dry forb herbaceous (2) Mesic forb herbaceous (3) Wet forb herbaceous (emergent)
	C Bryoid herbaceous	(1) Mosses (2) Lichens
	D Aquatic (nonemergent) herbaceous	(1) Freshwater aquatic herbaceous (2) Brackish water aquatic herbaceous (3) Marine aquatic herbaceous

Descriptions of levels I, II, III, and IV follow the classification table.

1a. Trees over 3 meters (10 ft) tall are present and have a canopy cover of 10 percent or more	I Forest	2
1b. Trees over 3 meters (10 ft) tall are absent or nearly so. Less than 10 percent cover. (Dwarf trees, less than 3 meters [10 ft] tall may be present and abundant)		7
I Forest		
2a. Over 75 percent of tree cover contributed by needleleaf (conifer) species	I A Needleleaf forest	3
2b. Less than 75 percent of tree cover contributed by needleleaf (conifer) species		4
3a. Tree canopy of 60-100 percent cover	I A 1 Closed needleleaf forest	
3b. Tree canopy of 25-59 percent cover	I A 2 Open needleleaf forest	
3c. Tree canopy of 10-24 percent cover	I A 3 Needleleaf woodland	
4a. Over 75 percent of tree cover contributed by broadleaf species	I B Broadleaf forest	5
4b. Broadleaf or needleleaf species contribute 25 to 75 percent of the tree cover		6
5a. Tree canopy of 60-100 percent cover	I B 1 Closed broadleaf forest	
5b. Tree canopy of 25-59 percent cover	I B 2 Open broadleaf forest	
5c. Tree canopy of 10-24 percent cover	I B 3 Broadleaf woodland	
6a. Tree canopy of 60-100 percent cover	I C 1 Closed mixed forest	
6b. Tree canopy of 25-59 percent cover	I C 2 Open mixed forest	
6c. Tree canopy of 10-24 percent cover	I C 3 Mixed woodland	
7a. Vegetation with at least 25 percent cover of erect to decumbent shrubs or with at least 10 percent cover of dwarf trees (less than 3 meters [10 ft] tall)		8
7b. Vegetation herbaceous (may have up to 25 percent shrub cover)		15

II. Scrub		
8a. Vegetation with at least 10 percent cover of dwarf trees	II A Dwarf tree scrub	9
8b. Vegetation with at least 25 percent cover of shrubs and less than 10 percent cover of dwarf trees		10
9a. Dwarf tree canopy of 60-100 percent cover	II A.1 Closed dwarf tree scrub	
9b. Dwarf tree canopy of 25-59 percent cover	II A.2 Open dwarf tree scrub	
9c. Dwarf tree canopy of 10-24 percent cover	II A 3 Dwarf tree scrub woodland	
10a. Shrubs more than 1.5 meters (5 ft) tall	II B Tall scrub	11
10b. Shrubs less than 1.5 meters (5 ft) tall		12
11 a. Shrub canopy cover greater than 75 percent	II B.1 Closed tall scrub	
11 b. Shrub canopy cover of 25-74 percent	II B 2 Open tall scrub	
12a. Shrubs 20 centimeters to 1.5 meters tall	II C Low scrub	13
12b. Shrubs under 20 centimeters in height	II D Dwarf scrub	14
13a. Shrub canopy cover greater than 75 percent	II C.1 Closed low scrub	
13b. Shrub canopy cover of 25-74 percent, or as low as 2 percent if little or no other vegetation cover present	II C.2 Open low scrub	
14a. Dryas species dominant in the dwarf shrub layer	II D.1 Dryas dwarf scrub	
14b. Ericaceous species dominant in the dwarf shrub layer	II D.2 Ericaceous dwarf scrub	
14c. Willow species dominant in the dwarf shrub layer	II D.2 Willow dwarf scrub	
III. Herbaceous		
15a. Terrestrial vegetation, or if growing in the water, dominated by emergent vegetation		16
15b. Dominant vegetation growing submerged in water or floating on the water surface, but not emerging above the water	III D Aquatic herbaceous	21

16a. Grasses, sedges, or rushes (graminoid) plants dominant	III A Graminoid herbaceous	17
16b. Forbs or bryophytes dominant		18
17a. Grasslands of well-drained, dry sites, such as south-facing bluffs, old beaches, and sand dunes. Typically (but not always) dominated by <i>Elymus</i> spp., <i>Festuca</i> spp., and <i>Deschampsia</i> spp.	III A.1 Dry graminoid herbaceous	
17b. On moist sites, but usually not with standing water. Usually dominated by <i>Calamagrostis</i> spp., <i>Carex</i> spp. or <i>Eriophorum</i> spp.; tussocks often present	III A.2 Mesic graminoid herbaceous	
17c. On wet sites, standing water present for part of the year; dominated by either sedges or grasses; includes wet tundra, bogs, marshes, and fens	III A 3 Wet graminoid herbaceous	
18a. Vegetation dominated by forbs (broadleaf herbs, ferns, or horsetails)	III B Forb herbaceous	19
18b. Vegetation dominated by mosses or lichens	III C Bryoid herbaceous	20
19a. On dry sites, usually rocky and well drained; mostly tundra sites	III B.1 Dry forb herbaceous	
19b. On moist sites but without standing water, mostly within forested areas	III B.2 Mesic forb herbaceous	
19c. On wet sites, usually with standing water for part of the year	III B.3 Wet forb herbaceous	
20a. Vegetation cover dominated by mosses	III C.1 Bryoid moss	
20b. Vegetation cover dominated by lichens	III C.2 Bryoid lichen	
21a. Vegetation submerged or floating in fresh water	III D.1 Freshwater aquatic herbaceous	
21 b. Vegetation submerged or floating in brackish water	III D.2 Brackish water aquatic herbaceous	
21c. Vegetation submerged or floating in salt water	III D 3 Marine aquatic herbaceous	

Vegetation Classification Data Form QA/QC Checklist

This form is to be completed before leaving the field site.

Feature ID: W60HT0519 Field Target: 202 Date: 9/3/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. General Information

- ☒ Location data recorded?
- ☒ Photo taken and photo number recorded?

2. Location Description

- ☒ Location of site recorded with enough detail to help relocate?

3. Common Species

- ☒ Scientific name of common species recorded?
- ☒ Percent cover of dominant structure level noted?

4. Habitat Description

- ☒ Habitat described?

5. Classification

- ☒ All three levels of classification recorded?

6. Field Log Book

- ☒ Field form entries consistent with log book?
- ☒ Logbook clearly identifies the Field Target ID and Feature ID?

X Jennifer Anderson
Field Technician (print)

X [Signature] 9/3/14
Signature

X Kee Christopher
Field Crew Chief (print)

X [Signature] 9/3/14
Signature

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 203	Map #: 2 Map Date: 8/29/14
Date: 9/3/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60 HT059
Investigators: JC, JA			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 666.43	
Latitude: 62° 19' 47.61" 47.61" N	Longitude: 150° 16' 35.51" W	Datum: WGS84	
Logbook No.: W60-4	Logbook Page No.: 3	Picture No.: W60 HT059	

SITE PARAMETERS	
Subregion: South Central	Landform (hillslope, terrace, hummocks, etc.): Terrace
Slope (%): 3-540	Local relief (concave, convex, none): CONVEY
Pre-mapped Alaska LNG/NWI classification: N/A	Soil Map Unit Name: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (if no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: UPL
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Vioreck): IC2, IC2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

Recent heavy rainfall

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea glauca</i>	10%	Y	Fac U
2. <i>Betula neolaskana</i>	25%	Y	Fac U
3.			
4.			
Total Cover: <u>35%</u>			
50% of total cover: <u>17.5</u> 20% of total cover: <u>7%</u>			
Sapling/Shrub Stratum (_____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Shepherdia canadensis</i>	25%	Y	Fac U
2. <i>Spiraea Stevenii</i>	5%		Fac U
3.			
4.			
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>30%</u>			
50% of total cover: <u>15%</u> 20% of total cover: <u>6%</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)
 Total Number of Dominant Species Across All Strata: 5 (B)
 % Dominant Species that are OBL, FACW, or FAC: 40% (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: — X 1 = _____
 FACW species: 15 X 2 = 30
 FAC species: 95 X 3 = 285
 FACU species: 80 X 4 = 320
 UPL species: — X 5 = _____
 Column Totals: 190 (A) 635 (B)
 PI = B/A = 3.34

VEGETATION (use scientific names of plants)			
Herb Stratum (_____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Athyrium cylasorum</i>	35%	Y	Fac
2. <i>Calamagrostis canadensis</i>	50%	Y	Fac
3. <i>Rubus Chamaemorus</i>	15%		Fac W
4. <i>Cornus canadensis</i>	15%		Fac U
5. <i>Equisetum sylvaticum</i>	10%		Fac
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>125</u>			
50% of total cover: <u>62.5</u> 20% of total cover: <u>25%</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
☒ Morphological Adaptations¹ (Provide supporting data in Notes)
☒ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
10 % Cover of Wetland Bryophytes
5 Total Cover of Bryophytes
0 % Cover of Water
Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>11/3/19</u>		Feature ID <u>W1001139</u>		Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features			Texture	Notes	
	Color (moist)	%	Color (moist)	%	Type ¹			Loc ²
0-9"							Fibric	Saturated
9-20"	10YR 2/2	100					SL	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) <u>X</u>	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____	
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer	
Thick Dark Surface (A12) _____		Other (Explain in Notes)	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: Depth (inches): N/A

Hydric Soil Present (Y/N): Y

Notes: Recent heavy rains likely influencing field indicator.

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: <u>Recent Heavy Rains</u> <u>Like Int. Field Indicators</u>	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>0"</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>4"</u>	
Saturation Present (Y/N): (includes capillary fringe) <u>X</u>	Depth (in): <u>0"</u>	
Notes: See notes for hydric soil notes.		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES	
P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____	
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____	
Number of Wetland Types (M): _____	Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____	
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____	
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____	
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____	
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____	
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____	
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____	
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____	

SOIL VARIABLES
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____

HYDROLOGIC VARIABLES
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____

LANDSCAPE VARIABLES (M)
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60HT059 Field Target: 903 Date: 9/13/14
For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

Upland

- ☐ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?

☒ Two photos were taken for each Observation Point (vegetation/site overview)?

Full point

X

Jennifer Anderson

Wetland Scientist (print)

X

Jennifer Anderson 9/3/14

Signature / Date

X

Joe Christopher

Field Crew Chief (print)

X

Joe Christopher 9/3/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input type="checkbox"/>		Field Target: 053	Map #: 34/130 Map Date: 5/27/14
Date: 6/27/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W61 HT 001
Investigators: K DEWITS J Anderson A Fisher			Team No.: W61
State: Alaska	Region: Alaska	Milepost: 522.8	
Latitude: 63° 53' 08.043"	Longitude: 149° 04' 30.719"	Datum: WGS84	
Logbook No.: W61-2	Logbook Page No.: 1	Picture No.: P-W61 H001 - P1; Plug: SW, NE	

SITE PARAMETERS	
Subregion: Interior	Landform (hillslope, terrace, hummocks, etc.): Flat
Slope (%): 0	Local relief (concave, convex, none): None
Pre-mapped Alaska LNG/NWI classification: PSS 1/4B	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)

SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Wetland Type: PSS-3 PSS1/4B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Alaska Vegetation Classification (Viereck): IIC1, IIA23

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 1 for sketch
 & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: <u>26'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<i>Picea glauca</i>	15	Y	FACU
2.				
3.				
4.				
Total Cover: <u>15</u>				
50% of total cover: <u>7.5</u>		20% of total cover: <u>3</u>		
Sapling/Shrub Stratum (<u>26'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<i>Betula glandulosa</i>	80	Y	FAC
2.	<i>Vaccinium vitis-idaea</i>	10		FAC
3.	<i>Vaccinium uliginosum</i>	20		FAC
4.	<i>Picea glauca</i>	10		FACU
5.	<i>Salix purpurea</i>	15		FAC
6.				
7.				
8.				
9.				
Total Cover: <u>135</u>				
50% of total cover: <u>67.5</u>		20% of total cover: <u>27</u>		

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

% Dominant Species that are OBL, FACW, or FAC: 67 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:

OBL species: — X 1 = —

FACW species: 2 X 2 = 4

FAC species: 135 X 3 = 405

FACU species: 29 X 4 = 100

UPL species: — X 5 = —

Column Totals: 162 (A) 509 (B)

PI = B/A = 3.14

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>26'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<i>Petasites frigidus</i>	2		FACW
2.	<i>Calamagrostis canadensis</i>	10	Y	FAC
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
Total Cover: <u>12</u>				
50% of total cover: <u>6</u>		20% of total cover: <u>2.4</u>		

Hydrophytic Vegetation Indicators:

☒ Dominance Test is > 50%

☐ Prevalence Index is ≤ 3.0

☐ Morphological Adaptations¹ (Provide supporting data in Notes)

☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

— % Cover of Wetland Bryophytes

40% Total Cover of Bryophytes

5 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>6/27/14</u> Feature ID <u>W21 HT001</u>		Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)					
Depth (inches)	Matrix		Redox Features		Notes
	Color (moist)	%	Color (moist)	%	
<u>0-4</u>					<u>Fabric Saturated</u>
<u>4-5</u>	<u>10YR 5/1</u>	<u>390</u>	<u>7.5YR 5/8</u>	<u>10</u>	<u>C m</u>
<u>5-6</u>	<u>10YR 5/1</u>	<u>100</u>	<u>7.5YR 5/8</u>	<u>40</u>	<u>C M</u>
<u>6"</u>	<u>Frozen</u>				

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ <u>X</u>
Histic Epipedon (A2) <u>X</u>	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: FROZEN Depth (inches): 6"

Hydric Soil Present (Y/N): Y

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) <u>X</u>
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>1/2"</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0"</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0"</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>15</u> Sapling (<5 dbh, <6m tall) <u>10</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>115</u> Dwarf shrub (<0.5m) <u>10</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>12</u> Moss-Lichen <u>40</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>1</u> Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) <u>0</u>		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover <u>0</u> N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site _____ Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>0</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>0</u>		
HGM Class (P): Slope _____ Flat <u>X</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty <u>X</u> Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>0</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Micorelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>0</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) <u>0</u> pH Reading <u>5.34</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable <u>0</u>	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below <u>X</u> Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>0</u>	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized <u>0</u> 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

[Signature]

GPS Technician QA/QC check:

[Signature]

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61H001

Field Target: 053

Date: 6/27/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Jennifer Anderson

Wetland Scientist (print)

X

Jennifer Anderson

Signature / Date

X

Kim DeGroot

Field Crew Chief (print)

X

Billy C. Hoff

Signature / Date

6/27/14

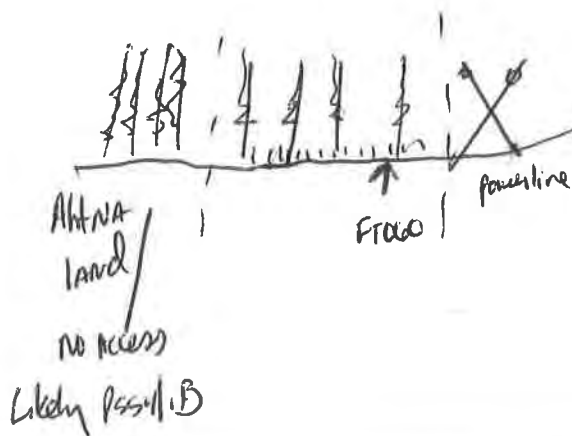
WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____	Field Target: 060	Map #: 39130	Map Date: 5/27/14
Date: 6/28/14	Project Name & No.: Alaska LNG 26221306	Feature Id: W61 H1002	
Investigators: L. DeGaris J. Anderson A. Fisher	Team No.: W61		
State: Alaska	Region: Alaska	Milepost: 547.5	
Latitude: 63° 36' 26.76"	Longitude: 148° 46' 21.20"	Datum: WGS84	
Logbook No.: W61-2	Logbook Page No.: 4	Picture No.: P-W61H1002-PT; Plug, SW, SE	

SITE PARAMETERS	
Subregion: Interior	Landform (hillslope, terrace, hummocks, etc.): Flat Slope
Slope (%): 2	Local relief (concave, convex, none): NONE
Pre-mapped Alaska LNG/NWI classification: Upland	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present? Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed? No <input checked="" type="checkbox"/> (If yes, explain in Notes)	
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic? No <input checked="" type="checkbox"/> (If yes, explain in Notes.)	
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: PFO4 / SS1B PSS-14B PSS4/1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Vioreck): IA2, IC1

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 4
for site sketch & notes



WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				Dominance Test worksheet:	
Tree Stratum (Plot sizes: <u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	No. of Dominant Species that are OBL, FACW, or FAC: <u>5</u> (A)	
1. <i>Picea mariana</i>	20	Y	FACW	Total Number of Dominant Species Across All Strata: <u>5</u> (B)	
2.				% Dominant Species that are OBL, FACW, or FAC: <u>100</u> (A/B)	
3.					
4.					
Total Cover: <u>20</u>				Multiply by:	
50% of total cover: <u>10</u>				20% of total cover: <u>4</u>	
Sapling/Shrub Stratum (<u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	OBL species: <u>—</u> X 1 = <u>—</u>	
1. <i>Betula nana</i>	35	Y	FAC	FACW species: <u>80</u> X 2 = <u>160</u>	
2. <i>Rhododendron groenlandicum</i>	30	Y	FAC	FAC species: <u>125</u> X 3 = <u>375</u>	
3. <i>Vaccinium uliginosum</i>	30	Y	FAC	FACU species: <u>—</u> X 4 = <u>—</u>	
4. <i>Vaccinium vitis-idaea</i>	20		FAC	UPL species: <u>—</u> X 5 = <u>—</u>	
5. <i>Empetrum nigrum</i>	8		FAC	Column Totals: <u>205</u> (A)	<u>535</u> (B)
6. <i>Salix pulchra</i>	5		FACW	PI = B/A = <u>2.6</u>	
7. <i>Picea Mariana</i>	25		FACW		
8.					
9.					
Total Cover: <u>153</u>					
50% of total cover: <u>76.5</u>				20% of total cover: <u>30.6</u>	

VEGETATION (use scientific names of plants)				Hydrophytic Vegetation Indicators:	
Herb Stratum (<u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	<input checked="" type="checkbox"/> Dominance Test is > 50%	
1. <i>Rubus chamaemorus</i>	25	Y	FACW	<input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0	
2. <i>Geocaulon lividum</i>	T		FACU	_____ Morphological Adaptations ¹ (Provide supporting data in Notes)	
3. <i>Petasites frigidus</i>	5		FACW	_____ Problematic Hydrophytic Vegetation ¹ (Explain)	
4. <i>Carex</i> spp.	T		FAC	¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.	
5. <i>Rubus chamaemorus</i>			FACW		
6. <i>Calamagrostis canadensis</i>	2		FAC		
7.					
8.					
9.					
10.					
Total Cover: <u>32</u>				% Bare Ground: <u>3</u>	
50% of total cover: <u>16</u>				% Cover of Wetland Bryophytes: _____	
20% of total cover: <u>6.4</u>				Total Cover of Bryophytes: <u>50</u>	
				% Cover of Water: <u>0</u>	
				Hydrophytic Vegetation Present (Y/N): <u>Y</u>	
				Notes: (If observed, list morphological adaptations below):	

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>6/22/14</u> Feature ID <u>W6LHT002</u>				Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features				Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²	
0-7"							Fabric Saturated
7"	Frozen						

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: Frozen Depth (inches): 7"

Hydric Soil Present (Y/N): Y

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) <u>X</u>
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>Ø</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>6.5"</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>Ø"</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved <u>1810</u> Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>20</u> Sapling (<5 dbh, <6m tall) <u>25</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>118</u> Dwarf shrub (<0.5m) <u>20</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>32</u> Moss-Lichen <u>50</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u> Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>X</u>		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <u>X</u> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches <u>X</u> Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>X</u>		
HGM Class (P): Slope <u>X</u> Flat <u>X</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Micorelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable <u>X</u>	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) <u>X</u>	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <u>X</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61HT002

Field Target: 060

Date: 6/28/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Anderson
Wetland Scientist (print)

X Jennifer Anderson 6/28/14
Signature / Date

X Kimberly DeGroot
Field Crew Chief (print)

X [Signature] 6/28/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: <input checked="" type="checkbox"/> Centerline <input type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: <u>257</u>	Map #: <u>31130</u> Map Date: <u>5/27/14</u>
Date: <u>6/28/14</u>	Project Name & No.: <u>Alaska LNG 26221306</u>		Feature Id: <u>W61HT003</u>
Investigators: <u>K. DeGutis</u> <u>J. Anderson</u> <u>A. Fisher</u>			Team No.: <u>W61</u>
State: <u>Alaska</u>	Region: <u>Alaska</u>	Milepost: <u>542.55</u>	
Latitude: <u>63° 40' 19.27"</u>		Longitude: <u>148° 45' 51.92"</u>	Datum: <u>WGS84</u>
Logbook No.: <u>W61-2</u>	Logbook Page No.: <u>5</u>	Picture No.: <u>P-W61HT003</u> Pt. Plug: <u>SE; NW</u>	

SITE PARAMETERS	
Subregion: <u>Interior</u>	Landform (hillslope, terrace, hummocks, etc.): <u>Flat</u>
Slope (%): <u>2</u>	Local relief (concave, convex, none): <u>Convex</u>
Pre-mapped Alaska LNG/NWI classification: <u>Upland</u>	Soil Map Unit Name: _____
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	
Are "Normal Circumstances" present? Yes <input checked="" type="checkbox"/> No _____ (if no, explain in Notes.)	
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed? No <input checked="" type="checkbox"/> (If yes, explain in Notes)	
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic? No <input checked="" type="checkbox"/> (If yes, explain in Notes.)	
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: <u>PSS1/4B</u>
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Viereck): <u>II C1, IIA2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 5
for site sketch & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				Dominance Test worksheet:	
Tree Stratum (Plot sizes: <u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	No. of Dominant Species that are OBL, FACW, or FAC: <u>6</u> (A)	
1. <i>Picea glauca</i>	12	Y	FACU	Total Number of Dominant Species Across All Strata: <u>8</u> (B)	
2.				% Dominant Species that are OBL, FACW, or FAC: <u>75%</u> (A/B)	
3.					
4.					
Total Cover: <u>12</u>				Prevalence Index worksheet:	
50% of total cover: <u>6</u> 20% of total cover: <u>2.4</u>				Total % Cover of: _____ Multiply by: _____	
Sapling/Shrub Stratum (<u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	OBL species: _____ X 1 = _____	
1. <i>Picea glauca</i>	20	Y	FACU	FACW species: <u>20</u> X 2 = <u>40</u>	
2. <i>Betula glandulosa</i>	35	Y	FAC	FAC species: <u>128</u> X 3 = <u>384</u>	
3. <i>Rhododendron greenlandicum</i>	20	Y	FAC	FACU species: <u>34</u> X 4 = <u>136</u>	
4. <i>Vaccinium uliginosum</i>	20	Y	FAC	UPL species: _____ X 5 = _____	
5. <i>Vaccinium vitis-idaea</i>	10		FAC	Column Totals: <u>182</u> (A) <u>560</u> (B)	
6. <i>Salix myrtillofolia</i>	12		FACW	PI = B/A = <u>3.08</u>	
7. <i>Empetrum nigrum</i>	20	Y	FAC		
8. <i>Arctostaphylos rubra</i>	10		FAC		
9. <i>Salix pulchra</i>	5		FACW		
Total Cover: <u>157</u>				<i>Dasiphora fruticosa</i> T FAC <i>Salix glauca</i> S FAC	
50% of total cover: <u>78.5</u> 20% of total cover: <u>31.4</u>					

VEGETATION (use scientific names of plants)				Hydrophytic Vegetation Indicators:	
Herb Stratum (<u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	<input checked="" type="checkbox"/> Dominance Test is > 50%	
1. <i>Petasites frigidus</i>	3	Y	FACW	<input type="checkbox"/> Prevalence Index is ≤ 3.0	
2. <i>Equisetum scirpoides</i>	T		FACU	<input type="checkbox"/> Morphological Adaptations ¹ (Provide supporting data in Notes)	
3. <i>Calamagrostis canadensis</i>	8	Y	FAC	<input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)	
4. Unknown herb	T		ASSGOTS FAC	¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.	
5. <i>Mertensia paniculata</i>	2		FACU		
6.					
7.					
8.					
9.					
10.					
Total Cover: <u>13</u>				<u>5</u> % Bare Ground _____ % Cover of Wetland Bryophytes <u>39%</u> Total Cover of Bryophytes <u>0</u> % Cover of Water	
50% of total cover: <u>6.5</u> 20% of total cover: <u>2.6</u>				Hydrophytic Vegetation Present (Y/N): <u>Y</u> Notes: (If observed, list morphological adaptations below)	

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>6/28/14</u> Feature ID <u>W61 H7003</u>		Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)						
Depth (inches)	Matrix		Redox Features		Texture	Notes
	Color (moist)	%	Color (moist)	%		
<u>0-7"</u>	<u>2.5Y 4/2</u>				<u>Fibric Silt</u>	<u>Saturated</u>
<u>7-8"</u>						
<u>8"</u>	<u>Frozen</u>					

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) <u>X</u>	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____	
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____	
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: Frozen Depth (inches): 8"

Hydric Soil Present (Y/N): Y

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) <u>X</u>
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): _____	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0'</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0"</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>12</u> Sapling (<5 dbh, <6m tall) <u>20</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>117</u> Dwarf shrub (<0.5m) <u>20</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>13</u> Moss-Lichen <u>35</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u> Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>X</u>		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <u>X</u> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches <u>X</u> Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>X</u>		
HGM Class (P): Slope _____ Flat <u>X</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty <u>X</u> Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Micorelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable <u>X</u>	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below <u>X</u> Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61 HT003 Field Target: 057 Date: 6/28/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Jennifer Anderson

Wetland Scientist (print)

X

Jennifer Anderson 6/28/14

Signature / Date

X

Kimberly DeGris

Field Crew Chief (print)

X

Kimberly DeGris 6/28/14

Signature / Date

WETLAND DETERMINATION DATA FORM

2000'

SITE DESCRIPTION			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/>		Field Target: <u>OSB</u>	Map #: <u>31130</u> Map Date: <u>5/27/14</u>
Date: <u>6/28/14</u>	Project Name & No.: Alaska LNG 26221306		Feature Id: <u>W61HT004</u>
Investigators: <u>K DEGUIS</u> <u>J Anderson</u> <u>A Fisher</u>			Team No.: <u>W61</u>
State: Alaska	Region: Alaska	Milepost: <u>542.55</u>	
Latitude: <u>63° 40' 20.59</u>		Longitude: <u>148° 45' 47.96</u>	Datum: WGS84
Logbook No.: <u>W61-2</u>	Logbook Page No.: <u>6</u>	Picture No.: <u>P-W61HT004-Pt; Plug; NE; S</u>	

SITE PARAMETERS	
Subregion: <u>Interion</u>	Landform (hillslope, terrace, hummocks, etc.): <u>FLAT</u>
Slope (%): <u>2</u>	Local relief (concave, convex, none): <u>CONVEX</u>
Pre-mapped Alaska LNG/NWI classification: <u>UPLAND</u>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no explain in Notes)	
Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)	
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Significantly Disturbed? No <input checked="" type="checkbox"/> (If yes, explain in Notes)	
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Naturally Problematic? No <input checked="" type="checkbox"/> (If yes, explain in Notes.)	
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Wetland Type: <u>UPLAND</u>
Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Vioreck): <u>IIc1, I A2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 6
for site sketch & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea glauca</i>	15	Y	FACU
2.			
3.			
4.			
Total Cover: <u>15</u> 50% of total cover: <u>7.5</u> 20% of total cover: <u>3</u>			
Sapling/Shrub Stratum (<u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Salix myrtillofolia</i>	10		FACW
2. <i>Vaccinium uliginosum</i>	20	Y	FAC
3. <i>Arctostaphylos rubra</i>	5		FAC
4. <i>Vaccinium vitis-idaea</i>	10		FAC
5. <i>Rhododendron groenlandicum</i>	30	Y	FAC
6. <i>Salix glauca</i>	10		FAC
7. <i>Betula nana</i>	40	Y	FAC
8. <i>Alnus tenuifolia</i>	8		FAC
9. <i>Picea glauca</i>	10		FACU
Total Cover: <u>153</u> 50% of total cover: <u>76.5</u> 20% of total cover: <u>30.6</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 64 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

% Dominant Species that are OBL, FACW, or FAC: 100 (A/B) 107%

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by: _____

OBL species: 10 X 1 = 10

FACW species: 134 X 2 = 268

FAC species: 157 X 3 = 471 402

FACU species: 27 X 4 = 108 108

UPL species: _____ X 5 = _____

Column Totals: 171 (A) 539 (B) 530

PI = B/A = 3.0 3.10

Salix pseudomonticola 5 FAC

Empetrum nigrum 3 FAC

Rosa acicularis 2 FACU

Salix arbusculoides 1 FACU

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Calamagrostis canadensis</i>	3	Y	FAC
2. <i>Mertensia paniculata</i>	T		FACU
3. <i>Petasites frigidus</i>	T		FACU
4. <i>Pea sp</i>	8	Y	Assume FAC
5. Unknown herb	T		Assume FAC
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>11</u> 50% of total cover: <u>5.5</u> 20% of total cover: <u>2.2</u>			

Hydrophytic Vegetation Indicators:

☒ Dominance Test is > 50%

☐ Prevalence Index is ≤ 3.0

☐ Morphological Adaptations¹ (Provide supporting data in Notes)

☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

10 % Bare Ground

0 % Cover of Wetland Bryophytes

20% Total Cover of Bryophytes

0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>6/28/14</u> Feature ID <u>W61HT004</u>		Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)					
Depth (inches)	Matrix		Redox Features		Notes
	Color (moist)	%	Color (moist)	%	
0-2.5"					Fibric Dry
2.5-5"					Moist Fibric Moist
5"-16"	2.5Y 4/1	70	10YR 5/6	30	C M Not distinct or prominent
16"	Cobbles				

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS	INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____
Hydrogen Sulfide (A4) _____	Alaska Color Change (TA4) ⁴ _____
Thick Dark Surface (A12) _____	Alaska Alpine Swales (TA5) _____
	Alaska Redox with 2.5Y Hue _____
	Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
	Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: Cobbles Depth (inches): 16"

Hydric Soil Present (Y/N): N

Notes: Does not satisfy (A11) or Ak Redox w/2.5Y Hues

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>Ø</u>	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): <u>Ø</u>	
Saturation Present (Y/N): <u>N</u> (includes capillary fringe)	Depth (in): <u>Ø</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (≥25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Micrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61HToch

Field Target: 050

Date: 6/28/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Anderson
Wetland Scientist (print)

X Jennifer Anderson 6/28/14
Signature / Date

X Kimberly DEGOTO
Field Crew Chief (print)

X Kelly White 6/28/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: <u>Centerline</u> <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: <u>059</u>	Map #: <u>30130</u> Map Date: <u>5/27/13</u>
Date: <u>6/29/14</u>	Project Name & No.: <u>Alaska LNG 26221306</u>		Feature Id: <u>W61HT005</u>
Investigators: <u>K DEGENIS</u> <u>J ANDERSON</u> <u>A Fisher</u>			Team No.: <u>W61</u>
State: <u>Alaska</u>	Region: <u>Alaska</u>	Milepost: <u>544.85</u>	
Latitude: <u>63° 38' 29.10"</u>		Longitude: <u>148° 44' 20.12"</u>	Datum: <u>WGS84</u>
Logbook No.: <u>W61-2</u>	Logbook Page No.: <u>9</u>	Picture No.: <u>P W61HT005_Pit; Plug; SE; NE</u>	

SITE PARAMETERS	
Subregion: <u>Interior</u>	Landform (hillslope, terrace, hummocks, etc.): <u>Flats</u>
Slope (%): <u>2</u>	Local relief (concave, convex, none): <u>Convex</u>
Pre-mapped Alaska LNG/NWI classification: <u>Upland</u>	Soil Map Unit Name: _____
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	
Are "Normal Circumstances" present? Yes <input checked="" type="checkbox"/> No _____ (if no, explain in Notes.)	
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed? No <input checked="" type="checkbox"/> (If yes, explain in Notes)	
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic? No <input checked="" type="checkbox"/> (If yes, explain in Notes.)	
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/>	Wetland Type: <u>UPLAND</u> PERMIB <u>PSS4/13</u>
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Vioreck): <u>IA2, IIC1, IIB2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 9
for site sketch & notes

IA2, IIC2
changed by
E.H.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)

Tree Stratum (Plot sizes: <u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea glauca</i>	25	Y	FACU
2.			
3.			
4.			
Total Cover: <u>25</u>			
50% of total cover: _____ 20% of total cover: _____			
Sapling/Shrub Stratum (<u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea glauca</i>	15		FACU
2. <i>Betula glandulosa</i>	10		FAC
3. <i>Arctostaphylos rubra</i>	25	Y	FAC
4. <i>Vaccinium uliginosum</i>	40	Y	FAC
5. <i>Rhododendron groenlandicum</i>	20	Y	FAC
6. <i>Vaccinium vitis-idaea</i>	5		FAC
7. <i>Empetrum nigrum</i>	8		FAC
8. <i>Salix pseudomyrsinites</i>	2		FACU FAC
9. <i>Salix glauca</i>	10		FAC
Total Cover: <u>139</u>			
50% of total cover: <u>68.5</u> 20% of total cover: <u>27.4</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)
 Total Number of Dominant Species Across All Strata: 4 (B)
 % Dominant Species that are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by: _____
 OBL species: — X 1 = —
 FACW species: 1 X 2 = 2
 FAC species: 118 X 3 = 354
 FACU species: 40 X 4 = 160
 UPL species: — X 5 = —
 Column Totals: 159 (A) 516 (B)
 PI = B/A = 3.25

VEGETATION (use scientific names of plants)

Herb Stratum (<u>26</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Petasites Frigidus</i>	1		FACW
2. <i>Poa</i> sp.	1		Assume FAC
3. <i>Mertensia paniculata</i>	T		FAC
4. Unknown herb	T		FAC
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>10</u>			
50% of total cover: _____ 20% of total cover: _____			

Hydrophytic Vegetation Indicators:

☒ Dominance Test is > 50%
☐ Prevalence Index is ≤ 3.0
☐ Morphological Adaptations¹ (Provide supporting data in Notes)
☐ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

10 % Bare Ground
 _____ % Cover of Wetland Bryophytes
10 % Total Cover of Bryophytes
0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

Herb stratum added to shrub stratum since < 5% cover

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>6/29/14</u>		Feature ID <u>W61 HT005</u>		Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features				Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²	
<u>0-3</u>							<u>Fabric</u>
<u>3-7</u>							<u>Heurc</u>
<u>7-13"</u>	<u>10YR 3/2</u>	<u>90</u>	<u>10YR 5/6</u>	<u>10</u>	<u>C</u>	<u>M</u>	<u>Sandy Silt loam</u>
<u>13"</u>	<u>Refusal - HARD PAN</u>						

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____	
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____	
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: HARD PAN Depth (inches): 13"

Hydric Soil Present (Y/N): NY

Notes: 7" of saturated organic

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) <u>X</u>
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>0</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>13"</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>3"</u>	
Notes: _____		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		
SOIL VARIABLES		
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____		
HYDROLOGIC VARIABLES		
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____		
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____		
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____		
Micorelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____		
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____		
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____		
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____		
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____		
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____		
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____		
LANDSCAPE VARIABLES (M)		
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____		
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____		
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____		
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____		

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61 HT005

Field Target: OS9

Date: 6/29/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Anderson
Wetland Scientist (print)

X Jennifer Anderson 6/29/14
Signature / Date

X Kim DeGroot
Field Crew Chief (print)

X Andy Mc 6/29/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 072	Map #: 48/130 Map Date: 5/27/14
Date: 6/29/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W61 HTO06
Investigators: K DeGroot J Anderson A Fisher			Team No.: W61
State: Alaska	Region: Alaska	Milepost: 572	
Latitude: 63° 20' 57.98"		Longitude: 149° 04' 30.38"	Datum: WGS84
Logbook No.: W61-2	Logbook Page No.: 10	Picture No.: P-W61 HTO06 - Pit; Plug; W/E	

SITE PARAMETERS	
Subregion: Interior	Landform (hillslope, terrace, hummocks, etc.): terrace
Slope (%): 0	Local relief (concave, convex, none): none
Pre-mapped Alaska LNG/NWI classification: PEMIF	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	
Are "Normal Circumstances" present? Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)	
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed? No <input checked="" type="checkbox"/> (If yes, explain in Notes)	
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic? No <input checked="" type="checkbox"/> (If yes, explain in Notes.)	
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: PSSIC
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Viereck): III A3 II B1

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

NO
1

See logbook W61-2, page
for notes & site sketch

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: <u>240'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: <u>3</u> (A) Total Number of Dominant Species Across All Strata: <u>3</u> (B) % Dominant Species that are OBL, FACW, or FAC: <u>100%</u> (A/B)
1. <u>N/A</u>	<u>-</u>	<u>-</u>	<u>-</u>	
2.				
3.				
4.				
Total Cover: <u>N/A</u> 50% of total cover: _____ 20% of total cover: _____				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species: <u>5</u> X 1 = <u>5</u> FACW species: <u>57</u> X 2 = <u>114</u> FAC species: <u>63</u> X 3 = <u>189</u> FACU species: <u>-</u> X 4 = <u>-</u> UPL species: <u>-</u> X 5 = <u>-</u> Column Totals: <u>105</u> (A) <u>308</u> (B) PI = B/A = <u>2.46</u>
Sapling/Shrub Stratum (_____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <u>Dasiphora fruticosa</u>	<u>40</u>	<u>Y</u>	<u>FAC</u>	
2. <u>Salix pulchra</u>	<u>50</u>	<u>Y</u>	<u>FACW</u>	
3. <u>Vaccinium uliginosum</u>	<u>5</u>		<u>FAC</u>	
4. <u>Andromeda polifolia</u>	<u>2</u>		<u>FACW</u>	
5. <u>Betula glandulosa</u>	<u>2</u>		<u>FAC</u>	
6. <u>Salix arbusculoides</u>	<u>5</u>		<u>FACW</u>	
7. <u>Salix pseudomonticola</u>	<u>5</u>		<u>FAC</u>	
8.				
9.				
Total Cover: <u>109</u> 50% of total cover: <u>54.5</u> 20% of total cover: <u>21.8</u>				

VEGETATION (use scientific names of plants)				
Herb Stratum (_____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Hydrophytic Vegetation Indicators: <input checked="" type="checkbox"/> Dominance Test is > 50% <input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic
1. <u>Comarum palustre</u>	<u>3</u>		<u>OBL</u>	
2. <u>Rubus arcticus</u>	<u>1</u>		<u>FAC</u>	
3. <u>Carex sp (no inflores.)</u>	<u>10</u>	<u>Y</u>	<u>Assume FAC</u>	
4. <u>Equisetum fluviatile</u>	<u>1</u>		<u>OBL</u>	
5. <u>Caltha palustris</u>	<u>1</u>		<u>OBL</u>	
6.				<u>0</u> % Bare Ground <u>-</u> % Cover of Wetland Bryophytes <u>45%</u> Total Cover of Bryophytes <u>95</u> % Cover of Water Hydrophytic Vegetation Present (Y/N): <u>Y</u> Notes: (If observed, list morphological adaptations below):
7.				
8.				
9.				
10.				
Total Cover: <u>16</u> 50% of total cover: <u>8</u> 20% of total cover: <u>3.2</u>				

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>6/29/14</u>		Feature ID <u>WGA HT006</u>		Soil Pit Required (Y/N) <u>N</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
<u>0-14</u>							<u>Fibric</u>	<u>Saturated</u>

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____	
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____	
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: N/A Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes: unable to excavate soil pit due to excessive ponding; no restrictive layer encountered

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) <u>X</u>	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>10"</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0"</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0"</u>	
Notes: _____		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>107</u> Dwarf shrub (<0.5m) <u>2</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>10</u> Moss-Lichen <u>45</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>1</u>		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven <u>X</u> Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>X</u> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover <u>X</u> >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches <u>X</u> Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>0</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>X</u>		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine <u>X</u> Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet <u>X</u>	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded <u>X</u>	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Micorelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs <u>X</u> Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow <u>X</u>	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) <u>X</u> Acid (<5.5) _____ pH Reading <u>7.64</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable <u>unknown?</u>	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) <u>X</u>	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <u>X</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized <u>X</u> 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W614T006

Field Target: 072

Date: 6/29/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Anderson
Wetland Scientist (print)

X Jennifer Anderson 6/29/14
Signature / Date

X Kim DeGutis
Field Crew Chief (print)

X Kim DeGutis 6/29/14
Signature / Date

WETLAND DETERMINATION DATA FORM

2000-ft corridor

SITE DESCRIPTION			
Survey Type: Centerline	Access Road (explain)	Other (explain) <input checked="" type="checkbox"/>	Field Target: 080
Date: 6/29/14	Project Name & No.: Alaska LNG 26221306	Feature Id: W61HT007	Map #: 541130 Map Date: 5/27/14
Investigators: K DEGWIS J Anderson A Fisher	Team No.: W61		
State: Alaska	Region: Alaska	Milepost: 590.1	
Latitude: 63° 09' 27.33"	Longitude: 149° 24' 38.27"	Datum: WGS84	
Logbook No.: W61-2	Logbook Page No.: 12	Picture No.: P-W61HT007; P+; P+; W; N	

SITE PARAMETERS	
Subregion: Interior	Landform (hillslope, terrace, hummocks, etc.): FLAT
Slope (%): 1	Local relief (concave, convex, none): NONE
Pre-mapped Alaska LNG/NWI classification: PEMIF	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No (if no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No	Wetland Type: PEMIF
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No	Alaska Vegetation Classification (Vioreck): IIIA3

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 12
for site sketch & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)

Tree Stratum (Plot sizes: <u>26' 15'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>N/A</u>			
2.			
3.			
4.			
Total Cover: <u>N/A</u>			
50% of total cover: _____ 20% of total cover: _____			
Sapling/Shrub Stratum (<u>15'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Picea glauca</u>	<u>10</u>	<u>Y</u>	<u>FACW</u>
2. <u>Betula nana</u>	<u>2</u>	<u>Y</u>	<u>FAC</u>
3. <u>Dasiphora fruticosa</u>	<u>8</u>	<u>Y</u>	<u>FAC</u>
4. <u>Vaccinium oxycoccus</u>	<u>1</u>		<u>OBL</u>
5. <u>Andromeda polifolia</u>	<u>1</u>		<u>FACW</u>
6. <u>Comarum palustre</u>	<u>3</u>		<u>OBL</u>
7. <u>Vaccinium uliginosum</u>	<u>2</u>		<u>FAC</u>
8.			
9.			
Total Cover: <u>27 24</u>			
50% of total cover: <u>13.6</u> 20% of total cover: <u>5.4</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)
 Total Number of Dominant Species Across All Strata: 4 (B)
 % Dominant Species that are OBL, FACW, or FAC: 75% (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:

OBL species: 30 X 1 = 30
 FACW species: 3 X 2 = 6
 FAC species: 75 X 3 = 225
 FACU species: 10 X 4 = 40
 UPL species: — X 5 = —
 Column Totals: 118 (A) 301 (B)
 PI = B/A = 2.55

VEGETATION (use scientific names of plants)

Herb Stratum (<u>15'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Pedicularis labradorica</u>	<u>1</u>		<u>FACW</u>
2. <u>Equisetum fluviatile</u>	<u>1</u>		<u>OBL</u>
3. <u>Plantanthera dilatata</u>	<u>1</u>		<u>FACW</u>
4. <u>Drosera rotundifolia</u>	<u>T</u>		<u>OBL</u>
5. <u>Viola lanugolobit palustris</u>	<u>T</u>		<u>FACW</u>
6. <u>Beckmannia syzigachne</u>	<u>25</u>	<u>Y</u>	<u>OBL</u>
7. <u>Festuca altaica</u>	<u>60</u>	<u>Y</u>	<u>FAC</u>
8. <u>Potentilla sp.</u>	<u>3</u>		<u>Assume FAC</u>
9. <u>Unknown sp.</u>	<u>T</u>		<u>Assume FAC</u>
10. <u>Comarum palustre</u>	<u>3</u>		<u>OBL</u>
Total Cover: <u>91 94</u>			
50% of total cover: <u>45.5</u> 20% of total cover: <u>18.2</u>			

Hydrophytic Vegetation Indicators:

☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
0 % Cover of Wetland Bryophytes
0 % Total Cover of Bryophytes
5 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

Sample plot shape altered to exclude adjacent upland

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>6/22/14</u> Feature ID <u>WG1HT007</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
<u>0-10"</u>							<u>Fibric</u>	<u>Saturated</u>
<u>10-18"</u>							<u>Hemic</u>	<u>Saturated</u>

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: N/A Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes: _____

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) <u>X</u>
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>1/2"</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>1"</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0"</u>	
Notes: _____		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <u>X</u> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>10</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>12</u> Dwarf shrub (<0.5m) <u>5</u> Tall herb (>1m) <u>0</u> Short herb (<1m) <u>91</u> Moss-Lichen <u>10</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>1</u>		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>X</u>
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>X</u> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover <u>X</u> >75% Scattered or Peripheral Cover <u>X</u> N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>X</u>		
HGM Class (P): Slope _____ Flat <u>X</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic <u>X</u> Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded <u>X</u>	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Micorelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) <u>X</u> Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading <u>5.86</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits <u>X</u> Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below <u>X</u> Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: UG1 HT007 Field Target: 080 Date: 6/29/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. . Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Jennifer Anderson
Wetland Scientist (print)

X

Jennifer Anderson 6/29/14
Signature / Date

X

Kim DEGUAS
Field Crew Chief (print)

X

Kim DeGuis 6/29/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline		Access Road (explain)	Other (explain) <u>P</u>
Field Target: <u>081</u>		Map #: <u>54130</u>	Map Date: <u>5/27/14</u>
Date: <u>6/29/14</u>	Project Name & No.: Alaska LNG 26221306		Feature Id: <u>W61HT008</u>
Investigators: <u>K Deyts</u> <u>J Anderson</u> <u>A Fisher</u>			Team No.: <u>W61</u>
State: Alaska	Region: Alaska	Milepost: <u>590.13</u>	
Latitude: <u>63° 09' 26.62"</u>	Longitude: <u>149° 24' 39.21"</u>	Datum: WGS84	
Logbook No.: <u>W61-2</u>	Logbook Page No.: <u>12</u>	Picture No.: <u>P-W61HT008 - Ditch Plug; W; N</u>	

SITE PARAMETERS	
Subregion: <u>Interior</u>	Landform (hillslope, terrace, hummocks, etc.): <u>Flat</u>
Slope (%): <u>2</u>	Local relief (concave, convex, none): <u>CONVEX</u>
Pre-mapped Alaska LNG/NWI classification: <u>PEMIF</u>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <u>X</u> No (if no explain in Notes)	Are "Normal Circumstances" present: Yes <u>X</u> No (If no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <u>P</u> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <u>P</u> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <u>X</u> No	Is the Sampled Area within a Wetland? Yes <u>X</u> No
Hydric Soil Present? Yes <u>X</u> No	Wetland Type: <u>PEMIF</u>
Wetland Hydrology Present? Yes <u>X</u> No	Alaska Vegetation Classification (Vioreck): <u>III A3</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 12
for site sketch & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)

Tree Stratum (Plot sizes: <u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>N/A</u>	<u>-</u>	<u>-</u>	<u>-</u>
2.			
3.			
4.			
Total Cover: <u>N/A</u>			
50% of total cover: _____ 20% of total cover: _____			
Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Picea canadensis</u>	<u>3</u>	<u>Y</u>	<u>FACU</u>
2. <u>Dasiphora fruticosa</u>	<u>5</u>	<u>Y</u>	<u>FAC</u>
3. <u>Betula nana</u>	<u>3</u>	<u>Y</u>	<u>FAC</u>
4. <u>Vaccinium oxycoccos</u>	<u>1</u>		<u>OBL</u>
5. <u>Andromeda polifolia</u>	<u>2</u>		<u>FACW</u>
6. <u>Vaccinium uliginosum</u>	<u>2</u>		<u>FAC</u>
7. <u>Unknown shrub</u>	<u>T</u>		<u>Assume FAC</u>
8.			
9.			
Total Cover: <u>16</u>			
50% of total cover: <u>8</u> 20% of total cover: <u>3.2</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)
 Total Number of Dominant Species Across All Strata: 4 (B)
 % Dominant Species that are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:

OBL species: 79 X 1 = 79
 FACW species: 4 X 2 = 8
 FAC species: 13 X 3 = 39
 FACU species: 3 X 4 = 12
 UPL species: - X 5 = -
 Column Totals: 99 (A) 138 (B)
 PI = B/A = 1.39

VEGETATION (use scientific names of plants)

Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Drosera rotundifolia</u>	<u>1</u>		<u>OBL</u>
2. <u>Comarum palustre</u>	<u>5</u>		<u>OBL</u>
3. <u>Viola palustris</u>	<u>1</u>		<u>FACW</u>
4. <u>Menyanthes trifidata</u>	<u>5</u>		<u>OBL</u>
5. <u>Carex microchaeta</u>	<u>3</u>		<u>FAC</u>
6. <u>Plantanthera dilatata</u>	<u>1</u>		<u>FACW</u>
7. <u>Eriophorum scheuchzeri</u>	<u>T</u>		<u>OBL</u>
8. <u>Beckmannia syzigachne</u>	<u>45</u>	<u>Y</u>	<u>OBL</u>
9. <u>Carex maritima</u>	<u>10</u>		<u>OBL</u>
10. <u>Eleocharis palustris</u>	<u>10</u>		<u>OBL</u>
Total Cover: <u>83</u>			
50% of total cover: <u>41.5</u> 20% of total cover: <u>16.6</u>			
<u>Eleocharis acicularis</u>	<u>2</u>		<u>OBL</u>

Hydrophytic Vegetation Indicators:

☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
15% % Cover of Wetland Bryophytes
15% Total Cover of Bryophytes
60 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>6/29/14</u> Feature ID <u>W61 H008</u>		Soil Pit Required (Y/N) <u>Y</u>				
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features			Texture	Notes	
	Color (moist)	%	Color (moist)	%	Type ¹			Loc ²
<u>0-16</u>							<u>Hemic</u>	<u>Saturated</u>

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____	
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____	
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: N/A Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>Y</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) <u>Y</u>
High Water Table (A2) <u>Y</u>	Inundation Visible on Aerial Imagery (B7) <u>Y</u>	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>Y</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>Y</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____	_____		
Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>6"</u>	Wetland Hydrology Present (Y/N): <u>Y</u>	
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0"</u>		
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0"</u>		
Notes: _____			

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <input checked="" type="checkbox"/> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>3</u> Sapling (<5 dbh, <6m tall) <u>3</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>10</u> Dwarf shrub (<0.5m) <u>3</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>63</u> Moss-Lichen <u>15</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>1</u>	Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven <input checked="" type="checkbox"/> Moderately even _____	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <input checked="" type="checkbox"/> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover <input checked="" type="checkbox"/> >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <input checked="" type="checkbox"/> High (>25) _____		
Presence of Islands (M): Absent (none) <input checked="" type="checkbox"/> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches <input checked="" type="checkbox"/> Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <input checked="" type="checkbox"/> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <input checked="" type="checkbox"/>		
HGM Class (P): Slope _____ Flat <input checked="" type="checkbox"/> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic <input checked="" type="checkbox"/> Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet <input checked="" type="checkbox"/>	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded <input checked="" type="checkbox"/>	
Evidence of Sedimentation (P): No Evidence Observed <input checked="" type="checkbox"/> Sediment Observed on Wetland Substrate _____ Fluvial/Quaternary Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <input checked="" type="checkbox"/> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <input checked="" type="checkbox"/> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow <input checked="" type="checkbox"/>	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) <input checked="" type="checkbox"/> Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading <u>6.03</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits <input checked="" type="checkbox"/> Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <input checked="" type="checkbox"/> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <input checked="" type="checkbox"/> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <input checked="" type="checkbox"/> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e., open space) <input checked="" type="checkbox"/>	
Watershed Land Use: 0-5% Rural <input checked="" type="checkbox"/> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <input checked="" type="checkbox"/> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W614T008

Field Target: 081

Date: 06/29/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Anderson
Wetland Scientist (print)

X Jennifer Anderson 6/29/14
Signature / Date

X Kim DeGroot
Field Crew Chief (print)

X Kim DeGroot 6/29/14
Signature / Date

WETLAND DETERMINATION DATA FORM

2000 A 1-14

SITE DESCRIPTION			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/>		Field Target: 082	Map #: 54130 Map Date: 5/21/14
Date: 6/29/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W61HT009
Investigators: K DeGutis J Anderson A Fisher			Team No.: W61
State: Alaska	Region: Alaska	Milepost: 590.13	
Latitude: 63° 09' 26.13		Longitude: 149° 24' 41.09	Datum: WGS84
Logbook No.: W61-2	Logbook Page No.: 12	Picture No.: P_W61HT009_P1; Plug; W; E	

SITE PARAMETERS	
Subregion: Interior	Landform (hillslope, terrace, hummocks, etc.): convex
Slope (%): 2	Local relief (concave, convex, none): flat
Pre-mapped Alaska LNG/NWI classification: PUB/ABH	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Wetland Type: PUB/ABH
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Alaska Vegetation Classification (Viereck): BD I ^{JA} III D 1

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 12
for site sketch & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: <u>4</u> (A) Total Number of Dominant Species Across All Strata: <u>4</u> (B) % Dominant Species that are OBL, FACW, or FAC: <u>100</u> (A/B)
1. <u>N/A</u>				
2.				
3.				
4.				
Total Cover: <u>N/A</u> 50% of total cover: _____ 20% of total cover: _____				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species: <u>0</u> x 1 = <u>0</u> FACW species: <u>0</u> x 2 = <u>0</u> FAC species: <u>0</u> x 3 = <u>0</u> FACU species: <u>-</u> x 4 = <u>-</u> UPL species: <u>-</u> x 5 = <u>-</u> Column Totals: <u>0</u> (A) <u>0</u> (B) PI = B/A = <u>-</u>
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <u>Dasiphora fruticosa</u>	<u>3</u>		<u>Fac</u>	
2. <u>Vaccinium Vlginosum</u>	<u>2</u>		<u>Fac</u>	
3. <u>Betula nana</u>	<u>10</u>	<u>Y</u>	<u>Fac</u>	
4. <u>Andromeda Polifolia</u>	<u>2</u>		<u>FacW</u>	
5. <u>Vaccinium Oxycoccus</u>	<u>1</u>		<u>obl</u>	
6.				
7.				
8.				
9.				
Total Cover: <u>18</u> 50% of total cover: <u>9</u> 20% of total cover: <u>3.6</u>				

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Hydrophytic Vegetation Indicators: <input checked="" type="checkbox"/> Dominance Test is > 50% <input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
1. <u>Menyanthes trifoliata</u>	<u>2</u>		<u>obl</u>	
2. <u>Cyperus palustris</u>	<u>5</u>		<u>obl</u>	
3. <u>Prosera rotundifolia</u>	<u>2</u>		<u>obl</u>	
4. <u>Eleocharis Palustris</u>	<u>10</u>	<u>Y</u>	<u>obl</u>	
5. <u>Beckmannia sizigachne</u>	<u>10</u>	<u>Y</u>	<u>obl</u>	
6. <u>Carex microchaeta</u>	<u>10</u>	<u>Y</u>	<u>Fac</u>	
7. <u>Viola Palustris</u>	<u>3</u>		<u>FacW</u>	
8. <u>Carex magellanica</u>	<u>5</u>		<u>obl</u>	
9. <u>Carex spp.</u>	<u>1</u>		<u>assume fac</u>	
Total Cover: <u>44</u> 50% of total cover: <u>22</u> 20% of total cover: <u>8.8</u>				_____ % Bare Ground _____ % Cover of Wetland Bryophytes <u>10</u> Total Cover of Bryophytes <u>70</u> % Cover of Water Hydrophytic Vegetation Present (Y/N): <u>Y</u> Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>6/29/14</u> Feature ID <u>W61HT009</u>		Soil Pit Required (Y/N) <u>N</u>			
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features			Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹		

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: N/A Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes: No pit dug due to presence of water assume A1 indicator
No restrictive layer found

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) <u>X</u>	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____	_____		
Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>60+</u>	Wetland Hydrology Present (Y/N): <u>Y</u>	
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0"</u>		
Saturation Present (Y/N): (includes capillary fringe) <u>Y</u>	Depth (in): <u>0"</u>		
Notes: _____			

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation-Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed <u>X</u>		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>15</u> Dwarf shrub (<0.5m) <u>3</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>44</u> Moss-Lichen <u>10</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u>	Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>X</u>	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) <u>X</u> Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover <u>X</u> 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches <u>X</u> Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>X</u>		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic <u>X</u> Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded <u>X</u>	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs <u>X</u> Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) <u>X</u> Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading <u>6.03</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <u>X</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

[Signature]

GPS Technician QA/QC check:

[Signature]

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W01H100 9

Field Target: 032

Date: 6/25/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Anderson
Wetland Scientist (print)

X Jennifer Anderson
Signature / Date

X Kim DeGoutis
Field Crew Chief (print)

X [Signature] 6/29/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 055	Map #: 351130 Map Date: 5/27/14
Date: 6/30/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W61HT010
Investigators: K DEGUTIS J Anderson A Fisher			Team No.: W61
State: Alaska	Region: Alaska	Milepost: 528.67	
Latitude: 63° 49' 09.16"		Longitude: 148° 59' 28.68"	Datum: WGS84
Logbook No.: W61-2	Logbook Page No.: 14	Picture No.: P-W61HT010-AT; Plug: S; W	

SITE PARAMETERS	
Subregion: Interior	Landform (hillslope, terrace, hummocks, etc.): FIAL
Slope (%): 3	Local relief (concave, convex, none): NONE
Pre-mapped Alaska LNG/NWI classification: PSS1/EM1B	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: PSS1/EM1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Vioreck): IIC1, IIA2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 14
for site sketch & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)

Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea glauca</i>	2%		FACU
2.			
3.			
4.			

Total Cover: 2%

50% of total cover: — 20% of total cover: —

Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea glauca</i>	8		FACU
2. <i>Desophora fruticosa</i>	8		FAC
3. <i>Betula glandulosa</i>	35	Y	FAC
4. <i>Salix alexensis</i>	25	Y	FAC
5. <i>Salix reticulata</i>	25	Y	FAC
6. <i>Vaccinium vitis-idaea</i>	5		FAC
7. <i>Dryas integrifolia</i>	5		FACU
8. <i>Alnus tenuifolia</i>	10		FAC
9. <i>Vaccinium uliginosum</i>	5		FAC

Total Cover: 132

50% of total cover: 66 20% of total cover: 26.4

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 45 (B)

% Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: — Multiply by:

OBL species: — X 1 = —

FACW species: 35 X 2 = 70

FAC species: 118 X 3 = 354

FACU species: 15 X 4 = 60

UPL species: — X 5 = —

Column Totals: 168 (A) 484 (B)

PI = B/A = 2.8

Salix myrtillifolia 2% FACW
Rhododendron tomentosum 1% FACW
Salix barclayi 1% FAC

Tree stratum added to shrub stratum since there was <5% cover.

VEGETATION (use scientific names of plants)

Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Rubus chamaemorus</i>	12	Y	FACW
2. <i>Calamagrostis canadensis</i>	2		FAC
3. <i>Equisetum arvense</i>	1		FAC
4. <i>Stellaria longipes</i>	T		—
5. <i>Equisetum sylvaticum</i>	T		—
6. <i>Petasites frigidus</i>	T		—
7. <i>Agrostis gigantea</i>	1		FAC
8. <i>Carex membranacea</i>	20	Y	FACW
9.			
10.			

Total Cover: 36

50% of total cover: 18 20% of total cover: 7.2

Hydrophytic Vegetation Indicators:

☒ Dominance Test is > 50%

☒ Prevalence Index is ≤ 3.0

— Morphological Adaptations¹ (Provide supporting data in Notes)

— Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

2 % Bare Ground

— % Cover of Wetland Bryophytes

20 Total Cover of Bryophytes

0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>6/30/14</u> Feature ID <u>W61HT010</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-7"							Fibric	organic / sto Saturated
7-11"	10 YR 2/2	90	10 YR 4/4	10			hemic / silt loam	Saturated
11"	Frozen							

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) <u>X</u>	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____	
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____	
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: Frozen Depth (inches): 11"

Hydric Soil Present (Y/N): Y

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) <u>X</u>
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): _____	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>7 1/2"</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>?</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>2</u> Sapling (<5 dbh, <6m tall) <u>8</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>102</u> Dwarf shrub (<0.5m) <u>30</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>36</u> Moss-Lichen <u>20</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u> Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <u>X</u> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches <u>X</u> Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>X</u>		
HGM Class (P): Slope _____ Flat <u>X</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty <u>X</u> Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable <u>X</u>	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) <u>X</u>	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown <u>X</u>	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized <u>X</u> 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61HT010

Field Target: 055

Date: 6/30/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Anderson
Wetland Scientist (print)

X Jennifer Anderson 6/30/14
Signature / Date

X Kim DEGOUTIS
Field Crew Chief (print)

X Kim Degoutis 6/30/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 054	Map #: 35/130 Map Date: 5/27/14
Date: 6/30/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W61 HTO11
Investigators: E DeGutis J Anderson A Fisher			Team No.: W61
State: Alaska	Region: Alaska	Milepost: 528.65	
Latitude: 63° 49' 11.34		Longitude: 148° 59' 32.29	Datum: WGS84
Logbook No.: W61-2	Logbook Page No.: 14	Picture No.: P.W61H011-Dt; Plug: SW; SE	

SITE PARAMETERS	
Subregion: Interior	Landform (hillslope, terrace, hummocks, etc.): FLAT
Slope (%): 4	Local relief (concave, convex, none): NONE
Pre-mapped Alaska LNG/NWI classification: PSS1/EM1B	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: PSS1 A / EM1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Vioreck): IIC1, IIIA2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 14

For site sketch & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea glauca</i>	3		FACU
2.			
3.			
4.			
Total Cover: <u>3</u> 50% of total cover: <u>—</u> 20% of total cover: <u>—</u>			
Sapling/Shrub Stratum ()	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea glauca</i>	5		FACU
2. <i>Betula glandulosa</i>	35	Y	FAC
3. <i>Salix pulchra</i>	5		FACW
4. <i>Salix alexensis</i>	15	Y	FAC
5. <i>Salix pseudomonticola</i>	2		FAC
6. <i>Vaccinium vitis-idaea</i>	8		FAC
7. <i>Dasiphora fruticosa</i>	3		FAC
8. <i>Alnus tenuifolia</i>	15	Y	FAC
9. <i>Vaccinium uliginosum</i>	5		FAC
Total Cover: <u>105</u> 50% of total cover: <u>52.5</u> 20% of total cover: <u>21</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 5 (A)
 Total Number of Dominant Species Across All Strata: 5 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: _____ X 1 = _____
 FACW species: 14 X 2 = 28
 FAC species: 98 X 3 = 294
 FACU species: 9 X 4 = 36
 UPL species: _____ X 5 = _____
 Column Totals: 121 (A) 358 (B)
 PI = B/A = 2.9

Salix alba 2 **FACW**
Salix reticulata 5 **FAC**
Salix lasioandra 2 **FACW**

Tree stratum added to shrub stratum since there was <5% cover.

VEGETATION (use scientific names of plants)			
Herb Stratum ()	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Chamaenerion angustifolium</i>	1		FACU
2. <i>Rubus chamaemorus</i>	5	Y	FACW
3. <i>Equisetum arvense</i>	1		FAC
4. <i>Stellaria longipes</i>	T		FAC
5. <i>Carex</i> sp. (No infl.)	8	Y	Assume FAC
6. <i>Pedicularis labradorica</i>	T		FACW
7. <i>Calamagrostis canadensis</i>	1		FAC
8. <i>Peltandra frigida</i>	T		FACW
9.			
10.			
Total Cover: <u>16</u> 50% of total cover: <u>8</u> 20% of total cover: <u>3.2</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
— % Cover of Wetland Bryophytes
20 Total Cover of Bryophytes
0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>6/30/10</u> Feature ID <u>W61HT010</u>		Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)					
Depth (inches)	Matrix		Redox Features		Notes
	Color (moist)	%	Color (moist)	%	
0-3"					Fibric Dry Organics
3-9"					Fibric Saturated Organics
9"					Frozen

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS	INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____
Hydrogen Sulfide (A4) _____	Alaska Color Change (TA4) ⁴ _____
Thick Dark Surface (A12) _____	Alaska Alpine Swales (TA5) _____
	Alaska Redox with 2.5Y Hue _____
	Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
	Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: Frozen Depth (inches): 9"

Hydric Soil Present (Y/N): Y

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) <u>X</u>
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): _____	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): _____	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>3"</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <input checked="" type="checkbox"/> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>3</u> Sapling (<5 dbh, <6m tall) <u>5</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>82</u> Dwarf shrub (<0.5m) <u>23</u> Tall herb (>1m) <u>0</u> Short herb (<1m) <u>16</u> Moss-Lichen <u>20</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>1</u>		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <input checked="" type="checkbox"/>
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <input checked="" type="checkbox"/> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <input checked="" type="checkbox"/> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <input checked="" type="checkbox"/> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <input checked="" type="checkbox"/>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <input checked="" type="checkbox"/>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <input checked="" type="checkbox"/> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <input checked="" type="checkbox"/>		
HGM Class (P): Slope _____ Flat <input checked="" type="checkbox"/> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <input checked="" type="checkbox"/> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <input checked="" type="checkbox"/> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <input checked="" type="checkbox"/> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <input checked="" type="checkbox"/> Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Micorelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <input checked="" type="checkbox"/> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <input checked="" type="checkbox"/> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <input checked="" type="checkbox"/> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <input checked="" type="checkbox"/> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable <input checked="" type="checkbox"/>	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) <input checked="" type="checkbox"/>	
Evidence of Seeps and Springs (P): No Seeps or Springs <input checked="" type="checkbox"/> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown <input checked="" type="checkbox"/>	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <input checked="" type="checkbox"/>	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized <input checked="" type="checkbox"/> 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <input checked="" type="checkbox"/> Large (>100 acres) _____	

Crew Chief QA/QC check:

[Signature]

GPS Technician QA/QC check:

Jonny Anderson

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61HT011

Field Target: 054

Date: 6/30/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Anderson
Wetland Scientist (print)

X Jennifer Anderson 6/30/14
Signature / Date

X Kim DEBOUTS
Field Crew Chief (print)

X [Signature] 6/30/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 056	Map #: 36 Map Date: 5/27/14
Date: 6/30/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W61HT012
Investigators: K Degutis, J Anderson, A Fisher			Team No.: W61
State: Alaska	Region: Alaska	Milepost: 529.7	
Latitude: 63° 48' 35.43"	Longitude: 148° 58' 01.38"	Datum: WGS84	
Logbook No.: W61-2	Logbook Page No.: 16	Picture No.: P-W61HT012-pt, plug, SW, NW	

SITE PARAMETERS	
Subregion: Interior	Landform (hillslope, terrace, hummocks, etc.): Flat
Slope (%): 3%	Local relief (concave, convex, none): Convex
Pre-mapped Alaska LNG/NWI classification: PSS1/EM1B	Soil Map Unit Name: _____
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (if no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: PSS1/EM1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Vioreck): II C 1, III A 2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 16
for site sketch & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: <u>26 ft</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: <u>3</u> (A) Total Number of Dominant Species Across All Strata: <u>3</u> (B) % Dominant Species that are OBL, FACW, or FAC: <u>100</u> (A/B)
1. <u>N/A</u>				
2.				
3.				
4.				
Total Cover: <u> </u> 50% of total cover: <u> </u> 20% of total cover: <u> </u>				Prevalence Index worksheet: Total % Cover of: <u> </u> Multiply by: <u> </u> OBL species: <u> </u> X 1 = <u> </u> FACW species: <u>33</u> X 2 = <u>66</u> FAC species: <u>84</u> X 3 = <u>252</u> FACU species: <u>3</u> X 4 = <u>12</u> UPL species: <u> </u> X 5 = <u> </u> Column Totals: <u>120</u> (A) <u>330</u> (B) PI = B/A = <u>2.75</u> <u>salix glauca</u> 2 Fac
Sapling/Shrub Stratum (<u>26 ft</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <u>Picea glauca</u>	<u>3</u>		<u>FacU</u>	
2. <u>Salix glauca</u>	<u>12</u>	<u>Y</u>	<u>Fac</u>	
3. <u>Betula glandulosa</u>	<u>40</u>	<u>Y</u>	<u>Fac</u>	
4. <u>Salix pulchra</u>	<u>5</u>		<u>FacW</u>	
5. <u>Dasiphora fruticosa</u>	<u>3</u>		<u>Fac</u>	
6. <u>Vaccinium uliginosum</u>	<u>10</u>		<u>Fac</u>	
7. <u>Salix reticulata</u>	<u>8</u>		<u>Fac</u>	
8. <u>Alnus tenuifolia</u>	<u>5</u>		<u>Fac</u>	
9. <u>Salix barclayi</u>	<u>1</u>		<u>Fac</u>	
Total Cover: <u>84</u> 50% of total cover: <u>42</u> 20% of total cover: <u>17.8</u>				

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>26 ft</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Hydrophytic Vegetation Indicators: <input checked="" type="checkbox"/> Dominance Test is > 50% <input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
1. <u>Equisetum arvense</u>	<u>1</u>		<u>Fac</u>	
2. <u>Juncus gigantea</u>	<u>1</u>		<u>Fac</u>	
3. <u>Petasites frigidus</u>	<u>3</u>		<u>FacW</u>	
4. <u>Carex sp. (no inflorescence)</u>	<u> </u>		<u>Assume Fac</u>	
5. <u>Calamagrostis canadensis</u>	<u>2</u>		<u>Fac</u>	
6. <u>Carex membranacea</u>	<u>25</u>	<u>Y</u>	<u>FacW</u>	
7.				
8.				
9.				
10.				
Total Cover: <u>31</u> 50% of total cover: <u>15.5</u> 20% of total cover: <u>6.2</u>				_____ % Bare Ground _____ % Cover of Wetland Bryophytes <u>5%</u> Total Cover of Bryophytes _____ % Cover of Water Hydrophytic Vegetation Present (Y/N): <u>Y</u> Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>6/30/14</u> Feature ID <u>W101HT012</u>				Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features			Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹		
<u>0-5"</u>							<u>hemic. Saturated</u>
<u>5-7"</u>	<u>10 YR 4/1</u>	<u>80</u>	<u>7.5 YR 4/6</u>	<u>20</u>			<u>Sandy/loam Saturated</u>
<u>7"</u>							<u>Frozen</u>

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS	INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____
Histic Epipedon (A2) <u>X</u>	Alaska Redox (A14) _____
Black Histic (A3) <u>X</u>	Alaska Gleyed Pores (A15) _____
Hydrogen Sulfide (A4) _____	Alaska Color Change (TA4) ⁴ _____
Thick Dark Surface (A12) _____	Alaska Alpine Swales (TA5) <u>X</u>
	Alaska Redox with 2.5Y Hue _____
	Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
	Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: Frozen Depth (inches): 7"

Hydric Soil Present (Y/N): Y

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>Y</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) <u>X</u>
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u> </u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>6"</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0"</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>3</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>81</u> Dwarf shrub (<0.5m) <u>8</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>31</u> Moss-Lichen <u>5</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u>	Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <u>X</u> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>X</u>		
HGM Class (P): Slope _____ Flat <u>X</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty <u>X</u> Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable <u>X</u>	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below <u>X</u> Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized <u>X</u> 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: 261HT012

Field Target: 056

Date: 6/30/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Jennifer Anderson
Wetland Scientist (print)

X

Jennifer Anderson 6/30/14
Signature / Date

X

Kim DEGUAS
Field Crew Chief (print)

X

Kim DeGuis 6/30/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/>		Field Target: 083	Map #: 55 Map Date: 5/27
Date: 7/1/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W61HT013
Investigators: K Deaytis, J Anderson, A Fisher			Team No.: W61
State: Alaska	Region: Alaska	Milepost: 59.5	
Latitude: 63° 08' 32.36"		Longitude: 149° 25' 17.00"	Datum: WGS84
Logbook No.: W61-2	Logbook Page No.: 18	Picture No.: P-W61HT013-PR; Plug; NW; NE	

SITE PARAMETERS	
Subregion: Interior	Landform (hillslope, terrace, hummocks, etc.): slope
Slope (%): 4	Local relief (concave, convex, none): none
Pre-mapped Alaska LNG/NWI classification: Upland	Soil Map Unit Name: —
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (if no explain in Notes)	
Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)	
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Wetland Type: Upland
Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Viereck): IA2, IB2, IC1

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 18 for site sketch & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: _____)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<i>Picea glauca</i>	20	Y	FacU
2.				
3.				
4.				
Total Cover: <u>20</u> 50% of total cover: _____ 20% of total cover: _____				
Sapling/Shrub Stratum (_____)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<i>Picea glauca</i>	5		FacU
2.	<i>Betula glandulosa</i>	25	Y	Fac
3.	<i>Vaccinium uliginosum</i>	35	Y	Fac
4.	<i>Spiraea stevenii</i>	20		FacU
5.	<i>Linnaea borealis</i>	15		FacU
6.	<i>Empetrum nigrum</i>	15		Fac
7.				
8.				
9.				
Total Cover: <u>115</u> 50% of total cover: <u>57.5</u> 20% of total cover: <u>23</u>				

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 4 (A)
 Total Number of Dominant Species Across All Strata: 6 (B)
 % Dominant Species that are OBL, FACW, or FAC: 67 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: _____ X 1 = _____
 FACW species: _____ X 2 = _____
 FAC species: 97 X 3 = 291
 FACU species: 73 X 4 = 292
 UPL species: _____ X 5 = _____
 Column Totals: 170 (A) 583 (B)
 PI = B/A = 3.4

VEGETATION (use scientific names of plants)				
Herb Stratum (_____)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<i>Chamaenerion angustifolium</i>	3		FacU
2.	<i>Rubus arcticus</i>	2		Fac
3.	<i>Cornus canadensis</i>	10	Y	FacU
4.	<i>Athyrium cyclosporum</i>	8	Y	Fac
5.	<i>Calamagrostis canadensis</i>	10	Y	Fac
6.	<i>Aconogonon alaskanum</i>	2		Fac
7.	<i>Carex</i> sp.	T		Assume Fac
8.				
9.				
10.				
Total Cover: <u>35</u> 50% of total cover: <u>17.5</u> 20% of total cover: <u>7</u>				

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☐ Prevalence Index is ≤ 3.0
☐ Morphological Adaptations¹ (Provide supporting data in Notes)
☐ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

_____ % Bare Ground
 _____ % Cover of Wetland Bryophytes
30% Total Cover of Bryophytes
 _____ % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/1/14</u> Feature ID <u>W44 H1013</u>		Soil Pit Required (Y/N) <u>Y</u>			
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features			Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹		
0-4"							Fabric dry #
4-9	10YR 3/1	60	7.5YR 3/3	40	C	M	Silt-loam
9-18	2.5Y 5/1	70	7.5YR 4/2	30	C	M	Fine sandy loam 30% Cobble
							Redox not distinct or prominent

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____	
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____	
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: No Depth (inches): _____

Hydric Soil Present (Y/N): N

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>✓</u>
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): _____	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): _____	
Saturation Present (Y/N): <u>N</u> (includes capillary fringe)	Depth (in): _____	

Notes: Sample plot at toe of slope

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES

P= Plot, M= Matrix

Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____
 Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____
 Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-
 Persistent _____ Aquatic Bed _____

Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____
 Dwarf shrub (<0.5m) _____ Tall herb (>1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____

Number of Wetland Types (M): _____ **Evenness of Wetland Type Distribution (M):** Even _____ Highly Uneven _____ Moderately even _____

Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____

Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or
 Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____

Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____

Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____

Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site
 Open _____ Small Scattered Patches _____ Continuous Cover _____

Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____
 Abundant (>50% of surface) _____

Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____
 High (small groupings, diverse and interspersed) _____

HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____

SOIL VARIABLES

Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____
 Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____

HYDROLOGIC VARIABLES

Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No
 Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial
 Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____

Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____
 Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____

Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment
 Created _____

Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____

Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____
 Return Interval >5 yrs _____

Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____

Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ **pH Reading** _____

Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____
 Glacial Till/Not Permeable _____

Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____

Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____

LANDSCAPE VARIABLES (M)

Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____
 Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____

Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____

Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____

Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Jennifer Anderson 7/1/14

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61HT013

Field Target: 083

Date: 7/1/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Anderson
Wetland Scientist (print)

X Jennifer Anderson 7/1/14
Signature / Date

X Kim Deering
Field Crew Chief (print)

X [Signature] 7/1/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 024	Map #: 40/130 Map Date: 5/21/14
Date: 7/1/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W61 HTO 14
Investigators: K. Deaton J. Anderson A. Fowler		Team No.: W61-1	
State: Alaska	Region: Alaska	Milepost: 592.6	
Latitude: 63° 07' 58.07"	Longitude: 149° 26' 56.74"	Datum: WGS84	
Logbook No.: W61-2	Logbook Page No.: 16	Picture No.: P-W61 HTO 14 - Pit; Plug; E; SW.	

SITE PARAMETERS	
Subregion: Interior / South Central	Landform (hillslope, terrace, hummocks, etc.): Flat
Slope (%): 1	Local relief (concave, convex, none): Convex
Pre-mapped Alaska LNG/NWI classification: PFOIC	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (if no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil <input checked="" type="checkbox"/> , or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)

SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/>	Wetland Type: UPLAND
Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Vioreck): IA2, IIB2, IIC1

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

Soils naturally problematic, glacial till material.

See logbook W61-2, page 146

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: <u>26'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<i>Populus balsamifera</i>	10	Y	FACU
2.	<i>Picea glauca</i>	35	Y	FACU
3.				
4.				
Total Cover: <u>45</u>				
50% of total cover: <u>22.5</u>		20% of total cover: <u>9</u>		
Sapling/Shrub Stratum (<u>26'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<i>Linnaea borealis</i>	25	Y	FACU
2.	<i>Shepherdia canadensis</i>	20	Y	FACU
3.	<i>Ribes glandulosum</i>	10		FACU
4.	<i>Ribes hudsonianum</i>	15		FAC
5.	<i>Salix pseudomonticola</i>	5		FAC
6.	<i>Alnus tenuifolia</i>	8		FAC
7.				
8.				
9.				
Total Cover: <u>83</u>				
50% of total cover: <u>41.5</u>		20% of total cover: <u>16.6</u>		

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

% Dominant Species that are OBL, FACW, or FAC: 28.5 (A/B)

25%

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by: _____

OBL species: — X 1 = —

FACW species: 3 X 2 = 6

FAC species: 53 X 3 = 159

FACU species: 16 X 4 = 64

UPL species: — X 5 = —

Column Totals: 172 (A) 629 (B)

PI = B/A = 3.66

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>26'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<i>Chamaecrista nictitans</i>	25	Y	FACU
2.	<i>Cornus canadensis</i>	5	Y	FACU
3.	<i>Calamagrostis canadensis</i>	20	Y	FAC
4.	<i>Equisetum pratense</i>	3		FACW
5.	<i>Rubus arcticus</i>	5	Y	FAC
6.	<i>Mertensia paniculata</i>	3		FACU
7.	<i>Pyrola asarifolia</i>	2		FACU
8.	<i>Gymnocarpium dryopteris</i>	1		FACU
9.	<i>Galium boreale</i>			
10.				
Total Cover: <u>44</u>				
50% of total cover: <u>22</u>		20% of total cover: <u>8.8</u>		

Hydrophytic Vegetation Indicators:

_____ Dominance Test is > 50%

_____ Prevalence Index is ≤ 3.0

_____ Morphological Adaptations¹ (Provide supporting data in Notes)

_____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

40% % Cover of Wetland Bryophytes

0 % Total Cover of Bryophytes

0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): N

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/1/14</u>		Feature ID <u>W6141014</u>		Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Notes
	Color (moist)	%	Color (moist)	%				
0-1							Fibric	Drum
1-14"	Gray 2.5/10Y	50	10Y 2.5/1				Sandy loam	Rock/cobble/gravel 35%
	Gray 3/1N	50						
	N 3/							

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS	INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____
Hydrogen Sulfide (A4) _____	Alaska Redox with 2.5Y Hue _____
Thick Dark Surface (A12) _____	Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
	Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.

⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: No Depth (inches): _____

Hydric Soil Present (Y/N): N

Notes: Naturally problematic conditions - due to existence of glacial tills masking

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>4</u>	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): <u>0</u>	
Saturation Present (Y/N): <u>N</u> (includes capillary fringe)	Depth (in): <u>1</u>	
Notes: _____		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ 75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (<25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvial/Quaternary Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposits Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W614T014

Field Target: 084

Date: 7/1/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Jennifer Anderson
Wetland Scientist (print)

X

Jennifer Anderson 7/1/14
Signature / Date

X

Kim DeGutis
Field Crew Chief (print)

X

Kim DeGutis 7/1/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/>		Field Target <input checked="" type="checkbox"/>	Map #: 57130 Map Date: 5/27/14
Date: 7/1/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W61HT015
Investigators: K Delavris J Anderson A Fisher			Team No.: W61
State: Alaska	Region: Alaska	Milepost: 594.1	
Latitude: 63° 06' 51.56"	Longitude: 149° 28' 17.67"	Datum: WGS84	
Logbook No.: W61-2	Logbook Page No.: 20	Picture No.: P-W61HT015-Pit, Plug, NE, W	

SITE PARAMETERS	
Subregion: Interior/Southcentral	Landform (hillslope, terrace, hummocks, etc.): FAT
Slope (%): 2	Local relief (concave, convex, none): None
Pre-mapped Alaska LNG/NWI classification: DEN B	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)
Are Vegetation <input type="checkbox"/> Soil <input type="checkbox"/> or Hydrology <input type="checkbox"/> Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation <input type="checkbox"/> Soil <input type="checkbox"/> or Hydrology <input type="checkbox"/> Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Wetland Type: UPLAND
Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Vioreck): III A1

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 20
for site sketch &
notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: <u>240'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<u>N/A</u>			
2.				
3.				
4.				
Total Cover: <u>—</u>				
50% of total cover: <u>—</u>		20% of total cover: <u>—</u>		
Sapling/Shrub Stratum (<u>240'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<u>N/A</u>			
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
Total Cover: <u>—</u>				
50% of total cover: <u>—</u>		20% of total cover: <u>—</u>		

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

% Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: — Multiply by: —

OBL species: — X 1 = —

FACW species: — X 2 = —

FAC species: 102 X 3 = 306

FACU species: 52 X 4 = 208

UPL species: — X 5 = —

Column Totals: 154 (A) 514 (B)

PI = B/A = 3.3

VEGETATION (use scientific names of plants)				
Herb Stratum ()		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<u>Calamagrostis canadensis</u>	<u>85</u>	<u>Y</u>	<u>FAC</u>
2.	<u>Chamaecrista angustifolia</u>	<u>20</u>		<u>FACU</u>
3.	<u>Meibomia paniculata</u>	<u>12</u>		<u>FACU</u>
4.	<u>Aconitum delphinifolium</u>	<u>5</u>		<u>FAC</u>
5.	<u>Heracleum maximum</u>	<u>20</u>		<u>FACU</u>
6.	<u>Polemonium acutellum</u>	<u>10</u>		<u>FAC</u>
7.	<u>Athyrium cyclosorum</u>	<u>2</u>		<u>FAC</u>
8.				
9.				
10.				
Total Cover: <u>154</u>				
50% of total cover: <u>77</u>		20% of total cover: <u>30.6</u>		

Hydrophytic Vegetation Indicators:

☒ Dominance Test is > 50%

☐ Prevalence Index is ≤ 3.0

☐ Morphological Adaptations¹ (Provide supporting data in Notes)

☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

0 % Cover of Wetland Bryophytes

0 Total Cover of Bryophytes

0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/1/14</u>		Feature ID <u>WHT015</u>		Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-3"	10 YR 3/2	100					Silt + loam	3: JA
3"-18"	2.5 Y 4/3	95	10 YR 5/6	5	C	M	Silt + loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer
Thick Dark Surface (A12) _____		Other (Explain in Notes)

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: N/A Depth (inches): _____

Hydric Soil Present (Y/N): N

Notes: _____

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>1</u>	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): <u>1</u>	
Saturation Present (Y/N): (includes capillary fringe) <u>N</u>	Depth (in): <u>1</u>	
Notes: _____		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (>1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		
SOIL VARIABLES		
Soil Factors (P): Soil Lacking _____ Histosol: Fibric _____ Histosol: Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____		
HYDROLOGIC VARIABLES		
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____		
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____		
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____		
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____		
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____		
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____		
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____		
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____		
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____		
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____		
LANDSCAPE VARIABLES (M)		
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____		
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____		
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____		
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____		

Crew Chief QA/QC check: *[Signature]*

GPS Technician QA/QC check: *[Signature]*

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61HT 015

Field Target: 085

Date: 085 7/1/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Jennifer Anderson

Wetland Scientist (print)

X

Jennifer Anderson 7/1/14

Signature / Date

X

Kim DEGRIS

Field Crew Chief (print)

X

Kim DeGris 7/1/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/> <i>outside 2000' corridor</i>		Field Target: <u>115</u>	Map #: <u>82/130</u> Map Date: <u>6/27/14</u>
Date: <u>7/2/14</u>	Project Name & No.: Alaska LNG 26221306		Feature Id: <u>W61HT016</u>
Investigators: <u>K. Debutis</u> <u>J. Anderson</u>			Team No.: <u>W61</u>
State: Alaska	Region: Alaska	Milepost: <u>645.35</u>	
Latitude: <u>62° 33' 55.12</u>	Longitude: <u>150° 15' 34.19</u>	Datum: WGS84	
Logbook No.: <u>W61-2</u>	Logbook Page No.: <u>22</u>	Picture No.: <u>P-W61HT016-P1; Plug; W; SE</u>	

SITE PARAMETERS	
Subregion: <u>Southcentral</u>	Landform (hillslope, terrace, hummocks, etc.): <u>FLAT</u>
Slope (%): <u>2</u>	Local relief (concave, convex, none): <u>Concave</u>
Pre-mapped Alaska LNG/NWI classification: <u>UPLAND</u>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Wetland Type: <u>Upland</u>
Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Vioreck): <u>III A I</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

- Note polygon shape for sample plot altered only to include open grassed area & not adjacent shrubs/treed areas.

See logbook W61-2, page 22 for notes & site sketch

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: <u>15'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<u>N/A</u>			
2.				
3.				
4.				
Total Cover: <u> </u>				
50% of total cover: <u> </u>		20% of total cover: <u> </u>		
Sapling/Shrub Stratum (<u>15'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<u>N/A</u>			
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
Total Cover: <u> </u>				
50% of total cover: <u> </u>		20% of total cover: <u> </u>		

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 1 (A)
 Total Number of Dominant Species Across All Strata: 1 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: Multiply by:
 OBL species: X 1 =
 FACW species: X 2 =
 FAC species: 110 X 3 = 330
 FACU species: 8 X 4 = 32
 UPL species: X 5 =
 Column Totals: 118 (A) 362 (B)
 PI = B/A = 3.06

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>15'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<u>Colanagrostis canadensis</u>	<u>90</u>	<u>Y</u>	<u>FAC</u>
2.	<u>Chamaenerion angustifolium</u>	<u>5</u>		<u>FACU</u>
3.	<u>Epizetum sylvaticum</u>	<u>10</u>		<u>FAC</u>
4.	<u>Polemonium acutiflorum</u>	<u>10</u>		<u>FAC</u>
5.	<u>Geranium linidum</u>	<u>T</u>		<u>FACU</u>
6.	<u>Gymnocarpium dryopteris</u>	<u>3</u>		<u>FACU</u>
7.				
8.				
9.				
10.				
Total Cover: <u>118</u>				
50% of total cover: <u>59</u>		20% of total cover: <u>23.6</u>		

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☐ Prevalence Index is ≤ 3.0
☐ Morphological Adaptations¹ (Provide supporting data in Notes)
☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

☒ % Bare Ground
☐ % Cover of Wetland Bryophytes
☒ Total Cover of Bryophytes
☒ % Cover of Water
 Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/2/14</u> Feature ID <u>UG1H-F016</u>		Soil Pit Required (Y/N) <u>Y</u>			
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features			Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹		
0-1"							Fibric Dry
1-9"	2.5Y 4/1	80	10YR 5/6	20	C	M	Fine Sandy loam
9-12"	10YR 5/6	100					Fine Sandy loam

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____	
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____	
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): N

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	
Saturation Present (Y/N): (includes capillary fringe) <u>N</u>	Depth (in): <u>—</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____			
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____			
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____			
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____			
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____			
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____			
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____			
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____			
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____			
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____			
SOIL VARIABLES			
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____			
HYDROLOGIC VARIABLES			
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____			
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____			
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____			
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____			
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____			
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____			
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____			
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____			
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____			
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____			
LANDSCAPE VARIABLES (M)			
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____			
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____			
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____			
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____			

Crew Chief QA/QC check: *[Signature]*

GPS Technician QA/QC check: *[Signature]*

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61 HTO16 Field Target: 115 Date: 7/2/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Anderson
Wetland Scientist (print)

X Jennifer Anderson 7/2/14
Signature / Date

X Kim DEGOTIS
Field Crew Chief (print)

X Kelly 7/2/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline		Access Road (explain)	Other (explain) <i>2000 ft corridor</i>
Field Target: <i>114</i>		Map #: <i>82/130</i>	Map Date: <i>6/27/14</i>
Date: <i>7/2/14</i>	Project Name & No.: Alaska LNG 26221306		Feature Id: <i>W61HT017</i>
Investigators: <i>L DEBUTIS J Anderson</i>			Team No.: <i>W61</i>
State: Alaska	Region: Alaska	Milepost: <i>645.3</i>	
Latitude: <i>62°33'57.16</i>		Longitude: <i>150°15'48.13</i>	Datum: WGS84
Logbook No.: <i>W61-2</i>	Logbook Page No.: <i>23</i>	Picture No.: <i>P-W61HT017-Pit; Plug; E; S</i>	

SITE PARAMETERS	
Subregion: <i>Southcentral</i>	Landform (hillslope, terrace, hummocks, etc.): <i>Flat</i>
Slope (%): <i>1</i>	Local relief (concave, convex, none): <i>Concave</i>
Pre-mapped Alaska LNG/NWI classification: <i>Upland</i>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Wetland Type: <i>UPLAND</i>
Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Viereck): <i>II B1, III A1</i>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

** Plot size altered to capture veg community c bottom of local depression*

See Logbook W61-2, page 23 for site sketch & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: <u>20'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	N/A			
2.				
3.				
4.				
Total Cover: _____				
50% of total cover: _____		20% of total cover: _____		
Sapling/Shrub Stratum (<u>20'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<i>Alnus fruticosa</i>	55	Y	FAC
2.	<i>Oplopanax horridus</i>	5		FACU
3.				
4.				
5.				
6.				
7.				
8.				
9.				
Total Cover: <u>60</u>				
50% of total cover: <u>30</u>		20% of total cover: <u>12</u>		

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

% Dominant Species that are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by: _____

OBL species: _____ X 1 = _____

FACW species: _____ X 2 = _____

FAC species: 78 X 3 = 234

FACU species: 20 X 4 = 80

UPL species: _____ X 5 = _____

Column Totals: 98 (A) 314 (B)

PI = B/A = 3.20

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>20'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<i>Athyrium cyclosorum</i>	3		FAC
2.	<i>Gymnocarpium dryopteris</i>	10	Y	FACU
3.	<i>Calopogon canadensis</i>	20	Y	FAC
4.	<i>Equisetum sylvaticum</i>	3		FAC
5.	<i>Oplopanax horridus</i>	5		FACU
6.	<i>Botrypus virginianus</i>	5		FACU
7.				
8.				
9.				
10.				
Total Cover: <u>46</u>				
50% of total cover: <u>23</u>		20% of total cover: <u>9.2</u>		

Hydrophytic Vegetation Indicators:

☒ Dominance Test is > 50%

☐ Prevalence Index is ≤ 3.0

☐ Morphological Adaptations¹ (Provide supporting data in Notes)

☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

2 % Bare Ground

0 % Cover of Wetland Bryophytes

0 Total Cover of Bryophytes

0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/2/14</u>		Feature ID <u>W61HT07</u>		Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-1"							Fibric	Dry
1-8"	10YR 3/2	85	7.5YR 4/6	15	C	M	silt loam	
8-18"	10YR 3/6	100						

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS	INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____
Hydrogen Sulfide (A4) _____	Alaska Redox with 2.5Y Hue _____
Thick Dark Surface (A12) _____	Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
	Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: N/A Depth (inches): —

Hydric Soil Present (Y/N): N

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: <u>W/in locally concave depression</u>	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	
Saturation Present (Y/N): <u>N</u> (includes capillary fringe)	Depth (in): <u>—</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (>1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____	Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ For More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		
SOIL VARIABLES		
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____		
HYDROLOGIC VARIABLES		
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____		
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____		
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvial/Quaternary Soils Sediment Created _____		
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____		
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____		
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____		
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____		
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____		
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____		
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____		
LANDSCAPE VARIABLES (M)		
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____		
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____		
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____		
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____		

Crew Chief QA/QC check: _____

GPS Technician QA/QC check: _____

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W611T017 Field Target: 114 Date: 7/2/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Jennifer Anderson
Wetland Scientist (print)

X

Jennifer Anderson 7/2/14
Signature / Date

X

Kim DEGUSIS
Field Crew Chief (print)

X

Kim Degusis 7/2/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline _____ Access Road (explain) _____ Other (explain) <u>X</u>		Field Target: <u>113</u>	Map #: <u>82/130</u> Map Date: <u>6/27/130</u>
Date: <u>7/2/14</u>	Project Name & No.: Alaska LNG 26221306		Feature Id: <u>W61HT018</u>
Investigators: <u>K Deguis</u> <u>J Anderson</u>			Team No.: <u>W61</u>
State: Alaska	Region: Alaska	Milepost: <u>645.4</u>	
Latitude: <u>62° 33' 53.18"</u>		Longitude: <u>150° 15' 53.92"</u>	Datum: WGS84
Logbook No.: <u>W61-2</u>	Logbook Page No.: <u>24</u>	Picture No.: <u>P-W61HT018-Pit; Plug; NE; SE</u>	

SITE PARAMETERS	
Subregion: <u>South Central</u>	Landform (hillslope, terrace, hummocks, etc.): <u>Depression</u>
Slope (%): <u>1</u>	Local relief (concave, convex, none): <u>Concave</u>
Pre-mapped Alaska LNG/NWI classification: <u>Upland</u>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <u>X</u> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <u>X</u> No _____ (If no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <u>X</u> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <u>X</u> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <u>X</u> No _____	Is the Sampled Area within a Wetland? Yes <u>X</u> No _____
Hydric Soil Present? Yes <u>X</u> No _____	Wetland Type: <u>PEM1XB</u>
Wetland Hydrology Present? Yes <u>X</u> No _____	Alaska Vegetation Classification (Vioreck): <u>III A3</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

* Sample plot shape modified to only include grassed vegetation type.

See logbook W61-2, page 24

for site sketch & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: <u>15'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<u>N/A</u>			
2.				
3.				
4.				
Total Cover: _____				
50% of total cover: _____		20% of total cover: _____		
Sapling/Shrub Stratum (<u>15'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<u>N/A</u>			
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
Total Cover: _____				
50% of total cover: _____		20% of total cover: _____		

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 1 (A)
 Total Number of Dominant Species Across All Strata: 1 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: 3 X 1 = 3
 FACW species: 2 X 2 = 4
 FAC species: 50 X 3 = 150
 FACU species: - X 4 = -
 UPL species: - X 5 = -
 Column Totals: 56 (A) 157 (B)
 PI = B/A = 2.85

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>15'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.	<u>Calamagrostis canadensis</u>	<u>50</u>	<u>Y</u>	<u>FAC</u>
2.	<u>Carex Aquatilis</u>	<u>3</u>		<u>OBL</u>
3.	<u>Carex macrochaeta</u>	<u>2</u>		<u>FACW</u>
4.				
5.				
6.				
7.				
8.				
9.				
10.				
Total Cover: <u>55</u>				
50% of total cover: <u>27.5</u>		20% of total cover: <u>11</u>		

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

☒ % Bare Ground
☒ % Cover of Wetland Bryophytes
☒ Total Cover of Bryophytes
☒ % Cover of Water
Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):
Calamagrostis growing in large hummock habitat

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/2/14</u> Feature ID <u>W61H018</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-1"							Thatch/roots	
1-6"	2.5Y 3/2	100					silt	saturated
6-16"	2.5Y 4/3	90	10YR 3/4	10	C	PL	silt	Saturated
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ² Location: PL=Pore Lining, M=Matrix.								
HYDRIC SOIL INDICATORS						INDICATORS FOR PROBLEMATIC HYDRIC SOILS³		
Histosol or Histel (A1) _____			Alaska Gleyed (A13) _____			Alaska Color Change (TA4) ⁴ _____		
Histic Epipedon (A2) _____			Alaska Redox (A14) _____			Alaska Alpine Swales (TA5) _____		
Black Histic (A3) _____			Alaska Gleyed Pores (A15) _____			Alaska Redox with 2.5Y Hue <u>X</u>		
Hydrogen Sulfide (A4) _____						Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____		
Thick Dark Surface (A12) _____						Other (Explain in Notes) _____		
³ One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic. ⁴ Give details of color change in Notes.								
Restrictive Layer (if present): Type: <u>Bedrock</u> Depth (inches): <u>16"</u>								
Hydric Soil Present (Y/N): <u>Y</u>								
Notes: <u>*note bedrock encountered @ 16" in sample plot; locally adjacent to sample plot bedrock w/in 14" of surface; Excavated multiple pits to confirm not permafrost or frozen soils</u>								

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)			SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____		Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____		Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____		Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____		Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____		Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____		Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____			
Iron Deposits (B5) _____				
Surface Water Present (Y/N): <u>N</u> Depth (in): _____ Water Table Present (Y/N): <u>Y</u> Depth (in): <u>3"</u> Saturation Present (Y/N): <u>Y</u> (includes capillary fringe) Depth (in): <u>?</u>			Wetland Hydrology Present (Y/N): <u>Y</u>	
Notes:				

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES	
P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <input checked="" type="checkbox"/> Aquatic Bed _____	
Percent Cover (P): Tree (>5 dbh, >6m tall) <input type="checkbox"/> Sapling (<5 dbh, <6m tall) <input type="checkbox"/> Tall shrub (2-6m) <input type="checkbox"/> Short shrub (0.5-2m) <input checked="" type="checkbox"/> Dwarf shrub (<0.5m) <input type="checkbox"/> Tall herb (≥1m) <input checked="" type="checkbox"/> Short herb (<1m) <input checked="" type="checkbox"/> Moss-Lichen <input type="checkbox"/> Floating <input type="checkbox"/> Submerged <input type="checkbox"/>	
Number of Wetland Types (M): <input type="checkbox"/>	Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <input checked="" type="checkbox"/>
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <input checked="" type="checkbox"/> High Density (60-80%) <input checked="" type="checkbox"/> Very High Density (80-100%) _____	
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <input checked="" type="checkbox"/> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____	
Plant Species Diversity (P): Low (< 5 plant species) <input checked="" type="checkbox"/> Medium (5-25 species) _____ High (>25) _____	
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <input checked="" type="checkbox"/>	
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches <input checked="" type="checkbox"/> Continuous Cover _____	
Dead Woody Material (P): Low Abundance (0-25% of surface) <input checked="" type="checkbox"/> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____	
Vegetative Interspersion (P): Low (large patches, concentric rings) <input checked="" type="checkbox"/> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____	
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <input checked="" type="checkbox"/> Riverine _____ Estaurine Fringe _____	

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty <input checked="" type="checkbox"/> Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <input checked="" type="checkbox"/> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <input checked="" type="checkbox"/> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded <input checked="" type="checkbox"/>	
Evidence of Sedimentation (P): No Evidence Observed <input checked="" type="checkbox"/> Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) <input checked="" type="checkbox"/> Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <input checked="" type="checkbox"/> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <input checked="" type="checkbox"/> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <input checked="" type="checkbox"/> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable <input checked="" type="checkbox"/>	
Basin Topographic Gradient (M): Low Gradient (<2%) <input checked="" type="checkbox"/> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <input checked="" type="checkbox"/> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated <input checked="" type="checkbox"/> Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <input checked="" type="checkbox"/>	
Watershed Land Use: 0-5% Rural <input checked="" type="checkbox"/> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: WG14T018

Field Target: 113

Date: 7/2/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Jennifer Anderson
Wetland Scientist (print)

X

Jennifer Anderson 7/2/14
Signature / Date

X

Kim DEGUTIS
Field Crew Chief (print)

X

Kim Degutis 7/2/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 117	Map #: 831130 Map Date: 6/21/14
Date: 7/3/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W61HT019
Investigators: K DEBOUTS J Anderson			Team No.: W61
State: Alaska	Region: Alaska	Milepost: 645.94	
Latitude: 62° 33' 25.70"		Longitude: 150° 15' 46.16"	Datum: WGS84
Logbook No.: W61-2	Logbook Page No.: 26	Picture No.: P-W61HT019 P.t. Plug: NE; NW	

SITE PARAMETERS	
Subregion: Southcentral	Landform (hillslope, terrace, hummocks, etc.): Slope
Slope (%): 3	Local relief (concave, convex, none): Convex
Pre-mapped Alaska LNG/NWI classification: UPLAND	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil <input checked="" type="checkbox"/> , or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/>	Wetland Type: UPLAND
Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Vioreck): I C 3, II B 2, III A

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

Soils show Ash-influenced horizon

See logbook W61-2, page 26 for site sketch & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: <u>26'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Betula neolacina</i>		<u>35</u>	<u>Y</u>	<u>FACU</u>
2. <i>Picea glauca</i>		<u>10</u>	<u>Y</u>	<u>FACU</u>
3.				
4.				
Total Cover: <u>45</u> 50% of total cover: <u>22.5</u> 20% of total cover: <u>9</u>				
Sapling/Shrub Stratum (<u>26'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Alnus fruticosa</i>		<u>30</u>	<u>Y</u>	<u>FAC</u>
2. <i>Ribes glandulosum</i>		<u>2</u>		<u>FACU</u>
3.				
4.				
5.				
6.				
7.				
8.				
9.				
Total Cover: <u>32</u> 50% of total cover: <u>16</u> 20% of total cover: <u>6.2</u>				

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)
 Total Number of Dominant Species Across All Strata: 6 (B)
 % Dominant Species that are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: _____ X 1 = _____
 FACW species: _____ X 2 = _____
 FAC species: 105 X 3 = 315
 FACU species: 67 X 4 = 268
 UPL species: _____ X 5 = _____
 Column Totals: 172 (A) 583 (B)
 PI = B/A = 3.38

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>26'</u>)		Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Calamagrostis canadensis</i>		<u>30</u>	<u>Y</u>	<u>FAC</u>
2. <i>Gymnocarpium dryopteris</i>		<u>20</u>	<u>Y</u>	<u>FACU</u>
3. <i>Athyrium filix-femina</i>		<u>35</u>	<u>Y</u>	<u>FAC</u>
4. <i>Equisetum sylvaticum</i>		<u>10</u>		<u>FAC</u>
5.				
6.				
7.				
8.				
9.				
10.				
Total Cover: <u>95</u> 50% of total cover: <u>47.5</u> 20% of total cover: <u>19</u>				

Hydrophytic Vegetation Indicators:
 _____ Dominance Test is > 50%
 _____ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

20 % Bare Ground
 _____ % Cover of Wetland Bryophytes
0 % Total Cover of Bryophytes
0 % Cover of Water
Hydrophytic Vegetation Present (Y/N): N
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/3/14</u> Feature ID <u>H41HT019</u>		Soil Pit Required (Y/N) <u>Y</u>			
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features			Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹		
0-6"							
6-10"	2.5Y 5/1	100					Fabric dry silt/loam may be influenced by ash.
10-18"	10YR 3/10	50					
10-18"	10YR 5/2	50					

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: N/A Depth (inches): _____

Hydric Soil Present (Y/N): N

Notes: 6-10" horizon includes Ash-influenced soils; does not satisfy Alaska 2.5Y Hue indicator (no PL)

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	
Saturation Present (Y/N): (includes capillary fringe) <u>N</u>	Depth (in): <u>—</u>	
Notes: _____		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (>1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		
SOIL VARIABLES		
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____		
HYDROLOGIC VARIABLES		
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____		
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____		
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvial/Quaternary Soils Sediment Created _____		
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____		
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____		
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____		
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____		
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____		
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (>2%) _____		
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____		
LANDSCAPE VARIABLES (M)		
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____		
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e., open space) _____		
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____		
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____		

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W6147019 Field Target: 117 Date: 7/3/19

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☐ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X
Jennifer Anderson
Wetland Scientist (print)

X
Jennifer Anderson 7/3/14
Signature / Date

X
Kim DEGUIS
Field Crew Chief (print)

X
Kelly G. Let 7/3/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline		Access Road (explain)	Other (explain) <u>X</u>
Field Target: <u>116</u>		Map #: <u>83/130</u> Map Date: <u>6/27/14</u>	
Date: <u>7/3/14</u>	Project Name & No.: Alaska LNG 26221306		Feature Id: <u>W61H020</u>
Investigators: <u>K DEGRIS</u> <u>J Anderson</u>			Team No.: <u>W61</u>
State: Alaska	Region: Alaska	Milepost: <u>645.8</u>	
Latitude: <u>62° 33' 27.54"</u>		Longitude: <u>150° 15' 55.56"</u>	Datum: WGS84
Logbook No.: <u>W61-2</u>	Logbook Page No.: <u>27</u>	Picture No.: <u>P-W61H020-PA; Plug; E; W.</u>	

SITE PARAMETERS	
Subregion: <u>Southcentral</u>	Landform (hillslope, terrace, hummocks, etc.): <u>Flat</u>
Slope (%): <u>0</u>	Local relief (concave, convex, none): <u>NONE</u>
Pre-mapped Alaska LNG/NWI classification: <u>PEM1/SS1B</u>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <u>X</u> No (if no explain in Notes)	Are "Normal Circumstances" present: Yes <u>X</u> No (If no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <u>X</u> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <u>X</u> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <u>X</u> No	Is the Sampled Area within a Wetland? Yes <u>X</u> No
Hydric Soil Present? Yes <u>X</u> No	Wetland Type: <u>PEM1/SS1B</u>
Wetland Hydrology Present? Yes <u>X</u> No	Alaska Vegetation Classification (Vioreck): <u>III A3, II C2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

No evidence of burn

See logbook W61-2, page 27
for notes & site sketch

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: <u>43</u> (A) Total Number of Dominant Species Across All Strata: <u>43</u> (B) % Dominant Species that are OBL, FACW, or FAC: <u>100</u> (A/B)
1. <u>N/A</u>				
2.				
3.				
4.				
Total Cover: _____ 50% of total cover: _____ 20% of total cover: _____				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species: <u>76</u> X 1 = <u>76</u> FACW species: <u>24</u> X 2 = <u>48</u> FAC species: <u>35</u> X 3 = <u>105</u> FACU species: <u>-</u> X 4 = <u>-</u> UPL species: <u>-</u> X 5 = <u>-</u> Column Totals: <u>135</u> (A) <u>229</u> (B) PI = B/A = <u>1.69</u>
Sapling/Shrub Stratum (<u>24'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <u>Betula nana</u>	<u>30</u>	<u>Y</u>	<u>FAC</u>	
2. <u>Rhododendron groenlandicum</u>	<u>5</u>		<u>FAC</u>	
3. <u>Chamaedaphne ciliolata</u>	<u>15</u>	<u>Y</u>	<u>FACW</u>	
4. <u>Anchusa pallida</u>	<u>1</u>		<u>FACW</u>	
5. <u>Picea mariana</u>	<u>1</u>		<u>FACW</u>	
6. <u>Vaccinium oxycoccus</u>	<u>1</u>		<u>OBL</u>	
7.				
8.				
9.				
Total Cover: <u>53</u> 50% of total cover: <u>26.5</u> 20% of total cover: <u>10.6</u>				

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Hydrophytic Vegetation Indicators: <input checked="" type="checkbox"/> Dominance Test is > 50% <input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
1. <u>Rubus chamaemorus</u>	<u>7</u>		<u>FACW</u>	
2. <u>Pedicularis labradorica</u>	<u>1</u>		<u>FACW</u>	
3. <u>Carex sitchensis</u>	<u>60</u>	<u>Y</u>	<u>OBL</u>	
4. <u>Carex vaginata</u>	<u>15</u>	<u>Y</u>	<u>OBL</u>	
5.				_____ % Bare Ground _____ % Cover of Wetland Bryophytes <u>40</u> Total Cover of Bryophytes _____ % Cover of Water Hydrophytic Vegetation Present (Y/N): <u>Y</u> Notes: (If observed, list morphological adaptations below):
6.				
7.				
8.				
9.				
10.				
Total Cover: <u>75</u> <u>82</u> 50% of total cover: <u>37.5</u> 20% of total cover: <u>15</u> <u>41</u> <u>16.4</u>				

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/3/14</u> Feature ID <u>LW61H2020</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0 - 18"							Fibric	Saturated

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>Y</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: N/A Depth (inches): —

Hydric Soil Present (Y/N): Y

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) <u>Y</u>
High Water Table (A2) <u>Y</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>Y</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>Y</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>7.5"</u>	
Saturation Present (Y/N): (includes capillary fringe) <u>Y</u>	Depth (in): <u>0"</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <u>X</u> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>1</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>50</u> Dwarf shrub (<0.5m) <u>2</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>75</u> Moss-Lichen <u>40</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u>		Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>X</u> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>X</u>		
HGM Class (P): Slope _____ Flat <u>X</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial/Quaternary Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits <u>X</u> Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <u>X</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: WG1 HT020 Field Target: 116 Date: 7/3/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Jennifer Anderson
Wetland Scientist (print)

X

Jennifer Anderson 7/2/14
Signature / Date

X

Kim DEGUTIS
Field Crew Chief (print)

X

Kathy K
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 074	Map #: 501130 Map Date: 6/24/14
Date: 7/5/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W61HT021
Investigators: K. REGOUTIS J. Anderson			Team No.: W61
State: Alaska	Region: Alaska	Milepost: 576.34	
Latitude: 63° 14' 48.35"		Longitude: 149° 10' 56.10"	Datum: WGS84
Logbook No.: W61-2	Logbook Page No.: 28	Picture No.: P-W61HT021; P+; Plug; W; E	

SITE PARAMETERS	
Subregion: Interior	Landform (hillslope, terrace, hummocks, etc.): FLAT
Slope (%): 0	Local relief (concave, convex, none): NONE
Pre-mapped Alaska LNG/NWI classification: PEMIF	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: PEM1 / SS1 A
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Viereck): III A3, IIC2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 28
for site sketch & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)

Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea glauca</i>	1		FACU
2.			
3.			
4.			
Total Cover: <u>1</u>			
50% of total cover: _____ 20% of total cover: _____			
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea glauca</i>	3		FACU
2. <i>Dasiphora fruticosa</i>	5		FAC
3. <i>Arctostaphylos rubra</i>	10	Y	FAC
4. <i>Salix reticulata</i>	3		FAC
5. <i>Betula nana</i>	10	Y	FAC
6. <i>Vaccinium oxycoccus</i>	1		OBL
7. <i>Empetrum nigrum</i>	1		FAC
8. <i>Vaccinium uliginosum</i>	3		FAC
9. <i>Salix arctica</i>	10	Y	FACU
Total Cover: <u>46.47</u>			
50% of total cover: <u>23.5</u> 20% of total cover: <u>9.4</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)
 Total Number of Dominant Species Across All Strata: 4 (B)
 % Dominant Species that are OBL, FACW, or FAC: 75% (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:

OBL species: 66 X 1 = 66
 FACW species: 7 X 2 = 14
 FAC species: 42 X 3 = 126
 FACU species: 16 X 4 = 64
 UPL species: — X 5 = —
 Column Totals: 131 (A) 270 (B)
 PI = B/A = 2.06

Tree stratum added to shrub stratum since there was < 5% cover

VEGETATION (use scientific names of plants)

Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Pedicularis canadensis</i>	1		FACW
2. <i>Sanguisorba canadensis</i>	5		FACW
3. <i>Geranium exanthum</i>	2		FACU
4. <i>Equisetum arvense</i>	8		FAC
5. <i>Thalictrum flavum</i>	2		FAC
6. <i>Rubus chamaemorus</i>	1		FACW
7. unknown herb (wild orchid)	1		Assume FAC
8. <i>Carex aquatilis</i>	55	Y	OBL
9. <i>Eleocharis acicularis</i>	10		OBL
10.			
Total Cover: <u>84</u>			
50% of total cover: <u>42</u> 20% of total cover: <u>16.8</u>			

Hydrophytic Vegetation Indicators:

0 Dominance Test is > 50%
0 Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
10 % Cover of Wetland Bryophytes
55 Total Cover of Bryophytes
5 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/5/14</u> Feature ID <u>1261H8021</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
<u>0-18"</u>							<u>Fibric</u>	<u>Saturated</u>

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____	
Hydrogen Sulfide (A4) <u>X</u>		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____	
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: N/A Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes: _____

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) <u>X</u>	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>1/2"</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>1"</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0"</u>	
Notes: _____		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <u>10</u> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>1</u> Sapling (<5 dbh, <6m tall) <u>3</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>18</u> Dwarf shrub (<0.5m) <u>25</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>84</u> Moss-Lichen <u>55</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u> Evenness of Wetland Type Distribution (M): Even <u>2</u> Highly Uneven _____ Moderately even _____		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <u>2</u> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover <u>0</u> N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>10</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>0</u> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>0</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>0</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>0</u>		
HGM Class (P): Slope _____ Flat <u>0</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>0</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>0</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>0</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded <u>0</u>	
Evidence of Sedimentation (P): No Evidence Observed <u>0</u> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>0</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>0</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>0</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) <u>0</u> Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading <u>7.06</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits <u>0</u> Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>0</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>0</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below <u>0</u> Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>0</u>	
Watershed Land Use: 0-5% Rural <u>0</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>0</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61HT021

Field Target: 074

Date: 7/5/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Jennifer Anderson
Wetland Scientist (print)

X

Jennifer Anderson 7/5/14
Signature / Date

X

Kim DEGUIS
Field Crew Chief (print)

X

Kelly 14/14 7/5/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION				
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 073	Map #: 501130	Map Date: 6/24/14
Date: 7/5/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W61HT022	
Investigators: K JEGOUSIS J Anderson			Team No.: W61	
State: Alaska	Region: Alaska	Milepost: 576.2		
Latitude: 63° 18' 54.04"		Longitude: 149° 10' 53.30"	Datum: WGS84	
Logbook No.: W61-2	Logbook Page No.: 28	Picture No.: P-W61HT022 - Pit; Plug; N; E		

SITE PARAMETERS	
Subregion: Interior	Landform (hillslope, terrace, hummocks, etc.): FLAT
Slope (%): 5	Local relief (concave, convex, none): CONVEX
Pre-mapped Alaska LNG/NWI classification: PSS1/4B	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	
Are "Normal Circumstances" present? Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)	
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed? No <input checked="" type="checkbox"/> (If yes, explain in Notes)	
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic? No <input checked="" type="checkbox"/> (If yes, explain in Notes.)	
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/>	Wetland Type: UPLAND
Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Viereck): PSS1/4B

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

Right at top edge of topo break (2-3' drop)
See logbook W61-2, page 28 for notes & site sketch

VIERECK:
II B2, II C1

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				Dominance Test worksheet:	
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	No. of Dominant Species that are OBL, FACW, or FAC: <u>3</u> (A)	
1. <i>Picea glauca</i>	8	Y	FACU	Total Number of Dominant Species Across All Strata: <u>5</u> (B)	
2.				% Dominant Species that are OBL, FACW, or FAC: <u>60%</u> (A/B)	
3.					
4.					
Total Cover: <u>8</u>				Prevalence Index worksheet:	
50% of total cover: <u>4</u> 20% of total cover: <u>2</u>				Total % Cover of: _____ Multiply by: _____	
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	OBL species: _____ X 1 = _____	
1. <i>Betula glandulosa</i>	65	Y	FAC	FACW species: <u>5</u> X 2 = <u>10</u>	
2. <i>Vaccinium uliginosum</i>	45	Y	FAC	FAC species: <u>15</u> + <u>71</u> X 3 = <u>513</u> <u>4108</u>	
3. <i>Empetrum nigrum</i>	2		FAC	FACU species: <u>26</u> X 4 = <u>104</u>	
4. <i>Salix pulchra</i>	5		FACW	UPL species: <u>15</u> — X 5 = <u>—</u> <u>75</u>	
5. <i>Alnus fruticosa</i>	15		FAC	Column Totals: <u>202</u> (A) <u>627</u> (B)	
6. <i>Vaccinium vitis-idaea</i>	2		FAC	PI = B/A = <u>3.10</u> <u>3.25</u>	
7. <i>Spiraea stewartii</i>	8		FACU		
8. <i>Salix pseudomyrsinites</i>	<u>715</u>		FAC UPL		
9.					
Total Cover: <u>157</u>					
50% of total cover: <u>78.5</u> 20% of total cover: <u>31.4</u>					

VEGETATION (use scientific names of plants)				Hydrophytic Vegetation Indicators:	
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	<u>0</u> Dominance Test is > 50%	
1. <i>Calamagrostis canadensis</i>	25	Y	FAC	Prevalence Index is ≤ 3.0	
2. <i>Cornus canadensis</i>	10	Y	FACU	Morphological Adaptations ¹ (Provide supporting data in Notes)	
3. <i>Dasychloa cuneata</i>	2		FAC	Problematic Hydrophytic Vegetation ¹ (Explain)	
4.				¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.	
5.					
6.					
7.					
8.					
9.					
10.					
Total Cover: <u>37</u>				<u>5</u> % Bare Ground <u>0</u> % Cover of Wetland Bryophytes <u>10</u> Total Cover of Bryophytes <u>0</u> % Cover of Water	
50% of total cover: <u>18.5</u> 20% of total cover: <u>7.4</u>				Hydrophytic Vegetation Present (Y/N): <u>Y</u>	
Notes: (If observed, list morphological adaptations below):					

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/5/14</u> Feature ID <u>W61H7022</u>		Soil Pit Required (Y/N) <u>Y</u>				
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features			Texture	Notes	
	Color (moist)	%	Color (moist)	%	Type ¹			Loc ²
0-5"							Fabric	dry
5-18"	10YR 4/4	100					Sandy/loam	30% gravel

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: N/A Depth (inches): —

Hydric Soil Present (Y/N): N

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	
Saturation Present (Y/N): <u>N</u> (includes capillary fringe)	Depth (in): <u>—</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Vegetation _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____	
Wetland Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61HT022

Field Target: 073

Date: 7/5/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Jennifer Anderson

Wetland Scientist (print)

X

Jennifer Anderson 7/5/14

Signature / Date

X

Kim DEGUTIS

Field Crew Chief (print)

X

Kelly LST 7/5/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION				
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 067	Map #: 44/130	Map Date: 5/21/14
Date: 7/5/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W61HT023	
Investigators: K DEGUTIS J Anderson			Team No.: W61	
State: Alaska	Region: Alaska	Milepost: 562.6		
Latitude: 64° 24' 57.34"		Longitude: 148° 50' 44.73"	Datum: WGS84	
Logbook No.: W61-2	Logbook Page No.: 31	Picture No.: P.W61HT023-P.t; Plug; NW; E		

SITE PARAMETERS	
Subregion: Interior	Landform (hillslope, terrace, hummocks, etc.): FLAT
Slope (%): 4	Local relief (concave, convex, none): NONE
Pre-mapped Alaska LNG/NWI classification: PSS1/EM1B	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: PSS1/EM1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Vioreck): IIC1, IIA2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 31
for site sketch & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: <u>4</u> (A) Total Number of Dominant Species Across All Strata: <u>45</u> (B) % Dominant Species that are OBL, FACW, or FAC: <u>100</u> (A/B) <u>80%</u>
1. <u>N/A</u>				
2.				
3.				
4.				
Total Cover: _____ 50% of total cover: _____ 20% of total cover: _____				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species: _____ X 1 = _____ FACW species: <u>38</u> X 2 = <u>76</u> FAC species: <u>91</u> X 3 = <u>273</u> FACU species: <u>19</u> X 4 = <u>76</u> UPL species: _____ X 5 = _____ Column Totals: <u>148</u> (A) <u>425</u> (B) PI = B/A = <u>2.87</u>
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <u>Betula nana</u>	<u>20</u>	<u>Y</u>	<u>FAC</u>	
2. <u>Vaccinium uliginosum</u>	<u>15</u>	<u>Y</u>	<u>FAC</u>	
3. <u>Rhododendron groenlandicum</u>	<u>10</u>		<u>FAC</u>	
4. <u>Empetrum nigrum</u>	<u>2</u>		<u>FAC</u>	
5. <u>Vaccinium vitis-idaea</u>	<u>5</u>		<u>FAC</u>	
6. <u>Cassiope tetragona</u>	<u>4</u>		<u>FACU</u>	
7. <u>Salix reticulata</u>	<u>3</u>		<u>FAC</u>	
8. <u>Salix arctica</u>	<u>15</u>	<u>Y</u>	<u>FACU</u>	
9. <u>Salix pulchra</u>	<u>30</u>	<u>Y</u>	<u>FACW</u>	
Total Cover: <u>104</u> 50% of total cover: <u>52</u> 20% of total cover: <u>20.8</u>				

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Hydrophytic Vegetation Indicators: <input checked="" type="checkbox"/> Dominance Test is > 50% <input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
1. <u>Bistorta vivipara</u>	<u>1</u>		<u>FAC</u>	
2. <u>Petasites frigidus</u>	<u>8</u>		<u>FACW</u>	
3. <u>Carex bigelowii</u>	<u>35</u>	<u>Y</u>	<u>FAC</u>	
4.				
5.				
6.				
7.				
8.				
9.				
10.				
Total Cover: <u>44</u> 50% of total cover: <u>22</u> 20% of total cover: <u>8.8</u>				<input checked="" type="checkbox"/> % Bare Ground <input checked="" type="checkbox"/> % Cover of Wetland Bryophytes <u>10</u> % Total Cover of Bryophytes <input checked="" type="checkbox"/> % Cover of Water Hydrophytic Vegetation Present (Y/N): <u>Y</u> Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/5/14</u>		Feature ID <u>W61HT023</u>		Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features				
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²	Texture
0-4"							Fibric
4-8"	10YR 3/6	50					organic
8-13"	2.5Y 4/2	50		10			Mixed Matrix
8-13"	2.5Y 4/1	90	10YR 4/6	10	C	PL	Mineral/Silty
13"	Bedrock						distinct & prominent
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ² Location: PL=Pore Lining, M=Matrix.							
HYDRIC SOIL INDICATORS						INDICATORS FOR PROBLEMATIC HYDRIC SOILS³	
Histosol or Histel (A1) _____			Alaska Gleyed (A13) _____			Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) _____			Alaska Redox (A14) _____			Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____			Alaska Gleyed Pores (A15) _____			Alaska Redox with 2.5Y Hue <u>X</u>	
Hydrogen Sulfide (A4) _____						Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____	
Thick Dark Surface (A12) _____						Other (Explain in Notes) _____	
³ One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic. ⁴ Give details of color change in Notes.							
Restrictive Layer (if present): Type: <u>Bedrock</u> Depth (inches): <u>13"</u>							
Hydric Soil Present (Y/N): <u>Y</u>							
Notes: _____							

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			
Surface Water Present (Y/N): <u>N</u>	Depth (in): _____	Wetland Hydrology Present (Y/N): <u>Y</u>	
Water Table Present (Y/N): <u>N</u>	Depth (in): _____		
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>2"</u>		
Notes: <u>Logbook notes saturation at 11" and water table at 12.5"</u> <u>(web 2 page 31) in</u>			

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>75</u> Dwarf shrub (<0.5m) <u>29</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>44</u> Moss-Lichen <u>0</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u> Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>X</u>		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>X</u> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches <u>X</u> Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>X</u>		
HGM Class (P): Slope _____ Flat <u>X</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty <u>X</u> Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent <u>X</u> Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable <u>X</u>	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below <u>X</u> Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

Thudly K

GPS Technician QA/QC check:

Jamie Andrea

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61H1023

Field Target: 067

Date: 7/5/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Jennifer Anderson
Wetland Scientist (print)

X

Jennifer Anderson 7/5/14
Signature / Date

X

Kim J. DEGUTIS
Field Crew Chief (print)

X

Kathy Wf 7/5/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/> ^{200 - ft. consider}		Field Target: 066	Map #: 43130 Map Date: 5/27/14
Date: 7/5/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W61HT024
Investigators: K DEGUI'S J Anderson			Team No.: W61
State: Alaska	Region: Alaska	Milepost: 560.95	
Latitude: 63° 26' 15.69		Longitude: 148° 49' 37.14	Datum: WGS84
Logbook No.: W61-2	Logbook Page No.: 32	Picture No.: P-W61HT024-P.t; Plug; N; W	

SITE PARAMETERS	
Subregion: Interior	Landform (hillslope, terrace, hummocks, etc.): Flat
Slope (%): 5	Local relief (concave, convex, none): None
Pre-mapped Alaska LNG/NWI classification: PEM1 SS1B	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Wetland Type: PSS1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Alaska Vegetation Classification (Vioreck): II C1

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 32
for site sketch & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea glauca</i>	<u>1</u>		<u>FACU</u>
2.			
3.			
4.			
Total Cover: <u>1</u>			
50% of total cover: <u>.5</u> 20% of total cover: <u>0.2</u>			
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Betula nana</i>	<u>50</u>	<u>Y</u>	<u>FAC</u>
2. <i>Vaccinium uliginosum</i>	<u>40</u>	<u>Y</u>	<u>FAC</u>
3. <i>Vaccinium vitis-idaea</i>	<u>15</u>		<u>FAC</u>
4. <i>Rhododendron grandis</i>	<u>25</u>		<u>FAC</u>
5. <i>Empetrum nigrum</i>	<u>5</u>		<u>FAC</u>
6. <i>Picea glauca</i>	<u>10</u>		<u>FACU</u>
7. <i>Vaccinium oxycoccos</i>	<u>1</u>		<u>OBL</u>
8. <i>Salix scouleriana</i>	<u>10</u>		<u>FAC</u>
9.			
Total Cover: <u>156</u> / <u>78</u>			
50% of total cover: <u>77.5</u> 20% of total cover: <u>31.2</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 34 (B)

% Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by: _____

OBL species: _____ X 1 = _____

FACW species: 8 X 2 = 16

FAC species: 16.5 X 3 = 49.5

FACU species: 11 X 4 = 44

UPL species: _____ X 5 = _____

Column Totals: 184 (A) 55.5 (B)

PI = B/A = 3.0

Tree stratum added to shrub stratum since there was 45% cover

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Rubus chamaemorus</i>	<u>8</u>	<u>Y</u>	<u>FACW</u>
2. <i>Carex bigelowii</i>	<u>20</u>	<u>Y</u>	<u>FAC</u>
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>28</u>			
50% of total cover: <u>14</u> 20% of total cover: <u>5.6</u>			

Hydrophytic Vegetation Indicators:

☒ Dominance Test is > 50%

☒ Prevalence Index is ≤ 3.0

____ Morphological Adaptations¹ (Provide supporting data in Notes)

____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

0 % Cover of Wetland Bryophytes

20 Total Cover of Bryophytes

0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): X

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/5/14</u> Feature ID <u>WGIHT024</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
<u>0-3"</u>							<u>Fibric</u>	<u>dry</u>
<u>3-13"</u>							<u>Fibric</u>	<u>saturated</u>
<u>13"</u>	<u>Frozen</u>							

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: 18" frozen Depth (inches): 13"

Hydric Soil Present (Y/N): X

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) <u>X</u>
High Water Table (A2) <u>Y</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>Y</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): _____	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>10"</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>5"</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____			
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>1</u> Sapling (<5 dbh, <6m tall) <u>10</u> Tall shrub (2-6m) <u>125</u> Short shrub (0.5-2m) <u>105</u> Dwarf shrub (<0.5m) <u>20</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>28</u> Moss-Lichen <u>20</u> Floating <u>0</u> Submerged <u>0</u>			
Number of Wetland Types (M): <u>1</u>		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>X</u>	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <u>X</u> Very High Density (80-100%) _____			
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____			
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____			
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <u>X</u>			
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>			
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____			
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>X</u>			
HGM Class (P): Slope _____ Flat <u>X</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____			

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable <u>X</u>	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) <u>X</u>	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below <u>X</u> Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized <u>X</u> 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

[Signature]

GPS Technician QA/QC check:

[Signature]

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61HT024

Field Target: 066

Date: 7/5/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Jennifer Anderson

Wetland Scientist (print)

X

Jennifer Anderson 7/5/14

Signature / Date

X

Kim DEARIS

Field Crew Chief (print)

X

Kimberly K. H. 7/5/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline		Access Road (explain)	Other (explain) <u>X</u>
Field Target: <u>064</u>		Map #: <u>44130</u>	Map Date: <u>5/27/14</u>
Date: <u>7/6/14</u>	Project Name & No.: Alaska LNG 26221306		Feature Id: <u>W61HT025</u>
Investigators: <u>K. DEGENS</u> <u>J. Anderson</u>			Team No.: <u>W61</u>
State: Alaska	Region: Alaska	Milepost: <u>560.05</u>	
Latitude: <u>63° 26' 29.67"</u>	Longitude: <u>148° 48' 09.35"</u>	Datum: WGS84	
Logbook No.: <u>W61-2</u>	Logbook Page No.: <u>34</u>	Picture No.: <u>P-W61HT025-PT; Plug: N; W</u>	

SITE PARAMETERS	
Subregion: <u>Intaion</u>	Landform (hillslope, terrace, hummocks, etc.): <u>Slope</u>
Slope (%): <u>20</u>	Local relief (concave, convex, none): <u>None</u>
Pre-mapped Alaska LNG/NWI classification: <u>PSS1 / EM13</u>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <u>X</u> No (if no explain in Notes)	Are "Normal Circumstances" present: Yes <u>X</u> No (If no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <u>X</u> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <u>X</u> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <u>X</u> No	Is the Sampled Area within a Wetland? Yes <u>X</u> No
Hydric Soil Present? Yes <u>A</u> No	Wetland Type: <u>PSS13</u>
Wetland Hydrology Present? Yes <u>d</u> No	Alaska Vegetation Classification (Vioreck): <u>II C1</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

Sample plot located on +20% hillslope
(Declinometer indicates this area is 50% slope)

See logbook W61-2, page 34 for notes & site sketch

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: <u>4</u> (A) Total Number of Dominant Species Across All Strata: <u>4</u> (B) % Dominant Species that are OBL, FACW, or FAC: <u>100</u> (A/B)
1. <u>N/A</u>				
2.				
3.				
4.				
Total Cover: _____ 50% of total cover: _____ 20% of total cover: _____				
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species: _____ X 1 = _____ FACW species: <u>13</u> X 2 = <u>26</u> FAC species: <u>143</u> X 3 = <u>429</u> FACU species: <u>10</u> X 4 = <u>40</u> UPL species: _____ X 5 = _____ Column Totals: <u>166</u> (A) <u>495</u> (B) PI = B/A = <u>2.98</u>
1. <u>Betula nana</u>	<u>30</u>	<u>Y</u>	<u>FAC</u>	
2. <u>Vaccinium vitis-idaea</u>	<u>20</u>	<u>Y</u>	<u>FAC</u>	
3. <u>Rhododendron groenlandicum</u>	<u>15</u>		<u>FAC</u>	
4. <u>Salix pulchra</u>	<u>10</u>		<u>FACW</u>	
5. <u>Empetrum nigrum</u>	<u>5</u>		<u>FAC</u>	
6. <u>Picea canadensis</u>	<u>10</u>		<u>FACU</u>	
7. <u>Alnus tenuifolia</u>	<u>3</u>		<u>FAC</u>	
8. <u>Vaccinium uliginosum</u>	<u>35</u>	<u>Y</u>	<u>FAC</u>	
9. <u>Salix scouleriana</u>	<u>10</u>		<u>FAC</u>	
Total Cover: <u>138</u> 50% of total cover: <u>69</u> 20% of total cover: <u>27.6</u>				

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Hydrophytic Vegetation Indicators: <input checked="" type="checkbox"/> Dominance Test is > 50% <input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
1. <u>Rubus chamaemorus</u>	<u>3</u>		<u>FACW</u>	
2. <u>Carex bigelowii</u>	<u>20</u>	<u>Y</u>	<u>FAC</u>	
3. <u>Bistorta vivipara</u>	<u>5</u>		<u>FAC</u>	
4.				
5.				
6.				
7.				
8.				
9.				
Total Cover: <u>28</u> 50% of total cover: <u>14</u> 20% of total cover: <u>5.6</u>				

☒ % Bare Ground
☒ % Cover of Wetland Bryophytes
30 % Total Cover of Bryophytes
☒ % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/6/14</u> Feature ID <u>W61H1025</u>		Soil Pit Required (Y/N) <u>Y</u>				
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features			Texture	Notes	
	Color (moist)	%	Color (moist)	%	Type ¹			Loc ²
<u>0-10"</u>							<u>Fibric</u>	<u>Saturated</u>

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____	
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____	
Thick Dark Surface (A12) _____		Other (Explain in Notes)	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: Frozen Depth (inches): 10"

Hydric Soil Present (Y/N): Y

Notes: Note - Saturation @ 8" bgs

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) <u>X</u>
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) <u>X</u>
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes):		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>8"</u>	

Notes: Sample produces water when lightly squeezed

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>10</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>103</u> Dwarf shrub (<0.5m) <u>25</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>28</u> Moss-Lichen <u>30</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>1</u> Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>X</u>		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <u>X</u> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches <u>X</u> Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>X</u>		
HGM Class (P): Slope <u>X</u> Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent <u>X</u> Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable <u>X</u>	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) <u>X</u>	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above <u>X</u> Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized <u>X</u> 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

Kelly W. M.

GPS Technician QA/QC check:

Janet Anderson

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61H1025

Field Target: 064

Date: 7/6/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Anderson
Wetland Scientist (print)

X Jennifer Anderson
Signature / Date

X Kim DEGUIS
Field Crew Chief (print)

X [Signature] 7/6/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline		Access Road (explain)	Other (explain) <u>X</u>
Field Target: <u>DE</u>		Map #: <u>421130</u>	Map Date: <u>5/27/14</u>
Date: <u>7/6/14</u>	Project Name & No.: Alaska LNG 26221306		Feature Id: <u>W61HT026</u>
Investigators: <u>K DeGutis</u> <u>J Anderson</u>			Team No.: <u>W61</u>
State: Alaska	Region: Alaska	Milepost: <u>560.1</u>	
Latitude: <u>63° 26' 29.79"</u>		Longitude: <u>148° 48' 14.34"</u>	Datum: WGS84
Logbook No.: <u>W61-2</u>	Logbook Page No.: <u>35</u>	Picture No.: <u>D-W61HT026-P.t; Plug; SE, NE</u>	

SITE PARAMETERS	
Subregion: <u>Interior</u>	Landform (hillslope, terrace, hummocks, etc.): <u>Flat</u>
Slope (%): <u>2%</u>	Local relief (concave, convex, none): <u>NONE</u>
Pre-mapped Alaska LNG/NWI classification: <u>Upland</u>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <u>X</u> No (if no explain in Notes)	Are "Normal Circumstances" present: Yes <u>X</u> No (if no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <u>X</u> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <u>X</u> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes No <u>X</u>	Is the Sampled Area within a Wetland? Yes No <u>X</u>
Hydric Soil Present? Yes No <u>X</u>	Wetland Type: <u>Upland</u>
Wetland Hydrology Present? Yes No <u>X</u>	Alaska Vegetation Classification (Viereck): <u>IA2, IIC2, IIIA1</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 35 for notes & site sketch

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)

Tree Stratum (Plot sizes: <u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea glauca</i>	45	Y	FACU
2.			
3.			
4.			

Total Cover: 45

50% of total cover: 22.5 20% of total cover: 9

Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Ribes glandulosum</i>	10	Y	FACU
2. <i>Alnus fruticosa</i>	15	Y	FAC
3. <i>Linnaea borealis</i>	10	Y	FACU
4. <i>Rosa acicularis</i>	8		FACU
5. <i>Picea glauca</i>	2		FACU
6.			
7.			
8.			
9.			

Total Cover: 45

50% of total cover: 22.5 20% of total cover: 9

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)
 Total Number of Dominant Species Across All Strata: 5 (B)
 % Dominant Species that are OBL, FACW, or FAC: 40% (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:

OBL species: - X 1 = -
 FACW species: - X 2 = -
 FAC species: 75 X 3 = 225
 FACU species: 98 X 4 = 392
 UPL species: - X 5 = -
 Column Totals: 173 (A) 617 (B)
 PI = B/A = 3.56

VEGETATION (use scientific names of plants)

Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Equisetum pratense</i>	45	Y	FAC
2. <i>Chamaenerion angustifolium</i>	5		FACU
3. <i>Colanagrostis canadensis</i>	5		FAC
4. <i>Mertensia paniculata</i>	10		FACU
5. <i>Cornus canadensis</i>	7		FACU
6. <i>Pyrola asarifolia</i>	1		FACU
7. <i>Aconitum delphinifolium</i>	10		FAC
8.			
9.			
10.			

Total Cover: 83

50% of total cover: 41.5 20% of total cover: 16.6

Hydrophytic Vegetation Indicators:

_____ Dominance Test is > 50%
 _____ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

25 % Bare Ground
0 % Cover of Wetland Bryophytes
5 % Total Cover of Bryophytes
0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): N

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/6/14</u> Feature ID <u>W01H1026</u>		Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)					
Depth (inches)	Matrix		Redox Features		Notes
	Color (moist)	%	Color (moist)	%	
0-3"					
3-12"	10YR 2/2	45	100%		Fibric loam dry 50% gravel 5% pebble
12"	Refusal due to high pebble content				

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: No Depth (inches):

Hydric Soil Present (Y/N): N

Notes: _____

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u> </u>	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): <u> </u>	
Saturation Present (Y/N): <u>N</u> (includes capillary fringe)	Depth (in): <u> </u>	
Notes: _____		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (>1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semi-perm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvial/Quaternary Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposits Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: WX61 H7026

Field Target: 065

Date: 7/6/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Anderson
Wetland Scientist (print)

X  7/6/14
Signature / Date

X Kim DEGUTIS
Field Crew Chief (print)

X  7/6/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline		Access Road (explain):	Other (explain): <u>X</u>
Field Target: <u>068</u>		Map #: <u>45/130</u>	Map Date: <u>5/21/14</u>
Date: <u>7/6/14</u>	Project Name & No.: Alaska LNG 26221306		Feature Id: <u>W61HT027</u>
Investigators: <u>K DEGENIS / J ANDERSON</u>			Team No.: <u>W61</u>
State: Alaska	Region: Alaska	Milepost: <u>563.6</u>	
Latitude: <u>63° 24' 08.92</u>		Longitude: <u>148° 51' 28.89</u>	Datum: WGS84
Logbook No.: <u>W61-2</u>	Logbook Page No.: <u>36</u>	Picture No.: <u>P-W61HT027-Pt; Plug; NW/S</u>	

SITE PARAMETERS	
Subregion: <u>Interior</u>	Landform (hillslope, terrace, hummocks, etc.): <u>Slope</u>
Slope (%): <u>2</u>	Local relief (concave, convex, none): <u>NONE</u>
Pre-mapped Alaska LNG/NWI classification: <u>PSS1/EM13</u>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <u>X</u> No (if no explain in Notes)	Are "Normal Circumstances" present: Yes <u>X</u> No (if no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <u>X</u> (If yes, explain in Notes)
Are Vegetation, Soil <u>X</u> , or Hydrology Naturally Problematic?	No (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <u>X</u> No	Is the Sampled Area within a Wetland? Yes <u>X</u> No
Hydric Soil Present? Yes <u>X</u> No	Wetland Type: <u>PEM1/SS1B</u>
Wetland Hydrology Present? Yes <u>X</u> No	Alaska Vegetation Classification (Vioreck): <u>III A², II C²</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

Soils problematic - extremely high gravel & pebble content, profile is hypersaturated where sample material is a soup consistency

See logbook W61-2, page 36 for site sketch & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)

Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>N/A</u>			
2.			
3.			
4.			

Total Cover: —

50% of total cover: — 20% of total cover: —

Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Salix glauca</u>	<u>12</u>	<u>Y</u>	<u>FAC</u>
2. <u>Salix reticulata</u>	<u>15</u>	<u>Y</u>	<u>FAC</u>
3. <u>Salix myrtillifolia</u>	<u>10</u>	<u>Y</u>	<u>FACW</u>
4. <u>Vaccinium uliginosum</u>	<u>5</u>		<u>FAC</u>
5. <u>Andromeda polifolium</u>	<u>1</u>		<u>FACW</u>
6. <u>Rhododendron sp.</u>	<u>2</u>		<u>FAC</u>
7. <u>Cornus tetragyna</u>	<u>1</u>		<u>FACW</u>
8. <u>Salix polaris</u>	<u>7</u>	<u>X</u>	<u>FACW</u>
9. <u>Betula glandulosa</u>	<u>5</u>		<u>FAC</u>

Total Cover: 57

50% of total cover: 28.5 20% of total cover: 11.4

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 5 (A)
 Total Number of Dominant Species Across All Strata: 5 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: — Multiply by:

OBL species: 12 X 1 = 12

FACW species: 63 X 2 = 126

FAC species: 60 X 3 = 180

FACU species: — X 4 = —

UPL species: — X 5 = —

Column Totals: 135 (A) 318 (B)

PI = B/A = 2.35

VEGETATION (use scientific names of plants)

Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Eleocharis palustris</u>	<u>7</u>		<u>OBL</u>
2. <u>Eleocharis acicularis</u>	<u>5</u>		<u>OBL</u>
3. <u>Chamaenerion latifolium</u>	<u>20</u>	<u>Y</u>	<u>FAC</u>
4. <u>Saxifraga rivularis</u>	<u>1</u>		<u>OBL</u>
5. <u>Stellaria longipedunculata</u>	<u>1</u>		<u>FAC</u>
6. <u>Carex membranacea</u>	<u>45</u>	<u>Y</u>	<u>FACW</u>
7. <u>Carex</u>	<u>—</u>		
8.			
9.			
10.			

Total Cover: 78

50% of total cover: 39 20% of total cover: 15.6

Hydrophytic Vegetation Indicators:

☒ Dominance Test is > 50%

☒ Prevalence Index is ≤ 3.0

— Morphological Adaptations¹ (Provide supporting data in Notes)

— Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

20 % Bare Ground

0 % Cover of Wetland Bryophytes

0 Total Cover of Bryophytes

10% % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/6/14</u> Feature ID <u>WG1HT027</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-2"							Fibric	Saturated organics
2-18"	10YR 2/2	100						50% gravel 5/pebble

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS	INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____
Hydrogen Sulfide (A4) _____	Alaska Redox with 2.5Y Hue _____
Thick Dark Surface (A12) _____	Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
	Other (Explain in Notes) <u>X</u>

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: N/A Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes: High gravel content, hyper saturated soils w/in sample plot
* Soil has low organic matter content and a high pH (7.39)

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>12"</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0"</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0"</u>	
Notes: _____		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <input checked="" type="checkbox"/> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <input checked="" type="checkbox"/> Sapling (<5 dbh, <6m tall) <input checked="" type="checkbox"/> Tall shrub (2-6m) <input checked="" type="checkbox"/> Short shrub (0.5-2m) <u>56</u> Dwarf shrub (<0.5m) <u>1</u> Tall herb (≥1m) <input checked="" type="checkbox"/> Short herb (<1m) <u>78</u> Moss-Lichen <input checked="" type="checkbox"/> Floating <input checked="" type="checkbox"/> Submerged <input checked="" type="checkbox"/>		
Number of Wetland Types (M): <u>2</u>	Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <input checked="" type="checkbox"/>	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) <input checked="" type="checkbox"/> Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover <input checked="" type="checkbox"/> N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <input checked="" type="checkbox"/> High (>25) _____		
Presence of Islands (M): Absent (none) <input checked="" type="checkbox"/> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open <input checked="" type="checkbox"/> Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <input checked="" type="checkbox"/> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <input checked="" type="checkbox"/>		
HGM Class (P): Slope <input checked="" type="checkbox"/> Flat <input checked="" type="checkbox"/> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly <input checked="" type="checkbox"/> Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet <input checked="" type="checkbox"/> Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet <input checked="" type="checkbox"/>	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <input checked="" type="checkbox"/> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <input checked="" type="checkbox"/> Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent <input checked="" type="checkbox"/> Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <input checked="" type="checkbox"/> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow <input checked="" type="checkbox"/>	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) <input checked="" type="checkbox"/> Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading <u>7.39</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits <input checked="" type="checkbox"/> Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) <input checked="" type="checkbox"/>	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed <input checked="" type="checkbox"/> Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below <input checked="" type="checkbox"/> Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <input checked="" type="checkbox"/>	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized <input checked="" type="checkbox"/> 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <input checked="" type="checkbox"/> Large (>100 acres) _____	

Crew Chief QA/QC check:

Handwritten signature

GPS Technician QA/QC check:

Handwritten signature

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61HT027 Field Target: 068 Date: 7/4/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Anderson
Wetland Scientist (print)

X Jennifer Anderson 7/6/14
Signature / Date

X Kim DEGUIS
Field Crew Chief (print)

X Kelly KR
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline _____ Access Road (explain) _____ Other (explain) _____		Field Target: <u>69</u>	Map #: <u>41130</u> Map Date: <u>5/2/14</u>
Date: <u>7/6/14</u>	Project Name & No.: Alaska LNG 26221306		Feature Id: <u>WG1HT028</u>
Investigators: <u>K DeGutis</u> <u>J Anderson</u>			Team No.: <u>W61</u>
State: Alaska	Region: Alaska	Milepost: <u>566.35</u>	
Latitude: <u>63° 22' 47.46"</u>		Longitude: <u>148° 54' 36.50"</u>	Datum: WGS84
Logbook No.: <u>W61-2</u>	Logbook Page No.: <u>31</u>	Picture No.: <u>P-WG1HT028-Pt; Plug; SW; NW</u>	

SITE PARAMETERS	
Subregion: <u>Interior</u>	Landform (hillslope, terrace, hummocks, etc.): <u>Flat</u>
Slope (%): <u>2</u>	Local relief (concave, convex, none): <u>NONE</u>
Pre-mapped Alaska LNG/NWI classification: <u>PSS1/EM1B</u>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <u>X</u> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <u>X</u> No _____ (If no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <u>X</u> (If yes, explain in Notes)
Are Vegetation _____, Soil <u>X</u> , or Hydrology _____ Naturally Problematic?	No <u>X</u> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <u>X</u> No _____	Is the Sampled Area within a Wetland? Yes <u>X</u> No _____
Hydric Soil Present? Yes <u>X</u> No _____	Wetland Type: <u>PSS1/EM1B</u>
Wetland Hydrology Present? Yes <u>X</u> No _____	Alaska Vegetation Classification (Vioreck): <u>II C1, III A2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 31
for site sketch & notes

Problematic soils - high gravel & hypersaturation
of soil profile

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: <u>4³</u> (A) Total Number of Dominant Species Across All Strata: <u>5</u> (B) % Dominant Species that are OBL, FACW, or FAC: <u>80%</u> (A/B) <u>60%</u>
1. <u>N/A</u>				
2.				
3.				
4.				
Total Cover: _____ 50% of total cover: _____ 20% of total cover: _____				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species: <u>1</u> X 1 = <u>1</u> FACW species: <u>39</u> X 2 = <u>78</u> FAC species: <u>80</u> <u>95</u> X 3 = <u>285</u> <u>240</u> FACU species: <u>10</u> X 4 = <u>40</u> UPL species: <u>30</u> X 5 = <u>150</u> Column Totals: <u>160</u> <u>145</u> (A) <u>404</u> <u>509</u> (B) PI = B/A = <u>2.70</u> <u>3.18</u> Salix scouleriana T FAC Salix stolonifera 15 Y FAC Picea glauca 10 FACU Salix pulchra 10 FACW Dryas ajacensis 15 Y NI - OPL * no indicator status listed in 2014 AR Wetland Plant List considered UPL species
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <u>Rhododendron groenlandicum</u>	<u>5</u>		<u>FAC</u>	
2. <u>Betula nana</u>	<u>15</u>	<u>Y</u>	<u>FAC</u>	
3. <u>Arctostaphylos rubra</u>	<u>25</u>	<u>Y</u>	<u>FAC</u>	
4. <u>Vaccinium uliginosum</u>	<u>10</u>		<u>FAC</u>	
5. <u>Empetrum nigrum</u>	<u>10</u>		<u>FAC</u>	
6. <u>Andromeda polifolia</u>	<u>T</u>		<u>FACW</u>	
7. <u>Salix reticulata</u>	<u>8</u>		<u>FAC</u>	
8. <u>Vaccinium vitis-idaea</u>	<u>5</u>		<u>FAC</u>	
9. <u>Vaccinium oxycoccos</u>	<u>1</u>		<u>OBL</u>	
Total Cover: <u>129</u> 50% of total cover: <u>64.5</u> 20% of total cover: <u>25.8</u>				

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Hydrophytic Vegetation Indicators: <input checked="" type="checkbox"/> Dominance Test is > 50% <input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
1. <u>Toxicaria pusilla</u>	<u>1</u>		<u>FAC</u>	
2. <u>Petasites frigidus</u>	<u>3</u>		<u>FACW</u>	
3. <u>Bistorta vivipara</u>	<u>1</u>		<u>FAC</u>	
4. <u>Carex membranacea</u>	<u>25</u>	<u>Y</u>	<u>FACW</u>	
5. <u>Dodecatheon frigidum</u>	<u>1</u>		<u>FACW</u>	
6. <u>Stellaria longipes</u>	<u>T</u>		<u>FAC</u>	
7.				
8.				
9.				
Total Cover: <u>31</u> 50% of total cover: <u>15.5</u> 20% of total cover: <u>6.2</u>				_____ % Bare Ground <u>10</u> % Cover of Wetland Bryophytes <u>50</u> Total Cover of Bryophytes _____ % Cover of Water Hydrophytic Vegetation Present (Y/N): <u>Y</u> Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/6/14</u> Feature ID <u>W61HT028</u>				Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features				Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²	
<u>0-4"</u>							<u>Fabric</u>
<u>4-18"</u>	<u>2.5Y 2/1</u>	<u>100</u>					<u>Saturated</u> <u>45% gravel, 5% pebble mix, saturated</u>

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer
Thick Dark Surface (A12) _____		Other (Explain in Notes) <u>X</u>

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: N/A Depth (inches): —

Hydric Soil Present (Y/N): Y

Notes: Problem soils - high content of gravel, pebbles does not allow for observation of redox features. Profile hyper saturated throughout

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) <u>X</u>
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes):		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>4"</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>2"</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>10</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>56</u> Sapling (<5 dbh, <6m tall) <u>10</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>73</u> Dwarf shrub (<0.5m) _____ Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>31</u> Moss-Lichen <u>50</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u>		Evenness of Wetland Type Distribution (M): Even <u>0</u> Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>0</u> High Density (60-80%) <u>0</u> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>0</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>0</u> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <u>0</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open <u>0</u> Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>0</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>0</u>		
HGM Class (P): Slope _____ Flat <u>0</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly <u>0</u> Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>0</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>0</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>0</u> Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>0</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>0</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>0</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>0</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits <u>0</u> Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>0</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>0</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above <u>0</u> Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>0</u>	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized <u>0</u> 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>0</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

[Signature]

GPS Technician QA/QC check:

[Signature]

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61ATO28 Field Target: 069 Date: 7/6/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Anderson
Wetland Scientist (print)

X Jennifer Anderson 7/6/14
Signature / Date

X Kim DEGUTIS
Field Crew Chief (print)

X Kim DEGUTIS 7/6/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline		Access Road (explain)	Other (explain) <i>300-ft Corridor</i>
Field Target: <i>071</i>		Map #: <i>HT1130</i>	Map Date: <i>5/21/14</i>
Date: <i>7/6/14</i>	Project Name & No.: Alaska LNG 26221306		Feature Id: <i>W61HT029</i>
Investigators: <i>K DeGutis J Anderson</i>			Team No.: <i>W61</i>
State: Alaska	Region: Alaska	Milepost: <i>567.6</i>	
Latitude: <i>63° 22' 26.400</i>		Longitude: <i>148° 56' 54.53</i>	Datum: WGS84
Logbook No.: <i>W61-2</i>	Logbook Page No.: <i>38</i>	Picture No.: <i>P-W61HT029-PT; Plug; NE; SE</i>	

SITE PARAMETERS	
Subregion: <i>Interior / Southcentral</i>	Landform (hillslope, terrace, hummocks, etc.): <i>Stream terrace</i>
Slope (%): <i>4</i>	Local relief (concave, convex, none): <i>Convex</i>
Pre-mapped Alaska LNG/NWI classification: <i>PSS1 / EM1C</i>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)

SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Wetland Type: <i>PSS1 / EM1B</i>
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Alaska Vegetation Classification (Viereck): <i>II C1, III A2</i>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

*See logbook W61-2, page 38
for site sketch & notes*

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>N/A</u>			
2.			
3.			
4.			
Total Cover: _____ 50% of total cover: _____ 20% of total cover: _____			
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Salix reticulata</u>	<u>15</u>	<u>Y</u>	<u>FAC</u>
2. <u>Vaccinium uliginosum</u>	<u>30</u>	<u>Y</u>	<u>FAC</u>
3. <u>Desiphora fruticosa</u>	<u>10</u>		<u>FAC</u>
4. <u>Salix bebbiana</u>	<u>7</u>		<u>FAC</u>
5. <u>Salix pulchra</u>	<u>10</u>		<u>FACW</u>
6. <u>Betula glandulosa</u>	<u>5</u>		<u>FAC</u>
7. <u>Salix borealis</u>	<u>15</u>	<u>Y</u>	<u>FAC</u>
8. <u>Salix arctica</u>	<u>10</u>		<u>FACU</u>
9. <u>Picea glauca</u>	<u>2</u>		<u>FACU</u>
Total Cover: <u>104</u> 50% of total cover: <u>52</u> 20% of total cover: <u>20.8</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 5 (A)
 Total Number of Dominant Species Across All Strata: 5 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: — X 1 = —
 FACW species: 35 X 2 = 70
 FAC species: 86 X 3 = 258
 FACU species: 12 X 4 = 48
 UPL species: — X 5 = —
 Column Totals: 133 (A) 376 (B)
 PI = B/A = 2.82

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>CAREX membranacea</u>	<u>15</u>	<u>Y</u>	<u>FACW</u>
2. <u>Rumex</u>			
3. <u>CAREX saxatilis</u>	<u>10</u>	<u>Y</u>	<u>FACW</u>
4. <u>Columagrostis canadensis</u>	<u>3</u>		<u>FAC</u>
5. <u>Aconogonon alaskanum</u>	<u>1</u>		<u>FAC</u>
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>29</u> 50% of total cover: <u>14.5</u> 20% of total cover: <u>5.8</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
5 % Cover of Wetland Bryophytes
35 Total Cover of Bryophytes
20 % Cover of Water
Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/6/14</u> Feature ID <u>W61HT029</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-2"							Fibric	dry
2-15"	7.5 YR 2.5/1	95	10 YR 3/4	5	C	M	Sandy loam	Redox dark surface (F6)

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS	INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____
Hydrogen Sulfide (A4) _____	Alaska Redox with 2.5Y Hue _____
Thick Dark Surface (A12) _____	Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
	Other (Explain in Notes) <u>X</u>

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: Frozen Depth (inches): 15"

Hydric Soil Present (Y/N): Y

Notes: 2-15" = Redox dark surface (F6). Initial soil pit taken on convex surface - was dry so dug check soil pit on locally concave surface and saturation at 6"

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) <u>X</u>
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): _____	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): _____	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>6"</u>	
Notes: _____		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES	
P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____	
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>2</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>24</u> Dwarf shrub (<0.5m) <u>25</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>29</u> Moss-Lichen <u>35</u> Floating <u>0</u> Submerged <u>0</u>	
Number of Wetland Types (M): <u>2</u>	Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>0</u>
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <u>X</u> Very High Density (80-100%) _____	
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover <u>X</u> N/A _____	
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____	
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____	
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches <u>X</u> Continuous Cover _____	
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____	
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>X</u>	
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine <u>X</u> Estaurine Fringe _____	

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy <u>X</u> Mineral: Silty <u>X</u> ED Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet <u>X</u> Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>0</u> Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) <u>X</u> Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs <u>X</u> Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) <u>X</u> Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading <u>6.82</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable <u>0</u>	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>0</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>0</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <u>0</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>0</u>	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized <u>0</u> 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61 HT029

Field Target: 71

Date: 7/6/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Anderson
Wetland Scientist (print)

X Jennifer Anderson 7/6/14
Signature / Date

X Kim DEBUTIS
Field Crew Chief (print)

X Andy K. DeH 7/6/14
Signature / Date

7

WETLAND DETERMINATION DATA FORM

300 ft corridor

SITE DESCRIPTION			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/>		Field Target: <u>70</u>	Map #: <u>41/30</u> Map Date: <u>5/27/14</u>
Date: <u>7/6/14</u>	Project Name & No.: Alaska LNG 26221306		Feature Id: <u>W61HT030</u>
Investigators: <u>K DEGWIS</u> <u>J ANDERSON</u>			Team No.: <u>W61</u>
State: Alaska	Region: Alaska	Milepost: <u>567.55</u>	
Latitude: <u>63° 22' 27.20"</u>		Longitude: <u>148° 56' 49.88"</u>	Datum: WGS84
Logbook No.: <u>W61-2</u>	Logbook Page No.: <u>39</u>	Picture No.: <u>P-W61HT030_Pit; Plug; E; South</u>	

SITE PARAMETERS	
Subregion: <u>Interior</u>	Landform (hillslope, terrace, hummocks, etc.): <u>River terrace</u>
Slope (%): <u>2</u>	Local relief (concave, convex, none): <u>NONE</u>
Pre-mapped Alaska LNG/NWI classification: <u>PSS1/EM1C</u>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Wetland Type: <u>PSS1C</u>
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Alaska Vegetation Classification (Vioreck): <u>II B1, II C2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 39 for site sketch & notes.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
<u>Tree Stratum</u> (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>N/A</u>	<u>—</u>	<u>—</u>	<u>—</u>
2.			
3.			
4.			
Total Cover: <u>—</u> 50% of total cover: <u>—</u> 20% of total cover: <u>—</u>			
<u>Sapling/Shrub Stratum</u> (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Alnus fruticosa</u>	<u>10</u>		<u>FAC</u>
2. <u>Salix bairdii</u>	<u>30</u>	<u>Y</u>	<u>FAC</u>
3. <u>Rubus arcticus</u>	<u>20</u>		<u>FAC</u>
4. <u>Salix pulchra</u>	<u>15</u>		<u>FACW</u>
5. <u>Salix glauca</u>	<u>35</u>	<u>Y</u>	<u>FAC</u>
6.			
7.			
8.			
9.			
Total Cover: <u>110</u> 50% of total cover: <u>55</u> 20% of total cover: <u>22</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 4 (A)
 Total Number of Dominant Species Across All Strata: 4 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: 15 X 1 = 15
 FACW species: 15 X 2 = 30
 FAC species: 105 X 3 = 315
 FACU species: — X 4 = —
 UPL species: — X 5 = —
 Column Totals: 135 (A) 360 (B)
 PI = B/A = 2.67

VEGETATION (use scientific names of plants)			
<u>Herb Stratum</u> (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Comarum palustre</u>	<u>10</u>	<u>Y</u>	<u>OBL</u>
2. <u>Calamagrostis canadensis</u>	<u>10</u>	<u>Y</u>	<u>FAC</u>
3. <u>Grass aquaticus</u>	<u>5</u>		<u>OBL</u>
4. <u>Viola palustris</u>	<u>T</u>		<u>FACW</u>
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>25</u> 50% of total cover: <u>12.5</u> 20% of total cover: <u>5</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
☒ Morphological Adaptations¹ (Provide supporting data in Notes)
— Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

30 % Bare Ground
0 % Cover of Wetland Bryophytes
5 Total Cover of Bryophytes
10 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):
multiple trunking observed on most Salix. specimen

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/6/14</u> Feature ID <u>W61H1030</u>		Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)					
Depth (inches)	Matrix		Redox Features		Notes
	Color (moist)	%	Color (moist)	%	
0-2"					Fibric Saturated
2-10"	7.5 YR				Fibric includes sandy loam
2-6"	7.5 YR 3/1	100			Fibric/sandy loam
6-18"	7.5 YR 2.5/1	85	10 YR 3/4	15	C m Fine sandy loam Redox distinct, prominent includes 15% gravel, 5% pebbles

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) <u>X</u>

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: N/A Depth (inches): -

Hydric Soil Present (Y/N): Y

Notes: Satisfies (FG) indicator = Redox dark surface

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>Y</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) <u>X</u>	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>Y</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) <u>a</u>	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>a</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>1/2"</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>6"</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0"</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <input checked="" type="checkbox"/> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <input checked="" type="checkbox"/> Sapling (<5 dbh, <6m tall) <input checked="" type="checkbox"/> Tall shrub (2-6m) <u>75</u> Short shrub (0.5-2m) <u>15</u> Dwarf shrub (<0.5m) <u>20</u> Tall herb (≥1m) <input checked="" type="checkbox"/> Short herb (<1m) <u>25</u> Moss-Lichen <u>5</u> Floating <input checked="" type="checkbox"/> Submerged <input checked="" type="checkbox"/>		
Number of Wetland Types (M): <u>1</u> Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <input checked="" type="checkbox"/>		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <input checked="" type="checkbox"/> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover <input checked="" type="checkbox"/> N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <input checked="" type="checkbox"/> High (>25) _____		
Presence of Islands (M): Absent (none) <input checked="" type="checkbox"/> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <input checked="" type="checkbox"/>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <input checked="" type="checkbox"/> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <input checked="" type="checkbox"/>		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine <input checked="" type="checkbox"/> Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly <input checked="" type="checkbox"/> Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet <input checked="" type="checkbox"/>	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <input checked="" type="checkbox"/> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded <input checked="" type="checkbox"/>	
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate <input checked="" type="checkbox"/> Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent <input checked="" type="checkbox"/> Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs <input checked="" type="checkbox"/> Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow <input checked="" type="checkbox"/>	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) <input checked="" type="checkbox"/> Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading <u>6.84</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits <input checked="" type="checkbox"/> Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <input checked="" type="checkbox"/> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <input checked="" type="checkbox"/> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <input checked="" type="checkbox"/> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <input checked="" type="checkbox"/>	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized <input checked="" type="checkbox"/> 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <input checked="" type="checkbox"/> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

[Signature]

GPS Technician QA/QC check:

[Signature] 7/6/14

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: WG/HT030

Field Target: 70

Date: 7/6/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Anderson
Wetland Scientist (print)

X Jennifer Anderson 7/6/14
Signature / Date

X Kim DEGUTIS
Field Crew Chief (print)

X Kelly Whit 7/6/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline		Access Road (explain)	Other (explain) <u>X</u>
Field Target: <u>075</u>		Map #: <u>51130</u> Map Date: <u>5/27/14</u>	
Date: <u>7/7/14</u>	Project Name & No.: Alaska LNG 26221306		Feature Id: <u>W61HT031</u>
Investigators: <u>K DeGusis</u> <u>J Anderson</u>			Team No.: <u>W61</u>
State: Alaska	Region: Alaska	Milepost: <u>581.15</u>	
Latitude: <u>63°15'20.05</u>		Longitude: <u>149°15'44.85</u>	Datum: WGS84
Logbook No.: <u>W61-2</u>	Logbook Page No.: <u>40</u>	Picture No.: <u>P-W61HT031-Pit Plug; NE, S</u>	

SITE PARAMETERS	
Subregion: <u>Interior/Southcentral</u>	Landform (hillslope, terrace, hummocks, etc.): <u>hummocks</u>
Slope (%): <u>1</u>	Local relief (concave, convex, none): <u>CONVEX</u>
Pre-mapped Alaska LNG/NWI classification: <u>PEM1F</u>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <u>X</u> No (if no explain in Notes)	Are "Normal Circumstances" present: Yes <u>X</u> No (If no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <u>X</u> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <u>X</u> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <u>X</u> No	Is the Sampled Area within a Wetland? Yes <u>X</u> No
Hydric Soil Present? Yes <u>X</u> No	Wetland Type: <u>PEM1/SSI X F</u>
Wetland Hydrology Present? Yes <u>X</u> No	Alaska Vegetation Classification (Viereck): <u>IIA3, IIC2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

Sample plot w/in area of patterned ground area

See logbook W61-2, page 40 for site sketch & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)					
Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: <u>4</u> (A) Total Number of Dominant Species Across All Strata: <u>4</u> (B) % Dominant Species that are OBL, FACW, or FAC: <u>100</u> (A/B)	
1.					
2.					
3.					
4.					
Total Cover: <u>0</u> 50% of total cover: _____ 20% of total cover: _____					
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species: <u>49</u> X 1 = <u>49</u> FACW species: <u>23</u> X 2 = <u>46</u> FAC species: <u>57</u> X 3 = <u>171</u> FACU species: <u>5</u> X 4 = <u>20</u> UPL species: _____ X 5 = _____ Column Totals: <u>134</u> (A) <u>286</u> (B) PI = B/A = <u>2.13</u>	
1. <i>Betula nana</i> -	20	Y	FAC		
2. <i>Vaccinium uliginosum</i> -	15 12	Y	FAC		
3. <i>Rhododendron groenlandicum</i> -	10		FAC		
4. <i>Andromeda polifolia</i> *	1		FACW		
5. <i>Picea glauca</i>	2		FACU		
6. <i>Empetrum nigrum</i> *	7		FAC		
7. <i>Spiraea stenonii</i> -	3		FACU		
8. <i>Vaccinium oxycoccos</i> *	1		OBL		
9.					
Total Cover: <u>56</u> 50% of total cover: <u>28</u> 20% of total cover: <u>11.2</u>					

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Hydrophytic Vegetation Indicators: <input checked="" type="checkbox"/> Dominance Test is > 50% <input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) <small>¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.</small>
1. <i>Comarum palustre</i>	3		OBL	
2. <i>Viola palustris</i>	1		FACW	
3. <i>Eleocharis acicularis</i>	30	Y	OBL	
4. <i>Calamagrostis canadensis</i>	15.8		FAC	
5. <i>Pedicularis labradorica</i>	1		FACW	
6. <i>Carex vaginata</i>	15		OBL	
7. <i>Carex capillaris</i>	20	Y	FACW	
8. <i>Rubus chamaemorus</i>	1		FACW	
9.				
Total Cover: 85 78 50% of total cover: 42.5 39 20% of total cover: 17 15.6				
0 % Bare Ground 5 % Cover of Wetland Bryophytes 45 Total Cover of Bryophytes 55 % Cover of Water Hydrophytic Vegetation Present (Y/N): <u>Y</u> Notes: (If observed, list morphological adaptations below):				

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/7/14</u> Feature ID <u>NW1HT031</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-18"							Histel/Fibric	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS	INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u> </u>	Alaska Gleyed (A13) <u> </u>
Histic Epipedon (A2) <u> </u>	Alaska Redox (A14) <u> </u>
Black Histic (A3) <u> </u>	Alaska Gleyed Pores (A15) <u> </u>
Hydrogen Sulfide (A4) <u> </u>	Alaska Color Change (TA4) ⁴ <u> </u>
Thick Dark Surface (A12) <u> </u>	Alaska Alpine Swales (TA5) <u> </u>
	Alaska Redox with 2.5Y Hue <u> </u>
	Alaska Gleyed without 5Y Hue or Redder Underlying Layer <u> </u>
	Other (Explain in Notes) <u> </u>

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: Depth (inches):

Hydric Soil Present (Y/N):

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u> </u>	Surface Soil Cracks (B6) <u> </u>	Water-stained Leaves (B9) <u> </u>	Stunted or Stressed Plants (D1) <u> </u>
High Water Table (A2) <u> </u>	Inundation Visible on Aerial Imagery (B7) <u> </u>	Drainage Patterns (B10) <u> </u>	Geomorphic Position (D2) <u> </u>
Saturation (A3) <u> </u>	Sparsely Vegetated Concave Surface (B8) <u> </u>	Oxidized Rhizospheres along Living Roots (C3) <u> </u>	Shallow Aquitard (D3) <u> </u>
Water Marks (B1) <u> </u>	Marl Deposits (B15) <u> </u>	Presence of Reduced Iron (C4) <u> </u>	Microtopographic Relief (D4) <u> </u>
Sediment Deposits (B2) <u> </u>	Hydrogen Sulfide Odor (C1) <u> </u>	Salt Deposits (C5) <u> </u>	FAC-Neutral Test (D5) <u> </u>
Drift Deposits (B3) <u> </u>	Dry-Season Water Table (C2) <u> </u>	Notes: <u> </u>	
Algal Mat or Crust (B4) <u> </u>	Other (Explain in Notes): <u> </u>		
Iron Deposits (B5) <u> </u>			

Surface Water Present (Y/N): <u> </u>	Depth (in): <u> </u>	Wetland Hydrology Present (Y/N): <u> </u>
Water Table Present (Y/N): <u> </u>	Depth (in): <u> </u>	
Saturation Present (Y/N): <u> </u> (includes capillary fringe)	Depth (in): <u> </u>	
Notes: <u> </u>		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <u>✓</u> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>2</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>45</u> Dwarf shrub (<0.5m) <u>9</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>78</u> Moss-Lichen <u>45</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u> Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven <u>✓</u> Moderately even _____		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>✓</u> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover <u>✓</u> >75% Scattered or Peripheral Cover <u>✓</u> N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>✓</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>✓</u> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches <u>✓</u> Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>✓</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>✓</u>		
HGM Class (P): Slope _____ Flat <u>✓</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>✓</u> Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>✓</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded <u>✓</u>	
Evidence of Sedimentation (P): No Evidence Observed <u>✓</u> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>✓</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>✓</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>✓</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) <u>✓</u> pH Reading <u>5.35</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits <u>✓</u> Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>✓</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>✓</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <u>✓</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>✓</u>	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized <u>✓</u> 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>✓</u> Large (>100 acres) _____	

Crew Chief QA/QC check: *[Signature]*

GPS Technician QA/QC check: *[Signature]*

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61HT031

Field Target: 075

Date: 7/7/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Anderson
Wetland Scientist (print)

X Jennifer Anderson 7/7/14
Signature / Date

X Kim DEGUTIS
Field Crew Chief (print)

X Kelly L. Alt 7/7/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline		Access Road (explain)	Other (explain) <u>X</u>
Field Target: <u>16</u>		Map #: <u>51130</u> Map Date: <u>5/27/14</u>	
Date: <u>7/7/14</u>	Project Name & No.: Alaska LNG 26221306		Feature Id: <u>W61HT032</u>
Investigators: <u>K DeGuis J Anderson</u>			Team No.: <u>W61</u>
State: Alaska	Region: Alaska	Milepost: <u>581.2</u>	
Latitude: <u>63° 15' 14.41"</u>	Longitude: <u>149° 15' 51.15"</u>	Datum: WGS84	
Logbook No.: <u>W61-2</u>	Logbook Page No.: <u>41</u>	Picture No.: <u>P-W61HT032-Pit; Plug; S; NE</u>	

SITE PARAMETERS	
Subregion: <u>South central</u>	Landform (hillslope, terrace, hummocks, etc.): <u>Flat</u>
Slope (%): <u>1</u>	Local relief (concave, convex, none): <u>none</u>
Pre-mapped Alaska LNG/NWI classification: <u>PEMIF</u>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <u>X</u> No (if no explain in Notes)	Are "Normal Circumstances" present: Yes <u>X</u> No (if no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <u>X</u> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <u>X</u> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <u>X</u> No	Is the Sampled Area within a Wetland? Yes <u>X</u> No
Hydric Soil Present? Yes <u>X</u> No	Wetland Type: <u>PSS1/EMIB</u>
Wetland Hydrology Present? Yes <u>X</u> No	Alaska Vegetation Classification (Vioreck): <u>II C1, III A3</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 41 for site sketch & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)

Tree Stratum (Plot sizes: <u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>N/A</u>	<u>-</u>	<u>-</u>	<u>-</u>
2.			
3.			
4.			

Total Cover: -

50% of total cover: - 20% of total cover: -

Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Betula nana</u>	<u>45</u>	<u>Y</u>	<u>FAC</u>
2. <u>Vaccinium uliginosum</u>	<u>35</u>	<u>Y</u>	<u>FAC</u>
3. <u>Rhododendron greenlandicum</u>	<u>15</u>	<u>.</u>	<u>FAC</u>
4. <u>Vaccinium oxycoccus</u>	<u>1</u>		<u>OBL</u>
5. <u>Empetrum nigrum</u>	<u>15</u>		<u>FAC</u>
6. <u>Andromeda polifolia</u>	<u>2</u>		<u>FACW</u>
7.			
8.			
9.			

Total Cover: 113

50% of total cover: 56.5 20% of total cover: 22.6

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

% Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: - Multiply by:

OBL species: 8 X 1 = 8

FACW species: 21 X 2 = 42

FAC species: 122 X 3 = 366

FACU species: - X 4 = -

UPL species: - X 5 = -

Column Totals: 151 (A) 416 (B)

PI = B/A = 2.75

VEGETATION (use scientific names of plants)

Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Rubus chamaemorus</u>	<u>8</u>	<u>Y</u>	<u>FACW</u>
2. <u>Carex vaginata</u>	<u>7</u>	<u>Y</u>	<u>OBL</u>
3. <u>Calamagrostis canadensis</u>	<u>5</u>		<u>FAC</u>
4. <u>Pedicularis laboradorica</u>	<u>3</u>		<u>FACW</u>
5. <u>Carex bigelowii</u>	<u>7</u>	<u>Y</u>	<u>FAC</u>
6. <u>Sagittaria canadensis</u>	<u>3</u>		<u>FACW</u>
7. <u>Euphorum angustifolium</u>	<u>7</u>		<u>OBL</u>
8. <u>Carex membranacea</u>	<u>5</u>		<u>FACW</u>
9.			
10.			

Total Cover: 38

50% of total cover: 19 20% of total cover: 7.6

Hydrophytic Vegetation Indicators:

Y Dominance Test is > 50%

Y Prevalence Index is ≤ 3.0

- Morphological Adaptations¹ (Provide supporting data in Notes)

- Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

- % Cover of Wetland Bryophytes

60 Total Cover of Bryophytes

3 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/7/14</u> Feature ID <u>W61HT032</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-18"							Fibric	Saturated

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>Y</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes)

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: No Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>Y</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>Y</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>Y</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes):		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>0"</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>8"</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0"</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES	
P= Plot, M= Matrix Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____	
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>95</u> Dwarf shrub (<0.5m) <u>18</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>39</u> Moss-Lichen <u>60</u> Floating <u>0</u> Submerged <u>0</u>	
Number of Wetland Types (M): <u>2</u>	Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>X</u>
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <u>X</u> Very High Density (80-100%) _____	
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover <u>X</u> N/A _____	
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____	
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____	
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches <u>X</u> Continuous Cover _____	
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____	
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>X</u>	
HGM Class (P): Slope _____ Flat <u>X</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____	

SOIL VARIABLES
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____

HYDROLOGIC VARIABLES
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) <u>X</u> pH Reading <u>5.23</u>
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits <u>X</u> Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____

LANDSCAPE VARIABLES (M)
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <u>X</u> Unknown _____
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized <u>X</u> 25-50% Urbanized _____ >50% Urbanized _____
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____

Crew Chief QA/QC check:

[Signature]

GPS Technician QA/QC check:

[Signature]

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W6LHT032

Field Target: FT:076

Date: 7/7/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Jennifer Anderson
Wetland Scientist (print)

X

Jennifer Anderson 7/7/14
Signature / Date

X

Kim DEGUTIS
Field Crew Chief (print)

X

Kim Degutis 7/7/14
Signature / Date

WETLAND DETERMINATION DATA FORM

2000 ft Corridor

SITE DESCRIPTION			
Survey Type: Centerline	Access Road (explain)	Other (explain) <u>X</u>	Field Target: <u>77</u>
Date: <u>7/7/14</u>	Project Name & No.: Alaska LNG 26221306		Map #: <u>5130</u> Map Date: <u>5/27/14</u>
Investigators: <u>K DeGutis</u> <u>J Anderson</u>			Feature Id: <u>W61 HTO 33</u>
State: Alaska	Region: Alaska	Milepost: <u>581.25</u>	Team No.: <u>W61</u>
Latitude: <u>63° 16' 12.00"</u>		Longitude: <u>149° 15' 52.92"</u>	Datum: WGS84
Logbook No.: <u>W61-2</u>	Logbook Page No.: <u>42</u>	Picture No.: <u>P-W61HTO33-Pit; Plug; SW; NE</u>	

SITE PARAMETERS	
Subregion: <u>Southcentral</u>	Landform (hillslope, terrace, hummocks, etc.): <u>FLAT</u>
Slope (%): <u>1</u>	Local relief (concave, convex, none): <u>NONE</u>
Pre-mapped Alaska LNG/NWI classification: <u>PSS1B</u>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <u>X</u> No (if no explain in Notes)	Are "Normal Circumstances" present: Yes <u>X</u> No (If no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <u>X</u> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No <u>X</u> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <u>X</u> No	Is the Sampled Area within a Wetland? Yes <u>X</u> No
Hydric Soil Present? Yes <u>X</u> No	Wetland Type: <u>PSS1B</u>
Wetland Hydrology Present? Yes <u>X</u> No	Alaska Vegetation Classification (Vioreck): <u>II B1, III A2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 42
for notes & site sketch

Salix. dom. wetland

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>N/A</u>	<u>-</u>	<u>-</u>	<u>-</u>
2.			
3.			
4.			
Total Cover: <u>-</u> 50% of total cover: <u>-</u> 20% of total cover: <u>-</u>			
Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Spirea Stevenii</u>	<u>10</u>		<u>FACU</u>
2. <u>Salix pseudomyrsinites</u>	<u>65</u>	<u>Y</u>	<u>Assumed FAC UPL</u>
3. <u>Rubus cuneatus</u>	<u>8</u>		<u>FAC</u>
4.			
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>83</u> 50% of total cover: <u>41.5</u> 20% of total cover: <u>16.6</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)
 Total Number of Dominant Species Across All Strata: 2 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)
50

Prevalence Index worksheet:
 Total % Cover of: - Multiply by: -
 OBL species: - X 1 = -
 FACW species: 4 X 2 = 8
 FAC species: 113-48 X 3 = 339-144
 FACU species: 12 X 4 = 48
 UPL species: 45 X 5 = -305
 Column Totals: 129 (A) 395-525 (B)
 PI = B/A = 3.06-4.07

* Not listed in 2014 AT Wetland Plant List - so considered UPL species

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Calamagrostis Canadensis</u>	<u>35</u>	<u>Y</u>	<u>FAC</u>
2. <u>Sanguinaria Canadensis</u>	<u>3</u>		<u>FACW</u>
3. <u>Equisetum arvense</u>	<u>5</u>		<u>FAC</u>
4. <u>Chamaenerion angustifolium</u>	<u>2</u>		<u>FACU</u>
5. <u>Viola palustris</u>	<u>1</u>		<u>FACW</u>
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>46</u> 50% of total cover: <u>23</u> 20% of total cover: <u>9.2</u>			

Hydrophytic Vegetation Indicators:
 _____ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
☒ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

5 % Bare Ground
0 % Cover of Wetland Bryophytes
0 Total Cover of Bryophytes
0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):
Salix exhibits surficial rooting & multiple
trunking throughout plot & w/in adjacent areas

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/7/14</u> Feature ID <u>W61 H1033</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Notes
	Color (moist)	%	Color (moist)	%				
0-2"							Fibric	Saturated
2-5"							Hemic	Saturated
5-7"	10YR 2/2	100					Silt loam	Saturated
7-12"	2.5Y 4/3	70	7.5YR 4/6	30	C	PL	Silt loam	
12-18"	2.5Y 5/3	85	7.5YR 5/6	15	C	PL	Silt loam	5% gravel throughout, Saturated
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ² Location: PL=Pore Lining, M=Matrix.								
HYDRIC SOIL INDICATORS						INDICATORS FOR PROBLEMATIC HYDRIC SOILS³		
Histosol or Histel (A1) _____			Alaska Gleyed (A13) _____			Alaska Color Change (TA4) ⁴ _____		
Histic Epipedon (A2) _____			Alaska Redox (A14) _____			Alaska Alpine Swales (TA5) _____		
Black Histic (A3) _____			Alaska Gleyed Pores (A15) _____			Alaska Redox with 2.5Y Hue <u>X</u>		
Hydrogen Sulfide (A4) _____						Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____		
Thick Dark Surface (A12) _____						Other (Explain in Notes) _____		
³ One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic. ⁴ Give details of color change in Notes.								
Restrictive Layer (if present): Type: <u>N/A</u> Depth (inches): <u>—</u>								
Hydric Soil Present (Y/N): <u>Y</u>								
Notes: _____								

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>Y</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>Y</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			
Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>Y</u>	
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>5"</u>		
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0"</u>		
Notes: _____			

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>10</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent- Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>65</u> Short shrub (0.5-2m) <u>10</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>46</u> Moss-Lichen <u>0</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>1</u>		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>α</u>
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <u>α</u> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>α</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>α</u> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <u>α</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>α</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>α</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>α</u>		
HGM Class (P): Slope _____ Flat <u>α</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty <u>α</u> Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>α</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>α</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>α</u> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent <u>α</u> Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>α</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>α</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>α</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits <u>α</u> Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>α</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>α</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below <u>α</u> Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>α</u>	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized <u>α</u> 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>α</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: 061HT033

Field Target: 077

Date: 7/7/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Jennifer Anderson

Wetland Scientist (print)

X

Jennifer Anderson

Signature / Date

X

Kim DeGutis

Field Crew Chief (print)

X

Kim DeGutis 7/7/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline		Access Road (explain)	Other (explain) <i>✓ corridor</i>
Date: 7/8/14	Project Name & No.: Alaska LNG 26221306		Field Target: 79
Investigators: K DEGOUTS J Anderson		Map #: 531 Map Date: 6/26/14	
State: Alaska	Region: Alaska	Milepost: No MP ON MAP OF GPS	Feature Id: W61HT034
Latitude: 63° 14' 11.8560"	Longitude: 149° 16' 29.39"	Datum: WGS84	
Logbook No.: W61-2	Logbook Page No.: 43	Picture No.: P-W61HT034 - Pit; Plug; S; N	

SITE PARAMETERS	
Subregion: Southcentral	Landform (hillslope, terrace, hummocks, etc.): TERRACE
Slope (%): 1	Local relief (concave, convex, none): NONE
Pre-mapped Alaska LNG/NWI classification: PFO1/4/SS1B	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No (if no explain in Notes)	Are "Normal Circumstances" present? Yes <input checked="" type="checkbox"/> No (If no, explain in Notes.)
Are Vegetation, Soil, or Hydrology Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation, Soil, or Hydrology Naturally Problematic?	No (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No	Wetland Type: PFO1A/SS1B <i>OK</i> PSS1B <i>27</i>
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No	Alaska Vegetation Classification (Vioreck): IC3, II B1, III A2 <i>OK</i>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

- Sample plot located on river terrace, soils problematic throughout.
- Very P/E 3.45, however multiple trunking & buttressing of trees observed w/in plot (MORPHOLOGICAL ADAPTATION)
- water table @ 6" (this is deepest WT out of several pits dug to confirm hydrology throughout).

See logbook W61-2, page 43

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)

Tree Stratum (Plot sizes: <u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Populus balsamifera</i>	15	Y	FACU
2. <i>Salix glauca</i>	3		FACU
3. <i>Betula neolascana</i>	2		FACU
4.			

Total Cover: 20

50% of total cover: 10 20% of total cover: 4

Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Shepherdia canadensis</i>	10		FACU
2. <i>Salix pseudomyrsinites</i>	55	Y	NI
3. <i>Rosa acicularis</i>	5		FACU
4. <i>Salix pseudomonticola</i>	5		FAC
5. <i>Vaccinium uliginosum</i>	25	Y	FAC
6. <i>Ribes hudsoni glandulosum</i>	2		FACU
7. <i>Populus balsamifera</i>	5		FACU
8.			
9.			

Total Cover: 107

50% of total cover: 53.5 20% of total cover: 21.4

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

% Dominant Species that are OBL, FACW, or FAC: 40 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:

OBL species: — X 1 = —

FACW species: 3 X 2 = 6

FAC species: 71 X 3 = 213

FACU species: 68 X 4 = 272

UPL species: — X 5 = —

Column Totals: 142 (A) 491 (B)

PI = B/A = 3.45

VEGETATION (use scientific names of plants)

Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Calamagrostis canadensis</i>	12	Y	FAC
2. <i>Equisetum arvense</i>	20	Y	FAC
3. <i>Cornus canadensis</i>	15	Y	FACU
4. <i>Chamaecrista angustifolium</i>	10		FACU
5. <i>Aconitum delphinifolium</i>	2		FAC
6. <i>Salix boreale</i>	1		FACU
7. <i>Rubus arcticus</i>	7		FAC
8. <i>Sanguisorba canadensis</i>	3		FACW
9. <i>Lupinus arcticus</i>	7		FACU
10.			

Total Cover: 70

50% of total cover: 35 20% of total cover: 14

Hydrophytic Vegetation Indicators:

_____ Dominance Test is > 50%

_____ Prevalence Index is ≤ 3.0

☒ Morphological Adaptations¹ (Provide supporting data in Notes)

_____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

45 % Bare Ground

0 % Cover of Wetland Bryophytes

0 Total Cover of Bryophytes

20.15 % Cover of Water

Hydrophytic Vegetation Present (Y/N): X Y

Notes: (If observed, list morphological adaptations below):

Some multiple trunking observed in *Salix* sp.
Populus balsam (tree) buttressing of trees observed
 some surficial rooting

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/8/14</u> Feature ID <u>W61 H1034</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features		Type ¹	Loc ²	Texture	Notes
	Color (moist)	%	Color (moist)	%				
0-2"							Fibric	Saturated
2-7"	7.5YR 3/1	80	10YR 3/10	20	C	M	Fine Sandy loam	Saturated
7-18"	10YR 2/1	100					Fine Sandy loam	15% cobble, 50% gravel

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____	
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____	
Thick Dark Surface (A12) _____		Other (Explain in Notes) <u>X</u>	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: No Depth (inches): —

Hydric Soil Present (Y/N): Y

Notes: problem soils on flood plain; Hydrology criteria satisfied.
alt is high (7.3), and soil has low organic-matter content

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) <u>X</u>	Drainage Patterns (B10) <u>h</u>	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes):		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>4"</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>8"</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>2"</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved <u>X</u> Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>20</u> Sapling (<5 dbh, <6m tall) <u>5</u> Tall shrub (2-6m) <u>60</u> Short shrub (0.5-2m) <u>47</u> Dwarf shrub (<0.5m) <u>6</u> Tall herb (≥1m) <u>6</u> Short herb (<1m) <u>70</u> Moss-Lichen <u>0</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>3</u>		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>X</u>
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <u>X</u> Very High Density (80-100%) <u>X</u>		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover <u>X</u> >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open <u>X</u> Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>X</u>		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine <u>X</u> Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy <u>X</u> Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate <u>X</u> Fluvaquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent <u>X</u> Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs <u>X</u> Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) <u>X</u> Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading <u>7.31</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits <u>X</u> Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below <u>X</u> Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized <u>X</u> 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) <u>X</u> Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W614T034

Field Target: 79

Date: 7/8/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Jennifer Anderson

Wetland Scientist (print)

X

Jennifer Anderson 7/8/14

Signature / Date

X

Kim DEGUTIS

Field Crew Chief (print)

X

Kim Degutis 7/8/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline		Access Road (explain)	Other (explain) <i>X</i>
Field Target: <i>7B</i>		Map #: <i>52130</i> Map Date: <i>6/20/14</i>	
Date: <i>7/8/14</i>	Project Name & No.: Alaska LNG 26221306		Feature Id: <i>W61HT035</i>
Investigators: <i>K DeGuns J Anderson</i>			Team No.: <i>W613</i>
State: Alaska	Region: Alaska	Milepost: <i>No HP on map & GPS</i>	
Latitude: <i>63° 14' 38.74"</i>		Longitude: <i>149° 16' 20.73"</i>	Datum: WGS84
Logbook No.: <i>W61-2</i>	Logbook Page No.: <i>44</i>	Picture No.: <i>P_W61HT035 - Pt; Plug; NE; SE</i>	

SITE PARAMETERS	
Subregion: <i>Southcentral</i>	Landform (hillslope, terrace, hummocks, etc.): <i>Flat</i>
Slope (%): <i>2</i>	Local relief (concave, convex, none): <i>NONE</i>
Pre-mapped Alaska LNG/NWI classification: <i>Upland</i>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <i>X</i> No (If no explain in Notes)	
Are "Normal Circumstances" present: Yes <i>X</i> No (If no, explain in Notes.)	
Are Vegetation, Soil, or Hydrology Significantly Disturbed? No <i>X</i> (If yes, explain in Notes)	
Are Vegetation, Soil, or Hydrology Naturally Problematic? No <i>X</i> (If yes, explain in Notes.)	
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <i>X</i> No	Is the Sampled Area within a Wetland? Yes No <i>X</i>
Hydric Soil Present? Yes No <i>X</i>	Wetland Type: <i>UPLAND</i>
Wetland Hydrology Present? Yes <i>X</i> No	Alaska Vegetation Classification (Vioreck): <i>II C2, III A2</i>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

*See logbook W61-2, page 44
for site sketch & notes*

- Hydrology by 2° indicator only*
- Soils very dry, no redox features observed*

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>N/A</u>	—	—	—
2.			
3.			
4.			
Total Cover: <u>—</u> 50% of total cover: <u>—</u> 20% of total cover: <u>—</u>			
Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Betula glandulosa</u>	<u>30</u>	<u>Y</u>	<u>FAC</u>
2. <u>Vaccinium uliginosum</u>	<u>8</u>		<u>FAC</u>
3. <u>Salix bebbiana</u>	<u>10</u>		<u>FAC</u>
4. <u>Salix polaris</u>	<u>7</u>		<u>FACW</u>
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>55</u> 50% of total cover: <u>27.5</u> 20% of total cover: <u>11</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)
 Total Number of Dominant Species Across All Strata: 2 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: — Multiply by: —
 OBL species: — X 1 = —
 FACW species: 15 X 2 = 30
 FAC species: 108 X 3 = 324
 FACU species: — X 4 = —
 UPL species: — X 5 = —
 Column Totals: 123 (A) 354 (B)
 PI = B/A = 2.87

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <u>Calamagrostis canadensis</u>	<u>45</u>	<u>Y</u>	<u>FAC</u>
2. <u>Deschampsia caespitosa</u>	<u>5</u>		<u>FAC</u>
3. <u>Rubus chamaemorus</u>	<u>5</u>		<u>FACW</u>
4. <u>Polemonium acutiflorum</u>	<u>3</u>		<u>FAC</u>
5. <u>Carex polytricha</u>	<u>5</u>		<u>FAC</u>
6. <u>Carex lasiocarpa</u>	<u>2</u>		<u>FAC</u>
7. <u>Carex saxatilis</u>	<u>3</u>		<u>FACW</u>
8.			
9.			
10.			
Total Cover: <u>68</u> 50% of total cover: <u>34</u> 20% of total cover: <u>13.6</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

15 % Bare Ground
0 % Cover of Wetland Bryophytes
35 Total Cover of Bryophytes
0 % Cover of Water
Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date _____	Feature ID _____				Soil Pit Required (Y/N) _____	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-0.5"							Fibric	dry
0.5-18"	2.5Y 4/3	4.5	10YR 3/3	5	C	PL	silt loam	5% gravel; 2% cobble

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: N/A Depth (inches): -

Hydric Soil Present (Y/N): N

Notes: Does not satisfy Alaska 2.5Y Hue indicator (color, % of redox throughout)

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____	_____		
Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>Y</u>	
Water Table Present (Y/N): <u>N</u>	Depth (in): <u>—</u>		
Saturation Present (Y/N): (includes capillary fringe) <u>N</u>	Depth (in): <u>—</u>		
Notes:			

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____		
Number of Wetland Types (M): _____ Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		
SOIL VARIABLES		
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____		
HYDROLOGIC VARIABLES		
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____		
Wetland Water Regime (P): Drier Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____		
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvial/Quaternary Soils Sediment Created _____		
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____		
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____		
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____		
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____		
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____		
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____		
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____		
LANDSCAPE VARIABLES (M)		
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____		
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e., open space) _____		
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____		
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____		

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W614T035

Field Target: 78

Date: 7/8/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Anderson
Wetland Scientist (print)

X Jennifer Anderson 7/8/14
Signature / Date

X Kim DEGUIS
Field Crew Chief (print)

X Kim Deguis 7/8/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 63	Map #: 41130 Map Date: 5/27/14
Date: 7/8/14	Project Name & No.: Alaska LNG 26221306		Feature Id: W61HT036
Investigators: K DEGUTIS J Anderson			Team No.: W61
State: Alaska	Region: Alaska	Milepost: 557.95	
Latitude: 63° 27' 55.57"		Longitude: 148° 48' 22.33"	Datum: WGS84
Logbook No.: W61-2	Logbook Page No.: 45	Picture No.: P-W61HT036 - Pt; Plug; S; E.	

SITE PARAMETERS	
Subregion: Southcentral	Landform (hillslope, terrace, hummocks, etc.): FLAT
Slope (%): 3	Local relief (concave, convex, none): NONE
Pre-mapped Alaska LNG/NWI classification: UPLAND	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	
Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)	
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed? No <input checked="" type="checkbox"/> (If yes, explain in Notes)	
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic? No <input checked="" type="checkbox"/> (If yes, explain in Notes.)	

SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: PSS1/EM1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Vioreck): IIA2, IIC1, IIIA2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

gummy

MOUNTAIN ROADWAY

TOPO BREAK

W61HT036

W61HT036-OP

See logbook W61-2, page 45 & notes & site sketch

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>26'</u>)		Absolute % Cover	Dominant Species? (Y/N)
1. <i>Picea glauca</i>		7	Y
2.			
3.			
4.			
Total Cover: <u>7</u>			
50% of total cover: <u>3.5</u>		20% of total cover: <u>—</u>	
Sapling/Shrub Stratum (<u>26'</u>)		Absolute % Cover	Dominant Species? (Y/N)
1. <i>Vaccinium uliginosum</i>		40	Y
2. <i>Vaccinium vitis-idaea</i>		10	
3. <i>Betula nana</i>		15	Y
4. <i>Salix lasioandra</i>		10	
5. <i>Salix pulchra</i>		10	
6. <i>Rhododendron groenlandicum</i>		5	
7. <i>Picea glauca</i>		15	Y
8. <i>Spirea stevensii</i>		15	Y
9. <i>Eriophorum nigrum</i>		5	
Total Cover: <u>140</u>			
50% of total cover: <u>70</u>		20% of total cover: <u>28</u>	

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

% Dominant Species that are OBL, FACW, or FAC: 57% (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by: _____

OBL species: — X 1 = —

FACW species: 25 X 2 = 50

FAC species: 36 X 3 = 108

FACU species: 36 X 4 = 144

UPL species: — X 5 = —

Column Totals: 193 (A) 554 (B)

PI = B/A = 2.87

Salix glauca 10 FAC

Salix arbusculoides 5 FACU

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>26'</u>)		Absolute % Cover	Dominant Species? (Y/N)
1. <i>Equisetum sylvaticum</i>		30	Y
2. <i>Calamagrostis canadensis</i>		15	Y
3. <i>Equisetum arvense</i>		10	
4. <i>Rubus chamaemorus</i>		5	
5. <i>Pyrola asarifolia</i>		2	
6. <i>Rumex crispus</i>		7	
7.			
8.			
9.			
10.			
Total Cover: <u>62</u>			
50% of total cover: <u>31</u>		20% of total cover: <u>12.4</u>	

Hydrophytic Vegetation Indicators:

Y Dominance Test is > 50%

X Prevalence Index is ≤ 3.0

_____ Morphological Adaptations¹ (Provide supporting data in Notes)

_____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

5 % Bare Ground

0 % Cover of Wetland Bryophytes

20 Total Cover of Bryophytes

15 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/9/14</u> Feature ID <u>E.V.61HT036</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-6"							Fibric	Saturated
6-18"	10YR 3/2	100					sandy loam	60% cobble

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS	INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____
Hydrogen Sulfide (A4) <u>A</u>	Alaska Redox with 2.5Y Hue _____
Thick Dark Surface (A12) _____	Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
	Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: N/A Depth (inches): —

Hydric Soil Present (Y/N): Y

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>A</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>Y</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>Y</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) <u>Y</u>	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>1/2"</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>1"</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0"</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <input checked="" type="checkbox"/> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>7</u> Sapling (<5 dbh, <6m tall) <u>15</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>120</u> Dwarf shrub (<0.5m) <u>5</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>62</u> Moss-Lichen <u>20</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u> Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven <input checked="" type="checkbox"/> Moderately even _____		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <input checked="" type="checkbox"/> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover <input checked="" type="checkbox"/> N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <input checked="" type="checkbox"/> High (>25) _____		
Presence of Islands (M): Absent (none) <input checked="" type="checkbox"/> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches <input checked="" type="checkbox"/> Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <input checked="" type="checkbox"/> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <input checked="" type="checkbox"/>		
HGM Class (P): Slope _____ Flat <input checked="" type="checkbox"/> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy <input checked="" type="checkbox"/> Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet <input checked="" type="checkbox"/> Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <input checked="" type="checkbox"/> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <input checked="" type="checkbox"/> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <input checked="" type="checkbox"/> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <input checked="" type="checkbox"/> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow <input checked="" type="checkbox"/>	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) <input checked="" type="checkbox"/> Acid (<5.5) _____ pH Reading <u>8.25</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits <input checked="" type="checkbox"/> Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) <input checked="" type="checkbox"/>	
Evidence of Seeps and Springs (P): No Seeps or Springs <input checked="" type="checkbox"/> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <input checked="" type="checkbox"/> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <input checked="" type="checkbox"/>	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized <input checked="" type="checkbox"/> 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <input checked="" type="checkbox"/> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

[Signature]

GPS Technician QA/QC check:

[Signature]

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61HT036

Field Target: 63

Date: 7/8/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Anderson
Wetland Scientist (print)

X Jennifer Anderson 7/8/14
Signature / Date

X Kim DEGUTIS
Field Crew Chief (print)

X [Signature] 7/8/14
Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: <u>62</u>	Map #: <u>40/130</u> Map Date: <u>5/27/14</u>
Date: <u>7/8/14</u>	Project Name & No.: Alaska LNG 26221306		Feature Id: <u>W6117037</u>
Investigators: <u>K DeGuns</u> <u>J Anderson</u>			Team No.: <u>W61</u>
State: Alaska	Region: Alaska	Milepost: <u>553.85</u>	
Latitude: <u>63° 31' 14.16"</u>		Longitude: <u>148° 48' 02.06"</u>	Datum: WGS84
Logbook No.: <u>W61-2</u>	Logbook Page No.: <u>46</u>	Picture No.: <u>P_W61H7037_P.t; Plug; S; W</u>	

SITE PARAMETERS	
Subregion: <u>Southcentral</u>	Landform (hillslope, terrace, hummocks, etc.): <u>Flat</u>
Slope (%): <u>1</u>	Local relief (concave, convex, none): <u>NONE</u>
Pre-mapped Alaska LNG/NWI classification: <u>PSS4/1B</u>	Soil Map Unit Name: _____
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/>	Wetland Type: <u>UPLAND</u>
Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Viereck): <u>I A2, II C1, III A2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

See logbook W61-2, page 46
for site sketch & notes

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)

Tree Stratum (Plot sizes: <u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea glauca</i>	7	Y	FACU
2.			
3.			
4.			

Total Cover: 7

50% of total cover: 3.5 20% of total cover: —

Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Betula glandulosa</i>	55	Y	FAC
2. <i>Rhododendron opacifolium</i>	30	Y	FAC
3. <i>Vaccinium vitis idaea</i>	35	7	FAC
4. <i>Rosa acicularis</i>	3		FACU
5. <i>Vaccinium uliginosum</i>	35	Y	FAC
6. <i>Picea glauca</i>	7		FACU
7.			
8.			
9.			

Total Cover: 130 137

50% of total cover: 65 68.5 20% of total cover: 26 27.4

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

% Dominant Species that are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of: — Multiply by:

OBL species: — X 1 = —

FACW species: 8 X 2 = 16

FAC species: 139 X 3 = 417

FACU species: 28 X 4 = 112

UPL species: — X 5 = —

Column Totals: 175 (A) 545 (B)

PI = B/A = 3.11

VEGETATION (use scientific names of plants)

Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Potamogeton amplifolius</i>	5		FACW
2. <i>Calamagrostis CANADENSIS</i>	10	Y	FAC
3. <i>Cornus canadensis</i>	7	10	FACU
4. <i>Rubus chamaemorus</i>	3		FACW
5. <i>Equisetum arvense</i>	2		FAC
6. <i>Chamaecrista angustifolia</i>	1		FACU
7.			
8.			
9.			
10.			

Total Cover: 31

50% of total cover: 15.5 20% of total cover: 6.2

Hydrophytic Vegetation Indicators:

X Dominance Test is > 50%

— Prevalence Index is ≤ 3.0

— Morphological Adaptations¹ (Provide supporting data in Notes)

— Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

0 % Cover of Wetland Bryophytes

20 Total Cover of Bryophytes

0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/8/14</u> Feature ID <u>W6147037</u>		Soil Pit Required (Y/N) <u>Y</u>			
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features			Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹		
0-8"							Fibric Dry
8-10"	2.5Y 3/2	87	10YR 3/6	15	PL	M	Silt loam
10-18"	2.5Y 4/1	89	7.5YR 3/4		PL	M	Silt loam

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: No Depth (inches): _____

Hydric Soil Present (Y/N): No

Notes: _____

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	
Saturation Present (Y/N): <u>N</u> (includes capillary fringe)	Depth (in): <u>—</u>	
Notes: _____		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____			
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____			
Number of Wetland Types (M): _____		Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____			
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____			
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____			
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____			
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site _____ Open _____ Small Scattered Patches _____ Continuous Cover _____			
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____			
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____			
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____			
SOIL VARIABLES			
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____			
HYDROLOGIC VARIABLES			
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____			
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____			
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____			
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____			
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____			
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____			
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____			
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____			
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____			
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____			
LANDSCAPE VARIABLES (M)			
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____			
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____			
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____			
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____			

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61HT037

Field Target: 62

Date: 7/8/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X Jennifer Andersen X [Signature] 7/8/14
Wetland Scientist (print) Signature / Date

X Kim DEGUSIS X [Signature] 7/8/14
Field Crew Chief (print) Signature / Date

WETLAND DETERMINATION DATA FORM

2000-ft corridor

SITE DESCRIPTION			
Survey Type: Centerline <input type="checkbox"/> Access Road (explain) <input type="checkbox"/> Other (explain) <input checked="" type="checkbox"/>		Field Target: <u>61</u>	Map #: <u>40130</u> Map Date: <u>5/27/14</u>
Date: <u>7/8/14</u>	Project Name & No.: Alaska LNG 26221306		Feature Id: <u>WG1HT038</u>
Investigators: <u>K DEGUTIS</u> <u>J Anderson</u>			Team No.: <u>WG1</u>
State: Alaska	Region: Alaska	Milepost: <u>553.65</u>	
Latitude: <u>63° 31' 24.36"</u>		Longitude: <u>148° 48' 06.96"</u>	Datum: WGS84
Logbook No.: <u>WG1-2</u>	Logbook Page No.: <u>47</u>	Picture No.: <u>P-WG1HT038-P.t; P.t; W; E</u>	

SITE PARAMETERS	
Subregion: <u>Southcentral</u>	Landform (hillslope, terrace, hummocks, etc.): <u>FLAT</u>
Slope (%): <u>1</u>	Local relief (concave, convex, none): <u>NONE</u>
Pre-mapped Alaska LNG/NWI classification: <u>UPLAND</u>	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Notes.)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Wetland Type: <u>UPLAND</u>
Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Alaska Vegetation Classification (Vioreck): <u>IA2, IIC2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

*See logbook WG1-2, page 47
for site sketch & notes*

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: <u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Picea glauca</i>	40	Y	FACU
2.			
3.			
4.			
Total Cover: <u>40</u> 50% of total cover: <u>20</u> 20% of total cover: <u>8</u>			
Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Rosa acicularis</i>	10	Y	FACU
2. <i>Vaccinium vitis-idaea</i>	7		FAC
3. <i>Empetrum nigrum</i>	5		FAC
4. <i>Linnaea borealis</i>	2		FACU
5. <i>Vaccinium uliginosum</i>	25	Y	FAC
6. <i>Salix baccata</i>	7		FAC
7.			
8.			
9.			
Total Cover: <u>56</u> 50% of total cover: <u>28</u> 20% of total cover: <u>11.2</u>			

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

% Dominant Species that are OBL, FACW, or FAC: 33% (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by: _____

OBL species: — X 1 = —

FACW species: 2 X 2 = 4

FAC species: 51 X 3 = 153

FACU species: 59 X 4 = 236

UPL species: — X 5 = —

Column Totals: 112 (A) 393 (B)

PI = B/A = 3.51

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Equisetum arvense</i>	5	Y	FAC
2. <i>Petasites frigidus</i>	2		FACW
3. <i>Calamagrostis canadensis</i>	2		FAC
4. <i>Mertensia paniculata</i>	3	Y	FACU
5. <i>Helysacum alpinum</i>	3	Y	FACU
6. <i>Chamaenerion angustifolium</i>	1		FACU
7. <i>Rumex crispus</i>	7		FAC
8.			
9.			
10.			
Total Cover: <u>16</u> 50% of total cover: <u>8</u> 20% of total cover: <u>3.2</u>			

Hydrophytic Vegetation Indicators:

_____ Dominance Test is > 50%

_____ Prevalence Index is ≤ 3.0

_____ Morphological Adaptations¹ (Provide supporting data in Notes)

_____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

10 % Bare Ground

0 % Cover of Wetland Bryophytes

10 Total Cover of Bryophytes

0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): N

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>7/8/14</u> Feature ID <u>W61H1038</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-7"							Fibric	organic
7-12"	2.5Y 3/1	95	10YR 3/6	5	C	M	Sand/loam	
12"	frozen							

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS	INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____
Hydrogen Sulfide (A4) _____	Alaska Redox with 2.5Y Hue _____
Thick Dark Surface (A12) _____	Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
	Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: frozen Depth (inches): 12"

Hydric Soil Present (Y/N): N

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) _____	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) <u>X</u>
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>N</u>
Water Table Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	
Saturation Present (Y/N): (includes capillary fringe) <u>N</u>	Depth (in): <u>—</u>	
Notes:		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES	
P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____	
Percent Cover (P): Tree (>5 dbh, >6m tall) _____ Sapling (<5 dbh, <6m tall) _____ Tall shrub (2-6m) _____ Short shrub (0.5-2m) _____ Dwarf shrub (<0.5m) _____ Tall herb (≥1m) _____ Short herb (<1m) _____ Moss-Lichen _____ Floating _____ Submerged _____	
Number of Wetland Types (M): _____	Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) _____	
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ 75% Scattered or Peripheral Cover _____ N/A _____	
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) _____ High (>25) _____	
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A _____	
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover _____	
Dead Woody Material (P): Low Abundance (0-25% of surface) _____ Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____	
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____	
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional _____ Riverine _____ Estaurine Fringe _____	

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet _____ No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated _____ Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed _____ Sediment Observed on Wetland Substrate _____ Fluvuquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding _____ Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow _____ Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) _____ High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs _____ Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) _____	
Watershed Land Use: 0-5% Rural _____ 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) _____ Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W61 HT039

Field Target: 61

Date: 7/8/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

X

Jennifer Anderson

Wetland Scientist (print)

X

John Am 7/8/14

Signature / Date

X

Kim DEGUTIS

Field Crew Chief (print)

X

Shelly Keltz 7/8/14

Signature / Date

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 193	Map #: 126 Map Date: 5/27/14
Date: 06-01-2014	Project Name & No.: Alaska LNG 26221306		Feature Id: W60T1001
Investigators: Valerie Watkins, Zoe Meade			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 701.9	
Latitude: 61°48'28.66"		Longitude: -150°18'40.96"	Datum: WGS84
Logbook No.: 1	Logbook Page No.: 1	Picture No.: P-W60T1001-E-W-pit-plug	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): hummock
Slope (%): 0-3	Local relief (concave, convex, none): Flat
Pre-mapped Alaska LNG/NWI classification: PSS1/EMIB	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (if no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: PSS1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Vioreck): 2C4 2C1 II C1

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

The sketch depicts a wetland area surrounded by a spruce/birch forest. A survey point is marked with an 'X' and labeled 'survey pt.'. A pit/plug location is marked with a circle and labeled 'pit/plug'. Two vegetation photo locations are marked with 'x' and labeled 'veg photo 001' and 'veg photo 002'. The entire area is enclosed within a hand-drawn boundary representing the wetland.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Betula neoalaskana</i>	5	—	FACU
2. <i>Betula nana</i>	25	Y	FAC
3. <i>Picea mariana</i>	1	—	FACW
4. <i>Salix fuscescens</i>	5	—	FACW
5. <i>Vaccinium Uliginosum</i>	60	Y	FAC
6.			
7.			
8.			
9.			
Total Cover: <u>96</u> 50% of total cover: <u>48</u> 20% of total cover: <u>19.2</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 4 (A)
 Total Number of Dominant Species Across All Strata: 4 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: 3 X 1 = 3
 FACW species: 26 X 2 = 52
 FAC species: 110 X 3 = 330
 FACU species: 5 X 4 = 20
 UPL species: 0 X 5 = 0
 Column Totals: 144 (A) 405 (B)
 PI = B/A = 2.8

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Andromeda polifolia</i>	20	Y	FACW
2. <i>Cornarum palustre</i>	3	—	OBL
3. <i>Calamagrostis Canadensis</i>	25	Y	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>48</u> 50% of total cover: <u>24</u> 20% of total cover: <u>9.6</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
40 % Cover of Wetland Bryophytes
10 Total Cover of Bryophytes
5 % Cover of Water
Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>06-01-14</u> Feature ID <u>W60T1001</u>				Soil Pit Required (Y/N) _____	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features			Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹		
0-6							Organic; fibric only
6-22	7.5 YR 4/4	60	7.5 YR 2.5/3	15	C	M	
	10 YR 2/1	25					

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) <u>X</u>		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes: 7.5 YR 2.5/3
10 YR 2/1
7.5 YR 4/4

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) <u>2.5/3</u>	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) <u>X</u>	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>✓</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: Saturated to surface	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): _____	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>3"</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0</u>	

Notes: parts of plot have standing surface water

7.5 YR 2.5/3

10 YR 2/1

WETLAND DETERMINATION DATA FORM

conductivity 25µs

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>6</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>25</u> Dwarf shrub (<0.5m) <u>65</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>48</u> Moss-Lichen <u>60</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>1</u>		Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <u>X</u> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover <u>X</u> N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) _____ One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>X</u>		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy <u>X</u> Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial/Quaternary Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) <u>X</u> Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) <u>X</u> pH Reading <u>4.04</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below <u>X</u> Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

GPS Technician QA/QC check:

VW

ym

QA/QC check
DEC Page 4 of 4

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60TI001

Field Target: 193

Date: 06-01-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☐ Two photos were taken for each Observation Point (vegetation/site overview)?

NA

X Zoe Meade

Wetland Scientist (print)

X *Zoe Meade* 06-01-14

Signature / Date

X Valerie Watkins

Field Crew Chief (print)

X *Valerie Watkins*

Signature / Date

DEE

Vegetation Classification Data Form

Site Description		
Date: 6/1/14	Project Name & #: Alaska LNG 26221306	Field Target: 192
Investigators: VW, ZM	Feature ID: W60T1002	
Latitude: 61° 48' 30.09"	Longitude: -150° 18' 38.19"	Datum: WGS84
Logbook #: 1	Logbook Page #: 1	Picture #: P-W60T1002-veg(W)(N)
Location Description:		
NEq FT 193		
Common Species Observed (Scientific Name)		
Picea mariana		
Betula nealaskana		
Vaccinium vitis-idaea		
Rhododendrum greenlandicum		
Percent Cover of Dominant Structure Level:		
Habitat Description:		
spruce / birch forest upland		
Alaska Vegetation Classification: Level I, Level II, Level III		
I A ³ II C2		
Notes:		

Field Crew Chief:

Van Lathus

Field Scientist/Technician

Zamora

QAQC NEE

Vegetation Classification Data Form

Table 1-Alaska vegetation classification to level III

Level I	Level II	Level III
I Forest	A. Needleleaf (conifer) forest	(1) Closed needleleaf (conifer) forest (2) Open needleleaf (conifer) forest (3) Needleleaf (conifer) woodland
	B. Broadleaf forest	(1) Closed broadleaf forest (2) Open broadleaf forest (3) Broadleaf woodland
	C. Mixed forest	(1) Closed mixed forest (2) Open mixed forest (3) Mixed woodland
II Scrub	A. Dwarf tree scrub	(1) Closed dwarf tree scrub (2) Open dwarf tree scrub (3) Dwarf tree scrub woodland
	B. Tall scrub	(1) Closed tall scrub (2) Open tall scrub
	C. Low scrub	(1) Closed low scrub (2) Open low scrub
	D. Dwarf scrub	(1) Dryas dwarf scrub (2) Ericaceous dwarf scrub (3) Willow dwarf scrub
III Herbaceous	A. Graminoid herbaceous	(1) Dry graminoid herbaceous (2) Mesic graminoid herbaceous (3) Wet graminoid herbaceous (emergent)
	B. Forb herbaceous	(1) Dry forb herbaceous (2) Mesic forb herbaceous (3) Wet forb herbaceous (emergent)
	C. Bryoid herbaceous	(1) Mosses (2) Lichens
	D. Aquatic (nonemergent) herbaceous	(1) Freshwater aquatic herbaceous (2) Brackish water aquatic herbaceous (3) Marine aquatic herbaceous

Descriptions of levels I, II, III, and IV follow the classification table

1a	Trees over 3 meters (10 ft) tall are present and have a canopy cover of 10 percent or more	I Forest	2
1b	Trees over 3 meters (10 ft) tall are absent or nearly so. Less than 10 percent cover. (Dwarf trees, less than 3 meters [10 ft] tall may be present and abundant)		7
2a	Over 75 percent of tree cover contributed by needleleaf (conifer) species	IA Needleleaf forest	3
2b	Less than 75 percent of tree cover contributed by needleleaf (conifer) species		4
3a	Tree canopy of 60-100 percent cover	IA.1 Closed needleleaf forest	
3b	Tree canopy of 25-59 percent cover	IA.2 Open needleleaf forest	
3c	Tree canopy of 10-24 percent cover	IA.3 Needleleaf woodland	
4a	Over 75 percent of tree cover contributed by broadleaf species	IB Broadleaf forest	5
4b	Broadleaf or needleleaf species contribute 25 to 75 percent of the tree cover		8
5a	Tree canopy of 60-100 percent cover	IB.1 Closed broadleaf forest	
5b	Tree canopy of 25-59 percent cover	IB.2 Open broadleaf forest	
5c	Tree canopy of 10-24 percent cover	IB.3 Broadleaf woodland	
6a	Tree canopy of 60-100 percent cover	IC.1 Closed mixed forest	
6b	Tree canopy of 25-59 percent cover	IC.2 Open mixed forest	
6c	Tree canopy of 10-24 percent cover	IC.3 Mixed woodland	
7a	Vegetation with at least 25 percent cover of erect to decumbent shrubs or with at least 10 percent cover of dwarf trees (less than 3 meters [10 ft] tall)		8
7b	Vegetation herbaceous (may have up to 25 percent shrub cover)		15

II. Scrub			
8a	Vegetation with at least 10 percent cover of dwarf trees	II A Dwarf tree scrub	9
8b	Vegetation with at least 25 percent cover of shrubs and less than 10 percent cover of dwarf trees		10
9a	Dwarf tree canopy of 60-100 percent cover	II.A.1 Closed dwarf tree scrub	
9b	Dwarf tree canopy of 25-59 percent cover	II.A.2 Open dwarf tree scrub	
9c	Dwarf tree canopy of 10-24 percent cover	II.A.3 Dwarf tree scrub woodland	
10a	Shrubs more than 1.5 meters (5 ft) tall	II B Tall scrub	11
10b	Shrubs less than 1.5 meters (5 ft) tall		12
11 a	Shrub canopy cover greater than 75 percent	II B.1 Closed tall scrub	
11 b	Shrub canopy cover of 25-74 percent	II B.2 Open tall scrub	
12a	Shrubs 20 centimeters to 1.5 meters tall	II C Low scrub	13
12b	Shrubs under 20 centimeters in height	II D Dwarf scrub	14
13a	Shrub canopy cover greater than 75 percent	II C.1 Closed low scrub	
13b	Shrub canopy cover of 25-74 percent, or as low as 2 percent if little or no other vegetation cover present	II C.2 Open low scrub	
14a	Dryas species dominant in the dwarf shrub layer	II D.1 Dryas dwarf scrub	
14b	Ericaceous species dominant in the dwarf shrub layer	II D.2 Ericaceous dwarf scrub	
14c	Willow species dominant in the dwarf shrub layer	II D.2 Willow dwarf scrub	
III. Herbaceous			
15a	Terrestrial vegetation, or if growing in the water, dominated by emergent vegetation		16
15b	Dominant vegetation growing submerged in water or floating on the water surface, but not emerging above the water	III D Aquatic herbaceous	21

16a	Grasses, sedges, or rushes (graminoid) plants dominant	III A Graminoid herbaceous	17
16b	Forbs or bryophytes dominant		18
17a	Grasslands of well-drained, dry sites, such as south-facing bluffs, old beaches, and sand dunes. Typically (but not always) dominated by <i>Elymus</i> spp., <i>Festuca</i> spp., and <i>Deschampsia</i> spp.	III A.1 Dry graminoid herbaceous	
17b	On moist sites, but usually not with standing water. Usually dominated by <i>Calamagrostis</i> spp., <i>Carex</i> spp. or <i>Eriophorum</i> spp., tussocks often present	III A.2 Mesic graminoid herbaceous	
17c	On wet sites, standing water present for part of the year; dominated by either sedges or grasses; includes wet tundra, bogs, marshes, and fens	III A.3 Wet graminoid herbaceous	
18a	Vegetation dominated by forbs (broadleaf herbs, ferns, or horsetails)	III B Forb herbaceous	19
18b	Vegetation dominated by mosses or lichens	III C Bryoid herbaceous	20
19a	On dry sites, usually rocky and well drained; mostly tundra sites	III B.1 Dry forb herbaceous	
19b	On moist sites but without standing water, mostly within forested areas	III B.2 Mesic forb herbaceous	
19c	On wet sites, usually with standing water for part of the year	III B.3 Wet forb herbaceous	
20a	Vegetation cover dominated by mosses	III C.1 Bryoid moss	
20b	Vegetation cover dominated by lichens	III C.2 Bryoid lichen	
21a	Vegetation submerged or floating in fresh water	III D.1 Freshwater aquatic herbaceous	
21b	Vegetation submerged or floating in brackish water	III D.2 Brackish water aquatic herbaceous	
21c	Vegetation submerged or floating in salt water	III D.3 Marine aquatic herbaceous	

Vegetation Classification Data Form QA/QC Checklist

This form is to be completed before leaving the field site.

Feature ID: W00T1002 Field Target: 192

Date: 06-01-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. General Information

- ☒ Location data recorded?
- ☒ Photo taken and photo number recorded?

2. Location Description

- ☒ Location of site recorded with enough detail to help relocate?

3. Common Species

- ☒ Scientific name of common species recorded?
- ☒ Percent cover of dominant structure level noted?

4. Habitat Description

- ☒ Habitat described?

5. Classification

- ☒ All three levels of classification recorded?

6. Field Log Book

- ☒ Field form entries consistent with log book?
- ☒ Logbook clearly identifies the Field Target ID and Feature ID?

X Zoe Meade

Field Technician (print)

X Zoe Meade

Signature

X Valerie Winters

Field Crew Chief (print)

X Valerie Winters

Signature

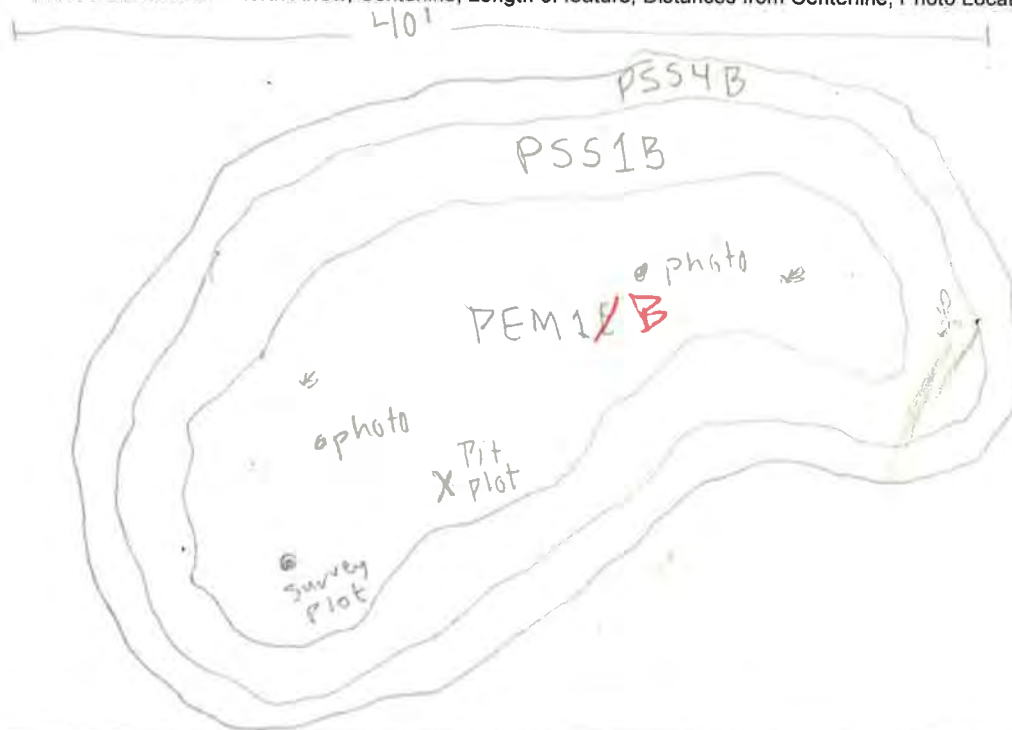
QA/QC DEK

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION				
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: <u>191</u>	Map #: <u>125</u> Map Date: <u>5/27/14</u>	
Date: <u>06-01-2014</u>	Project Name & No.: <u>Alaska LNG 26221306</u>		Feature Id: <u>W60T1003</u>	
Investigators: <u>Valerie Watkins, Zoe Meade</u>			Team No.: <u>W60</u>	
State: <u>Alaska</u>	Region: <u>Alaska</u>	Milepost: <u>700</u>		
Latitude: <u>61°49'52.50"</u>		Longitude: <u>-150.16'54.30"</u>	Datum: <u>WGS84</u>	
Logbook No.: <u>1</u>	Logbook Page No.: <u>2</u>	Picture No.: <u>P-W60T1003-N-S-pit-plot</u>		

SITE PARAMETERS	
Subregion: <u>Interior</u>	Landform (hillslope, terrace, hummocks, etc.): <u>Sm, hummocks</u>
Slope (%): <u>0-3</u>	Local relief (concave, convex, none): <u>concave</u>
Pre-mapped Alaska LNG/NWI classification: <u>PSS1B</u>	Soil Map Unit Name: _____
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	
Are "Normal Circumstances" present? Yes <input checked="" type="checkbox"/> No _____ (if no, explain in Notes.)	
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed? No <input checked="" type="checkbox"/> (If yes, explain in Notes)	
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic? No <input checked="" type="checkbox"/> (If yes, explain in Notes.)	
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: <u>PEM1B</u> PEM1 PEM1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Viereck): <u>3A3</u> 3A3 III A3

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.



WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1.				
2.				
3.				
4.				
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>				
Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <i>Betula nana</i>	3	Y	FAC	
2. <i>Vaccinium oxycoccus</i>	10	Y	OBL	
3.				
4.				
5.				
6.				
7.				
8.				
9.				
Total Cover: <u>13</u> 50% of total cover: <u>6.5</u> 20% of total cover: <u>2.6</u>				

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 4.5 (A)

Total Number of Dominant Species Across All Strata: 4.5 (B)

% Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by: _____

OBL species: 25 x 1 = 25

FACW species: 23 x 2 = 46

FAC species: 8 x 3 = 24

FACU species: 0 x 4 = 0

UPL species: 0 x 5 = 0

Column Totals: 56 (A) 95 (B)

PI = B/A = 1.7

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <i>Comarum palustre</i>	10	Y	OBL	
2. <i>Vaccinium oxycoccus</i>			OBL	
3. <i>Andromeda polifolia</i>	3	Y	FACW	
4. <i>Calamagrostis Canadensis</i>	5 5	N	FAC	
5. <i>Carex aquatilis</i>	5	N	OBL	
6. <i>Carex saxatilis</i>	20	Y	FACW	
7.				
8.				
9.				
10.				
Total Cover: <u>43</u> 50% of total cover: <u>21.5</u> 20% of total cover: <u>8.6</u>				

Hydrophytic Vegetation Indicators:

Y Dominance Test is > 50%

Y Prevalence Index is ≤ 3.0

____ Morphological Adaptations¹ (Provide supporting data in Notes)

____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground

80 % Cover of Wetland Bryophytes

80 Total Cover of Bryophytes

15 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y

Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>06-04-14</u> Feature ID <u>W6071 003</u>		Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)					
Depth (inches)	Matrix		Redox Features		Notes
	Color (moist)	%	Color (moist)	%	
0-11	—	—	—	—	Fibric Organics
11-16	—	—	—	—	Sapric/hemic Organics
16-18	10YR 3/6	—	—	—	hemic so texture organics
18-21	2.5YR 4/4	50	10YR 3/6	5	SL - silt loam
	10YR 3/2	45			SL
21-23	10YR 2/2	100			SL

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) <u>X</u>	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____	
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____	
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: N/A Depth (inches): N/A

Hydric Soil Present (Y/N): Y

Notes: 10YR 2/2 saturated organic layers

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>✓</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>0</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>1</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0</u>	

Notes: pockets of standing water present

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix	
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <u>X</u> Aquatic Bed _____			
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>0</u> Dwarf shrub (<0.5m) <u>13</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>43</u> Moss-Lichen <u>80</u> Floating <u>0</u> Submerged <u>0</u>			
Number of Wetland Types (M): <u>3</u>		Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>X</u> High Density (60-80%) _____ Very High Density (80-100%) _____			
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover <u>X</u> N/A _____			
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____			
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____			
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>			
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____			
Vegetative Interspersion (P): Low (large patches, concentric rings) <u>X</u> Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) _____			
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____			
SOIL VARIABLES			
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____			
HYDROLOGIC VARIABLES			
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____			
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____			
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial/Quaternary Soils Sediment Created _____			
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____			
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____			
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____			
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) <u>X</u> pH Reading <u>4.1</u>			
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____			
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____			
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____			
LANDSCAPE VARIABLES (M)			
Wetland Juxtaposition: Wetland Isolated <u>X</u> Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____			
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>			
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____			
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____			

Crew Chief QA/QC check:

VW

GPS Technician QA/QC check:

ZM

DEG

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60T1003

Field Target: 191

Date: 06-01-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Made

Wetland Scientist (print)

X Gormead

Signature / Date

X Valerie Watkins

Field Crew Chief (print)

X Valerie Watkins

Signature / Date

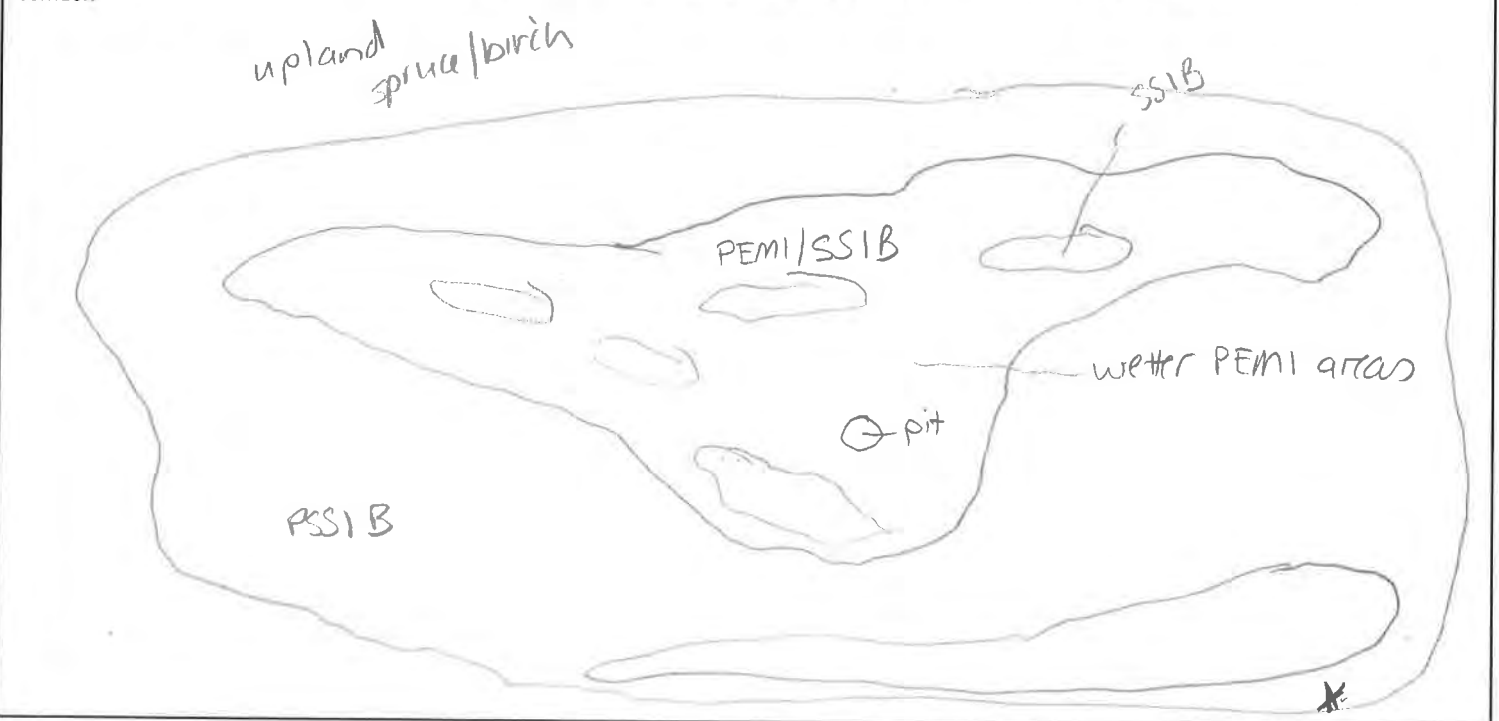
QAQC DEC

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: <u>Centerline</u> <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) <u>corridor</u>	Field Target: <u>190</u>	Map #: <u>124</u>	Map Date: <u>05 27 14</u>
Date: <u>06-02-14</u>	Project Name & No.: <u>Alaska LNG 26221306</u>	Feature Id: <u>W60T1004</u>	
Investigators: <u>Valerie Watkins, Zoe Meade</u>			Team No.: <u>W60</u>
State: <u>Alaska</u>	Region: <u>Alaska</u>	Milepost: <u>699.8</u>	
Latitude: <u>61° 50' 02.87"</u>	Longitude: <u>-150° 16' 49.43"</u>	Datum: <u>WGS84</u>	
Logbook No.: <u>1</u>	Logbook Page No.: <u>4</u>	Picture No.: <u>P-W60T1004-N-5-pit-plug</u>	

SITE PARAMETERS	
Subregion: <u>interior</u>	Landform (hillslope, terrace, hummocks, etc.): <u>small hummocks</u>
Slope (%): <u>0-3</u>	Local relief (concave, convex, none): <u>slightly concave</u>
Pre-mapped Alaska LNG/NWI classification: <u>PEMIB</u>	Soil Map Unit Name: _____
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (if no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: <u>PEMI/SSIB</u>
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Vioreck): <u>IIIA2, IIC2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.



check in survey pt.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
<u>Tree Stratum</u> (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: <u>3</u> (A) Total Number of Dominant Species Across All Strata: <u>4</u> (B) % Dominant Species that are OBL, FACW, or FAC: <u>75</u> (A/B)
1.				
2.				
3.				
4.				
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species: <u>19</u> X 1 = <u>19</u> FACW species: <u>0</u> X 2 = <u>0</u> FAC species: <u>55</u> X 3 = <u>165</u> FACU species: <u>25</u> X 4 = <u>100</u> UPL species: <u>0</u> X 5 = <u>0</u> Column Totals: <u>99</u> (A) <u>284</u> (B) PI = B/A = <u>2.87</u>
<u>Sapling/Shrub Stratum</u> (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <u>Betula neoalaskana</u>	<u>5</u>	<u>N</u>	<u>FACU</u>	
2. <u>Rhododendron groenlandicum</u>	<u>5</u>	<u>N</u>	<u>FAC</u>	
3. <u>Vaccinium oxycoccus</u>	<u>4</u>	<u>N</u>	<u>OBL</u>	
4. <u>Vaccinium uliginosum</u>	<u>15</u>	<u>Y</u>	<u>FAC</u>	
5. <u>Spiraea stevenii</u>	<u>20</u>	<u>Y</u>	<u>FACU</u>	
6.				
7.				
8.				
9.				
Total Cover: <u>49</u> 50% of total cover: <u>24.5</u> 20% of total cover: <u>9.8</u>				

VEGETATION (use scientific names of plants)				
<u>Herb Stratum</u> (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Hydrophytic Vegetation Indicators: <input checked="" type="checkbox"/> Dominance Test is > 50% <input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) <small>¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.</small>
1. <u>Calamagrostis canadensis</u>	<u>35</u>	<u>Y</u>	<u>FAC</u>	
2. <u>Carex pluri flora</u>	<u>25</u>	<u>Y</u>	<u>OBL</u>	
3.				
4.				
5.				
6.				
7.				
8.				
9.				
Total Cover: <u>60</u> 50% of total cover: <u>30</u> 20% of total cover: <u>12</u>				_____ % Bare Ground _____ % Cover of Wetland Bryophytes _____ Total Cover of Bryophytes _____ % Cover of Water Hydrophytic Vegetation Present (Y/N): <u>Y</u> Notes: (If observed, list morphological adaptations below):

unknown shrub sample taken for ID
 Identified as Spiraea stevenii

2.5 YR 2.5/1

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>06/02</u>		Feature ID <u>W00 T1 004</u>		Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix	Redox Features					
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²	Notes
0 - 10	—	—	—	—	—	—	Fibric organics
10 - 13	—	—	—	—	—	—	Sapric/Hemic organics
13 - 22	2.5Y 5/3	65	7.5YR 3/4	15	C	M	Silt loam
13 - 22	2.5YR 2.5/1	15	2.5YR 3/6	5	C	PL	Silty loam
22 - 25	10YR 2/2	100	—	—	—	—	Sandy loam

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____	
Histic Epipedon (A2) <u>X</u>	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____	
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____	
Hydrogen Sulfide (A4) <u>X</u>		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____	
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: N/A Depth (inches): N/A

Hydric Soil Present (Y/N): Y

Notes: Faint hydrogen sulfide odor at 10"

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) <u>X</u>	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: conductivity = 58	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>6 inches</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0 inches</u>	

Notes: small pockets of standing water. Saturated to surface.

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <u>X</u> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>5</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>20</u> Dwarf shrub (<0.5m) <u>24</u> Tall herb (>1m) <u>0</u> Short herb (<1m) <u>60</u> Moss-Lichen <u>15</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u>	Evenness of Wetland Type Distribution (M): Even _____ Highly Uneven _____ Moderately even <u>X</u>	
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) <u>X</u> Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water _____ <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover <u>X</u> N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open <u>X</u> Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) <u>X</u> High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microlief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) <u>X</u> pH Reading <u>4.7</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (>2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated <u>X</u> Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

W 3m

GPS Technician QA/QC check:

QAQC

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60TI004

Field Target: 190

Date: 06-02-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X *soe meade*

Wetland Scientist (print)

X

Signature / Date

X *Valerie Watkins*

Field Crew Chief (print)

X

Signature / Date

ASC

Vegetation Classification Data Form

Site Description		
Date: 6/2/14	Project Name & #: Alaska LNG 26221306	Field Target: 190
Investigators: VW, ZM		Feature ID: W60T1 005
Latitude: 61° 50' 02.66"	Longitude: -150° 16' 51.25"	Datum: WGS84
Logbook #: 1	Logbook Page #: 4	Picture #: P-W60T1005-
Location Description:		
West of W60T1004		
Common Species Observed (Scientific Name)		
Picea mariana		
Betula neodalisiana		
Salix sp.		
Vaccinium vitis-idaea		
Percent Cover of Dominant Structure Level: 80		
Habitat Description:		
spruce/birch forest		
Alaska Vegetation Classification: Level I, Level II, Level III		
ICI	ICFI	
Notes:		

Field Crew Chief:

VW

Field Scientist/Technician

ZM

Vegetation Classification Data Form

Table I-Alaska vegetation classification to level III

Level I	Level II	Level III
I. Forest	A. Needleleaf (conifer) forest	(1) Closed needleleaf (conifer) forest (2) Open needleleaf (conifer) forest (3) Needleleaf (conifer) woodland
	B. Broadleaf forest	(1) Closed broadleaf forest (2) Open broadleaf forest (3) Broadleaf woodland
	C. Mixed forest	(1) Closed mixed forest (2) Open mixed forest (3) Mixed woodland
II. Scrub	A. Dwarf tree scrub	(1) Closed dwarf tree scrub (2) Open dwarf tree scrub (3) Dwarf tree scrub woodland
	B. Tall scrub	(1) Closed tall scrub (2) Open tall scrub
	C. Low scrub	(1) Closed low scrub (2) Open low scrub
	D. Dwarf scrub	(1) Dryas dwarf scrub (2) Ericaceous dwarf scrub (3) Willow dwarf scrub
III. Herbaceous	A. Graminoid herbaceous	(1) Dry graminoid herbaceous (2) Mesic graminoid herbaceous (3) Wet graminoid herbaceous (emergent)
	B. Forb herbaceous	(1) Dry forb herbaceous (2) Mesic forb herbaceous (3) Wet forb herbaceous (emergent)
	C. Bryoid herbaceous	(1) Mosses (2) Lichens
	D. Aquatic (nonemergent) herbaceous	(1) Freshwater aquatic herbaceous (2) Brackish water aquatic herbaceous (3) Marine aquatic herbaceous

Descriptions of levels I, II, III, and IV follow the classification table

1a	Trees over 3 meters (10 ft) tall are present and have a canopy cover of 10 percent or more	I Forest	2
1b	Trees over 3 meters (10 ft) tall are absent or nearly so. Less than 10 percent cover. (Dwarf trees, less than 3 meters [10 ft] tall may be present and abundant)		7
I Forest			
2a	Over 75 percent of tree cover contributed by needleleaf (conifer) species	I A Needleleaf forest	3
2b	Less than 75 percent of tree cover contributed by needleleaf (conifer) species		4
3a	Tree canopy of 60-100 percent cover	I A 1 Closed needleleaf forest	
3b	Tree canopy of 25-59 percent cover	I A 2 Open needleleaf forest	
3c	Tree canopy of 10-24 percent cover	I A 3 Needleleaf woodland	
4a	Over 75 percent of tree cover contributed by broadleaf species	I B Broadleaf forest	5
4b	Broadleaf or needleleaf species contribute 25 to 75 percent of the tree cover		6
5a	Tree canopy of 60-100 percent cover	I B 1 Closed broadleaf forest	
5b	Tree canopy of 25-59 percent cover	I B 2 Open broadleaf forest	
5c	Tree canopy of 10-24 percent cover	I B 3 Broadleaf woodland	
6a	Tree canopy of 60-100 percent cover	I C 1 Closed mixed forest	
6b	Tree canopy of 25-59 percent cover	I C 2 Open mixed forest	
6c	Tree canopy of 10-24 percent cover	I C 3 Mixed woodland	
7a	Vegetation with at least 25 percent cover of erect to decumbent shrubs or with at least 10 percent cover of dwarf trees (less than 3 meters [10 ft] tall)		8
7b	Vegetation herbaceous (may have up to 25 percent shrub cover)		15

II. Scrub			
8a	Vegetation with at least 10 percent cover of dwarf trees	II A Dwarf tree scrub	9
8b	Vegetation with at least 25 percent cover of shrubs and less than 10 percent cover of dwarf trees		10
9a	Dwarf tree canopy of 60-100 percent cover	II A.1 Closed dwarf tree scrub	
9b	Dwarf tree canopy of 25-59 percent cover	II A.2 Open dwarf tree scrub	
9c	Dwarf tree canopy of 10-24 percent cover	II A 3 Dwarf tree scrub woodland	
10a	Shrubs more than 1.5 meters (5 ft) tall	II B Tall scrub	11
10b	Shrubs less than 1.5 meters (5 ft) tall		12
11 a	Shrub canopy cover greater than 75 percent	II B 1 Closed tall scrub	
11 b	Shrub canopy cover of 25-74 percent	II B.2 Open tall scrub	
12a	Shrubs 20 centimeters to 1.5 meters tall	II C Low scrub	13
12b	Shrubs under 20 centimeters in height	II D Dwarf scrub	14
13a	Shrub canopy cover greater than 75 percent	II C.1 Closed low scrub	
13b	Shrub canopy cover of 25-74 percent, or as low as 2 percent if little or no other vegetation cover present	II C.2 Open low scrub	
14a	Dryas species dominant in the dwarf shrub layer	II D.1 Dryas dwarf scrub	
14b	Ericaceous species dominant in the dwarf shrub layer	II D.2 Ericaceous dwarf scrub	
14c	Willow species dominant in the dwarf shrub layer	II D 2 Willow dwarf scrub	
III. Herbaceous			
15a	Terrestrial vegetation, or if growing in the water, dominated by emergent vegetation		16
15b	Dominant vegetation growing submerged in water or floating on the water surface, but not emerging above the water	III D Aquatic herbaceous	21

16a	Grasses, sedges, or rushes (graminoid) plants dominant	III A Graminoid herbaceous	17
16b	Forbs or bryophytes dominant		18
17a	Grasslands of well-drained, dry sites, such as south-facing bluffs, old beaches, and sand dunes. Typically (but not always) dominated by <i>Elymus</i> spp., <i>Festuca</i> spp., and <i>Deschampsia</i> spp.	III A 1 Dry graminoid herbaceous	
17b	On moist sites, but usually not with standing water. Usually dominated by <i>Calamagrostis</i> spp., <i>Carex</i> spp. or <i>Enophorum</i> spp. tussocks often present	III A 2 Mesic graminoid herbaceous	
17c	On wet sites, standing water present for part of the year; dominated by either sedges or grasses; includes wet tundra, bogs, marshes, and fens	III A 3 Wet graminoid herbaceous	
18a	Vegetation dominated by forbs (broadleaf herbs, ferns, or horsetails)	III B Forb herbaceous	19
18b	Vegetation dominated by mosses or lichens	III C Bryoid herbaceous	20
19a	On dry sites, usually rocky and well drained; mostly tundra sites	III B.1 Dry forb herbaceous	
19b	On moist sites but without standing water, mostly within forested areas	III B.2 Mesic forb herbaceous	
19c	On wet sites, usually with standing water for part of the year	III B 3 Wet forb herbaceous	
20a	Vegetation cover dominated by mosses	III C.1 Bryoid moss	
20b	Vegetation cover dominated by lichens	III C.2 Bryoid lichen	
21a	Vegetation submerged or floating in fresh water	III D 1 Freshwater aquatic herbaceous	
21 b	Vegetation submerged or floating in brackish water	III D 2 Brackish water aquatic herbaceous	
21c	Vegetation submerged or floating in salt water	III D 3 Marine aquatic herbaceous	

Vegetation Classification Data Form QA/QC Checklist

This form is to be completed before leaving the field site.

Feature ID: W60TI005 Field Target: V1900

Date: 06-02-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. General Information

- ☒ Location data recorded?
- ☒ Photo taken and photo number recorded?

2. Location Description

- ☒ Location of site recorded with enough detail to help relocate?

3. Common Species

- ☒ Scientific name of common species recorded?
- ☒ Percent cover of dominant structure level noted?

4. Habitat Description

- ☒ Habitat described?

5. Classification

- ☒ All three levels of classification recorded?

6. Field Log Book

- ☒ Field form entries consistent with log book?
- ☒ Logbook clearly identifies the Field Target ID and Feature ID?

X Zoe meade

Field Technician (print)

X Zoe meade

Signature

X Valente Watson

Field Crew Chief (print)

X Valente Watson

Signature

DEC

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 188	Map #: 123 Map Date: 5/27/14
Date: 06-02-14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60T1006
Investigators: Valerie Watkins, Zoe Meade			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 692.8	
Latitude: 61° 55' 31.6"		Longitude: -150.12' 06.39"	Datum: WGS84
Logbook No.: 1	Logbook Page No.: 4	Picture No.: P-W60T1006-E-W-pit-plug	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): sm. hummocks
Slope (%): 3-5	Local relief (concave, convex, none): concave; slight
Pre-mapped Alaska LNG/NWI classification: PEM1/SS1B	Soil Map Unit Name:
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (if no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: PEM1/SS1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Viereck): III A2, IIC2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

Burn area surrounding wetland stretch



WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				Dominance Test worksheet:
Tree Stratum (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1.				No. of Dominant Species that are OBL, FACW, or FAC: <u>4</u> (A)
2.				Total Number of Dominant Species Across All Strata: <u>6</u> (B)
3.				% Dominant Species that are OBL, FACW, or FAC: <u>66.7</u> (A/B)
4.				
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species: <u>20</u> X 1 = <u>20</u> FACW species: <u>10</u> X 2 = <u>20</u> FAC species: <u>55</u> X 3 = <u>165</u> FACU species: <u>10</u> X 4 = <u>40</u> UPL species: <u>0</u> X 5 = <u>0</u> Column Totals: <u>85</u> (A) <u>245</u> (B) PI = B/A = <u>2.89</u>
Sapling/Shrub Stratum (<u>26'</u>)				
	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <i>Betula nana</i>	5	Y	FAC	
2. <i>Spiraea stevenii</i>	5	Y	FACU	
3. <i>Betula neoalaskana</i>	5	Y	FACU	
4. <i>Salix pulchra</i>	10	Y	FACW	
5.				
6.				
7.				
8.				
9.				
Total Cover: <u>25</u> 50% of total cover: <u>12.5</u> 20% of total cover: <u>5</u>				

VEGETATION (use scientific names of plants)				Hydrophytic Vegetation Indicators:
Herb Stratum (<u>16'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <i>Calamagrostis Canadensis</i>	50	Y	FAC	<input checked="" type="checkbox"/> Dominance Test is > 50% <input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
2. <i>Trientalis arctica</i>	T	N	FACU	
3. <i>Carex aquatilis</i>	20	Y	OBL	
4. <i>Equisetum sylvaticum</i>	T	N	FAC	
5.				
6.				
7.				
8.				
9.				
10.				
Total Cover: <u>70</u> 50% of total cover: <u>35</u> 20% of total cover: <u>14</u>				<u>15</u> % Bare Ground <u>0</u> % Cover of Wetland Bryophytes <u>0</u> Total Cover of Bryophytes <u>0</u> % Cover of Water Hydrophytic Vegetation Present (Y/N): <u>Y</u> Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>060214</u> Feature ID <u>W0011006</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-2	—	—	—	—	—	—	Fibric	Organics
2-8	7.5YR 3/4	100	—	—	—	—	Silty loam	w/ fine roots
8-22	2.5Y 3/2	85	7.5YR 2.5/2	15	C	M	Sandy loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) <u>X</u>		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: N/A Depth (inches): N/A

Hydric Soil Present (Y/N): Y

Notes: water table is present at 11"
faint hydrogen sulfide odor at 11"

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) <u>X</u>	Salt Deposits (C5) _____	FAC-Neutral Test (D5) _____
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>11"</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>9"</u>	

Notes: saturation present at 9"

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved _____ Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent <u>X</u> Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>5</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>20</u> Dwarf shrub (<0.5m) <u>0</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>10</u> Moss-Lichen <u>0</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>1</u>		Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>X</u> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open <u>X</u> Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>X</u>		
HGM Class (P): Slope _____ Flat _____ Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric _____ Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy <u>X</u> Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) <u>X</u> Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits <u>X</u> Low Permeability Stratified Deposits _____ Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated <u>X</u> Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

VW

GPS Technician QA/QC check:

ym

940C REC

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: W60T1006

Field Target: 188

Date: 06-02-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X

Signature / Date

X Valent Watling

Field Crew Chief (print)

X

Signature / Date

DEC

Vegetation Classification Data Form

Site Description		
Date: 06-02-14	Project Name & #: Alaska LNG 26221306	Field Target: 189
Investigators: VW, ZM		Feature ID: W60T1007
Latitude: 61° 55' 25.39"	Longitude: 150° 12' 16.25"	Datum: WGS84
Logbook #: 1	Logbook Page #: 5-6	Picture #: 001-002 P-W60T1007-E-W
Location Description:		
SW of W60T1006		
Common Species Observed (Scientific Name)		
Salex pulchra	Chamerion angustifolium	
Betula neoalaskana		
Rosa acicularis		
Calamagrostis Canadensis		
Percent Cover of Dominant Structure Level: 30		
Habitat Description:		
Burned area		
Alaska Vegetation Classification: Level I, Level II, Level III		
II B 2	II C 2	III A 2
Notes:		

Field Crew Chief: VW

Field Scientist/Technician: Zumeau

222

Vegetation Classification Data Form

Table I-Alaska vegetation classification to level III

Level I	Level II	Level III
I. Forest	A. Needleleaf (conifer) forest	(1) Closed needleleaf (conifer) forest (2) Open needleleaf (conifer) forest (3) Needleleaf (conifer) woodland
	B. Broadleaf forest	(1) Closed broadleaf forest (2) Open broadleaf forest (3) Broadleaf woodland
	C. Mixed forest	(1) Closed mixed forest (2) Open mixed forest (3) Mixed woodland
II. Scrub	A. Dwarf tree scrub	(1) Closed dwarf tree scrub (2) Open dwarf tree scrub (3) Dwarf tree scrub woodland
	B. Tall scrub	(1) Closed tall scrub (2) Open tall scrub
	C. Low scrub	(1) Closed low scrub (2) Open low scrub
	D. Dwarf scrub	(1) Dryas dwarf scrub (2) Ericaceous dwarf scrub (3) Willow dwarf scrub
III. Herbaceous	A. Graminoid herbaceous	(1) Dry graminoid herbaceous (2) Mesic graminoid herbaceous (3) Wet graminoid herbaceous (emergent)
	B. Forb herbaceous	(1) Dry forb herbaceous (2) Mesic forb herbaceous (3) Wet forb herbaceous (emergent)
	C. Bryoid herbaceous	(1) Mosses (2) Lichens
	D. Aquatic (nonemergent) herbaceous	(1) Freshwater aquatic herbaceous (2) Brackish water aquatic herbaceous (3) Marine aquatic herbaceous

Descriptions of levels I, II, III, and IV follow the classification table.

1a. Trees over 3 meters (10 ft) tall are present and have a canopy cover of 10 percent or more	I. Forest	2
1b. Trees over 3 meters (10 ft) tall are absent or nearly so. Less than 10 percent cover. (Dwarf trees, less than 3 meters [10 ft] tall may be present and abundant)		7
2a. Over 75 percent of tree cover contributed by needleleaf (conifer) species	I.A Needleleaf forest	3
2b. Less than 75 percent of tree cover contributed by needleleaf (conifer) species		4
3a. Tree canopy of 60-100 percent cover	I.A.1 Closed needleleaf forest	
3b. Tree canopy of 25-59 percent cover	I.A.2 Open needleleaf forest	
3c. Tree canopy of 10-24 percent cover	I.A.3 Needleleaf woodland	
4a. Over 75 percent of tree cover contributed by broadleaf species	I.B Broadleaf forest	5
4b. Broadleaf or needleleaf species contribute 25 to 75 percent of the tree cover		6
5a. Tree canopy of 60-100 percent cover	I.B.1 Closed broadleaf forest	
5b. Tree canopy of 25-59 percent cover	I.B.2 Open broadleaf forest	
5c. Tree canopy of 10-24 percent cover	I.B.3 Broadleaf woodland	
6a. Tree canopy of 60-100 percent cover	I.C.1 Closed mixed forest	
6b. Tree canopy of 25-59 percent cover	I.C.2 Open mixed forest	
6c. Tree canopy of 10-24 percent cover	I.C.3 Mixed woodland	
7a. Vegetation with at least 25 percent cover of erect to decumbent shrubs or with at least 10 percent cover of dwarf trees (less than 3 meters [10 ft] tall)		8
7b. Vegetation herbaceous (may have up to 25 percent shrub cover)		15

II. Scrub		
8a	Vegetation with at least 10 percent cover of dwarf trees	II.A Dwarf tree scrub 9
8b	Vegetation with at least 25 percent cover of shrubs and less than 10 percent cover of dwarf trees	10
9a	Dwarf tree canopy of 60-100 percent cover	II.A.1 Closed dwarf tree scrub
9b	Dwarf tree canopy of 25-59 percent cover	II.A.2 Open dwarf tree scrub
9c	Dwarf tree canopy of 10-24 percent cover	II.A.3 Dwarf tree scrub woodland
10a	Shrubs more than 1.5 meters (5 ft) tall	II.B Tall scrub 11
10b	Shrubs less than 1.5 meters (5ft) tall	12
11a	Shrub canopy cover greater than 75 percent	II.B.1 Closed tall scrub
11b	Shrub canopy cover of 25-74 percent	II.B.2 Open tall scrub
12a	Shrubs 20 centimeters to 1.5 meters tall	II.C Low scrub 13
12b	Shrubs under 20 centimeters in height	II.D Dwarf scrub 14
13a	Shrub canopy cover greater than 75 percent	II.C.1 Closed low scrub
13b	Shrub canopy cover of 25-74 percent, or as low as 2 percent if little or no other vegetation cover present	II.C.2 Open low scrub
14a	Dryas species dominant in the dwarf shrub layer	II.D.1 Dryas dwarf scrub
14b	Ericaceous species dominant in the dwarf shrub layer	II.D.2 Ericaceous dwarf scrub
14c	Willow species dominant in the dwarf scrub layer	II.D.2 Willow dwarf scrub
III. Herbaceous		
15a	Terrestrial vegetation, or if growing in the water, dominated by emergent vegetation	16
15b	Dominant vegetation growing submerged in water or floating on the water surface, but not emerging above the water	III.D Aquatic herbaceous 21

16a. Grasses, sedges, or rushes (graminoid) plants dominant	III.A Graminoid herbaceous	17
16b. Forbs or bryophytes dominant		18
17a. Grasslands of well-drained, dry sites, such as south-facing bluffs, old beaches, and sand dunes. Typically (but not always) dominated by <i>Elymus</i> spp., <i>Festuca</i> spp., and <i>Deschampsia</i> spp.	III.A.1 Dry graminoid herbaceous	
17b. On moist sites, but usually not with standing water. Usually dominated by <i>Calamagrostis</i> spp., <i>Carex</i> spp. or <i>Enophorum</i> spp.; tussocks often present	III.A.2 Mesic graminoid herbaceous	
17c. On wet sites, standing water present for part of the year; dominated by either sedges or grasses; includes wet tundra, bogs, marshes, and fens	III.A.3 Wet graminoid herbaceous	
18a. Vegetation dominated by forbs (broadleaf herbs, ferns, or horsetails)	III.B Forb herbaceous	19
18b. Vegetation dominated by mosses or lichens	III.C Bryoid herbaceous	20
19a. On dry sites, usually rocky and well drained; mostly tundra sites	III.B.1 Dry forb herbaceous	
19b. On moist sites but without standing water, mostly within forested areas	III.B.2 Mesic forb herbaceous	
19c. On wet sites, usually with standing water for part of the year	III.B.3 Wet forb herbaceous	
20a. Vegetation cover dominated by mosses	III.C.1 Bryoid moss	
20b. Vegetation cover dominated by lichens	III.C.2 Bryoid lichen	
21a. Vegetation submerged or floating in fresh water	III.D.1 Freshwater aquatic herbaceous	
21b. Vegetation submerged or floating in brackish water	III.D.2 Brackish water aquatic herbaceous	
21c. Vegetation submerged or floating in salt water	III.D.3 Marine aquatic herbaceous	

Vegetation Classification Data Form QA/QC Checklist

This form is to be completed before leaving the field site.

Feature ID: W60T1007 Field Target: 189

Date: 06-02-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. General Information

- ☒ Location data recorded?
- ☒ Photo taken and photo number recorded?

2. Location Description

- ☒ Location of site recorded with enough detail to help relocate?

3. Common Species

- ☒ Scientific name of common species recorded?
- ☒ Percent cover of dominant structure level noted?

4. Habitat Description

- ☒ Habitat described?

5. Classification

- ☒ All three levels of classification recorded?

6. Field Log Book

- ☒ Field form entries consistent with log book?
- ☒ Logbook clearly identifies the Field Target ID and Feature ID?

X Zoe meade

Field Technician (print)

X Zoe meade

Signature

X Valerie Wootkins

Field Crew Chief (print)

X Valerie Wootkins

Signature

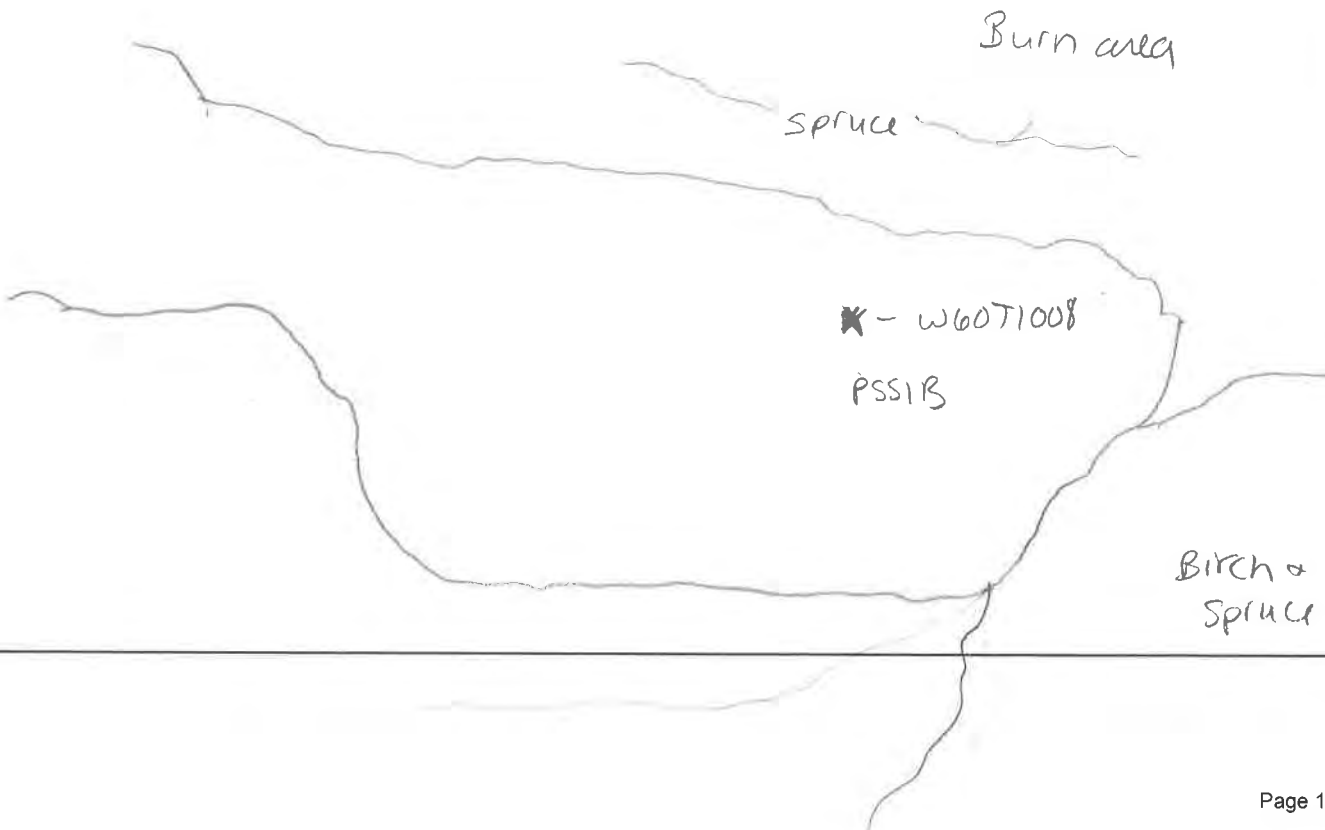
QA/QC ZEE

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 187	Map #: 122 Map Date: 5/27/14
Date: 06-03-14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60T1008
Investigators: VW, ZM			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 691.3	
Latitude: 61° 56' 45.33"		Longitude: -150° 11' 44.57"	Datum: WGS84
Logbook No.: 1	Logbook Page No.: 7	Picture No.: P-W60T1008-N-S-pH-plug	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): hummocks
Slope (%): 0-3	Local relief (concave, convex, none): Flat
Pre-mapped Alaska LNG/NWI classification: PSS 4/18	Soil Map Unit Name: _____
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (if no, explain in Notes.)
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <input checked="" type="checkbox"/> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <input checked="" type="checkbox"/> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: PSS1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Vioreck): II C 1

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.



WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)

Tree Stratum (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			

Total Cover: 0
 50% of total cover: 0 20% of total cover: 0

Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Betula nana</i>	75	Y	FAC
2. <i>Chamaedaphne calyculata</i>	8		FACW
3. <i>Rhododendrum tomentosum</i>	8		FACW
4. <i>Salix pulchra</i>	8		FACW
5. <i>Salix fuscescens</i>	8		FACW
6. <i>Vaccinium uliginosum</i>	5		FAC
7.			
8.			
9.			

Total Cover: 112
 50% of total cover: 56 20% of total cover: 22.4

Dominance Test worksheet:

No. of Dominant Species that are OBL, FACW, or FAC: 4 (A)
 Total Number of Dominant Species Across All Strata: 4 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:
 OBL species: 33 X 1 = 33
 FACW species: 32 X 2 = 64
 FAC species: 88 X 3 = 264
 FACU species: 2 X 4 = 16
 UPL species: 0 X 5 = 0
 Column Totals: 155 (A) 377 (B)
 PI = B/A = 2.43

VEGETATION (use scientific names of plants)

Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Equisetum fluviatile</i>	20	Y	OBL
2. <i>Comarum palustre</i>	8	Y	OBL
3. <i>Rubus arcticus</i>	8	Y	FAC
4. <i>Carex aquatilis</i>	5		OBL
5. <i>Chamerion angustifolium</i>	2		FACU
6.			
7.			
8.			
9.			
10.			

Total Cover: 43
 50% of total cover: 21.5 20% of total cover: 8.6

Hydrophytic Vegetation Indicators:

☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
80 % Cover of Wetland Bryophytes
80 Total Cover of Bryophytes
0 % Cover of Water

Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>06-03</u> Feature ID <u>W60TI008</u>				Soil Pit Required (Y/N) <u>Y</u>		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-20	<u> </u>	<u>—</u>	<u> </u>	<u>—</u>	<u> </u>	<u> </u>	Fibric	organics
20-22	<u> </u>	<u>—</u>	<u> </u>	<u>—</u>	<u> </u>	<u> </u>	hemic	organics

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³	
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) <u> </u>	Alaska Color Change (TA4) ⁴ <u> </u>	
Histic Epipedon (A2) <u> </u>	Alaska Redox (A14) <u> </u>	Alaska Alpine Swales (TA5) <u> </u>	
Black Histic (A3) <u> </u>	Alaska Gleyed Pores (A15) <u> </u>	Alaska Redox with 2.5Y Hue <u> </u>	
Hydrogen Sulfide (A4) <u> </u>		Alaska Gleyed without 5Y Hue or Redder Underlying Layer <u> </u>	
Thick Dark Surface (A12) <u> </u>		Other (Explain in Notes) <u> </u>	

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: Depth (inches):

Hydric Soil Present (Y/N): Y

Notes: 22 inches of saturated organics

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) <u> </u>	Water-stained Leaves (B9) <u> </u>	Stunted or Stressed Plants (D1) <u> </u>
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) <u> </u>	Drainage Patterns (B10) <u> </u>	Geomorphic Position (D2) <u> </u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) <u> </u>	Oxidized Rhizospheres along Living Roots (C3) <u> </u>	Shallow Aquitard (D3) <u> </u>
Water Marks (B1) <u> </u>	Marl Deposits (B15) <u> </u>	Presence of Reduced Iron (C4) <u> </u>	Microtopographic Relief (D4) <u> </u>
Sediment Deposits (B2) <u> </u>	Hydrogen Sulfide Odor (C1) <u> </u>	Salt Deposits (C5) <u> </u>	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) <u> </u>	Dry-Season Water Table (C2) <u> </u>	Notes: <u> </u>	
Algal Mat or Crust (B4) <u> </u>	Other (Explain in Notes): <u> </u>		
Iron Deposits (B5) <u> </u>			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>—</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0</u>	
Notes: <u> </u>		

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>90</u> Dwarf shrub (<0.5m) <u>20</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>43</u> Moss-Lichen <u>20</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>2</u>		Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) _____ High Density (60-80%) _____ Very High Density (80-100%) <u>X</u>		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover _____ N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>X</u> One or Few _____ Several to Many _____ N/A _____		
Cover Distribution of Dominant Layer (P): No Veg. _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open _____ Small Scattered Patches _____ Continuous Cover <u>X</u>		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) _____ High (small groupings, diverse and interspersed) <u>X</u>		
HGM Class (P): Slope _____ Flat <u>X</u> Lacustrine Fringe _____ Depressional _____ Riverine _____ Estuarine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol: Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet _____ Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvial Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) _____ Well Developed (6-18in.) <u>X</u> Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water <u>X</u> Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) _____ pH Reading _____	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above <u>X</u> Connected Upstream & Downstream _____ Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

WV

GPS Technician QA/QC check:

WV

QAQC
25.6

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: 187 Field Target: W60TI008 Date: 06-03-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☐ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Zoe Meade

Wetland Scientist (print)

X *Zoe Meade*

Signature / Date

X Valerie Wath

Field Crew Chief (print)

X *Valerie Wath*

Signature / Date

QAQC

NEE

Vegetation Classification Data Form

Site Description		
Date: 6/3/14	Project Name & #: Alaska LNG 26221306	Field Target: 187
Investigators: VW, ZM	Feature ID: W6071009	
Latitude: 61° 56' 48.06"	Longitude: -150° 11' 42.66"	Datum: WGS84
Logbook #: 1	Logbook Page #: 8	Picture #: P-W6071009-N-S
Location Description:		
north of W6071008 on centurion		
Common Species Observed (Scientific Name)		
Betula neoalaskana	Equisetum sylvaticum	
Rosa acicularis		
Salix pulchra		
Chamaenerion angustifolium		
Percent Cover of Dominant Structure Level: 30		
Habitat Description:		
burned upland area		
Alaska Vegetation Classification: Level I, Level II, Level III		
II B2	II C2	
Notes:		

Field Crew Chief: W

Field Scientist/Technician: ZM

2AGC
WCE

Vegetation Classification Data Form

Table I-Alaska vegetation classification to level III

Level I	Level II	Level III
I. Forest	A. Needleleaf (conifer) forest	(1) Closed needleleaf (conifer) forest (2) Open needleleaf (conifer) forest (3) Needleleaf (conifer) woodland
	B. Broadleaf forest	(1) Closed broadleaf forest (2) Open broadleaf forest (3) Broadleaf woodland
	C. Mixed forest	(1) Closed mixed forest (2) Open mixed forest (3) Mixed woodland
II. Scrub	A. Dwarf tree scrub	(1) Closed dwarf tree scrub (2) Open dwarf tree scrub (3) Dwarf tree scrub woodland
	B. Tall scrub	(1) Closed tall scrub (2) Open tall scrub
	C. Low scrub	(1) Closed low scrub (2) Open low scrub
	D. Dwarf scrub	(1) Dryas dwarf scrub (2) Ericaceous dwarf scrub (3) Willow dwarf scrub
III. Herbaceous	A. Graminoid herbaceous	(1) Dry graminoid herbaceous (2) Mesic graminoid herbaceous (3) Wet graminoid herbaceous (emergent)
	B. Forb herbaceous	(1) Dry forb herbaceous (2) Mesic forb herbaceous (3) Wet forb herbaceous (emergent)
	C. Bryoid herbaceous	(1) Mosses (2) Lichens
	D. Aquatic (nonemergent) herbaceous	(1) Freshwater aquatic herbaceous (2) Brackish water aquatic herbaceous (3) Marine aquatic herbaceous

Descriptions of levels I, II, III, and IV follow the classification table.

1a	Trees over 3 meters (10 ft) tall are present and have a canopy cover of 10 percent or more	I Forest	2
1b	Trees over 3 meters (10 ft) tall are absent or nearly so. Less than 10 percent cover. (Dwarf trees, less than 3 meters (10 ft) tall may be present and abundant)		7
I Forest			
2a	Over 75 percent of tree cover contributed by needleleaf (conifer) species	IA Needleleaf forest	3
2b	Less than 75 percent of tree cover contributed by needleleaf (conifer) species		4
3a	Tree canopy of 60-100 percent cover	IA.1 Closed needleleaf forest	
3b	Tree canopy of 25-59 percent cover	IA.2 Open needleleaf forest	
3c	Tree canopy of 10-24 percent cover	IA.3 Needleleaf woodland	
4a	Over 75 percent of tree cover contributed by broadleaf species	IB Broadleaf forest	5
4b	Broadleaf or needleleaf species contribute 25 to 75 percent of the tree cover		8
5a	Tree canopy of 60-100 percent cover	IB.1 Closed broadleaf forest	
5b	Tree canopy of 25-59 percent cover	IB.2 Open broadleaf forest	
5c	Tree canopy of 10-24 percent cover	IB.3 Broadleaf woodland	
6a	Tree canopy of 60-100 percent cover	IC.1 Closed mixed forest	
6b	Tree canopy of 25-59 percent cover	IC.2 Open mixed forest	
6c	Tree canopy of 10-24 percent cover	IC.3 Mixed woodland	
7a	Vegetation with at least 25 percent cover of erect to decumbent shrubs or with at least 10 percent cover of dwarf trees (less than 3 meters (10 ft) tall)		8
7b	Vegetation herbaceous (may have up to 25 percent shrub cover)		15

II. Scrub			
8a	Vegetation with at least 10 percent cover of dwarf trees	II.A Dwarf tree scrub	9
8b	Vegetation with at least 25 percent cover of shrubs and less than 10 percent cover of dwarf trees		10
9a	Dwarf tree canopy of 60-100 percent cover	II.A.1 Closed dwarf tree scrub	
9b	Dwarf tree canopy of 25-59 percent cover	II.A.2 Open dwarf tree scrub	
9c	Dwarf tree canopy of 10-24 percent cover	II.A.3 Dwarf tree scrub woodland	
10a	Shrubs more than 1.5 meters (5 ft) tall	II.B Tall scrub	11
10b	Shrubs less than 1.5 meters (5 ft) tall		12
11a	Shrub canopy cover greater than 75 percent	II.B.1 Closed tall scrub	
11b	Shrub canopy cover of 25-74 percent	II.B.2 Open tall scrub	
12a	Shrubs 20 centimeters to 1.5 meters tall	II.C Low scrub	13
12b	Shrubs under 20 centimeters in height	II.D Dwarf scrub	14
13a	Shrub canopy cover greater than 75 percent	II.C.1 Closed low scrub	
13b	Shrub canopy cover of 25-74 percent, or as low as 2 percent if little or no other vegetation cover present	II.C.2 Open low scrub	
14a	Dryas species dominant in the dwarf shrub layer	II.D.1 Dryas dwarf scrub	
14b	Ericaceous species dominant in the dwarf shrub layer	II.D.2 Ericaceous dwarf scrub	
14c	Willow species dominant in the dwarf shrub layer	II.D.2 Willow dwarf scrub	
III. Herbaceous			
15a	Terrestrial vegetation, or if growing in the water, dominated by emergent vegetation		15
15b	Dominant vegetation growing submerged in water or floating on the water surface, but not emerging above the water	III.D Aquatic herbaceous	21

16a	Grasses, sedges, or rushes (graminoid) plants dominant	III.A Graminoid herbaceous	17
16b	Forbs or bryophytes dominant		18
17a	Grasslands of well-drained, dry sites, such as south-facing bluffs, old beaches, and sand dunes. Typically (but not always) dominated by <i>Elymus</i> spp., <i>Festuca</i> spp., and <i>Deschampsia</i> spp.	III.A.1 Dry graminoid herbaceous	
17b	On moist sites, but usually not with standing water. Usually dominated by <i>Calamagrostis</i> spp., <i>Carex</i> spp. or <i>Eriophorum</i> spp.; tussocks often present	III.A.2 Mesic graminoid herbaceous	
17c	On wet sites, standing water present for part of the year; dominated by either sedges or grasses; includes wet tundra, bogs, marshes, and fens	III.A.3 Wet graminoid herbaceous	
18a	Vegetation dominated by forbs (broadleaf herbs, ferns, or horsetails)	III.B Forb herbaceous	19
18b	Vegetation dominated by mosses or lichens	III.C Bryoid herbaceous	20
19a	On dry sites, usually rocky and well drained; mostly tundra sites	III.B.1 Dry forb herbaceous	
19b	On moist sites but without standing water, mostly within forested areas	III.B.2 Mesic forb herbaceous	
19c	On wet sites, usually with standing water for part of the year	III.B.3 Wet forb herbaceous	
20a	Vegetation cover dominated by mosses	III.C.1 Bryoid moss	
20b	Vegetation cover dominated by lichens	III.C.2 Bryoid lichen	
21a	Vegetation submerged or floating in fresh water	III.D.1 Freshwater aquatic herbaceous	
21b	Vegetation submerged or floating in brackish water	III.D.2 Brackish water aquatic herbaceous	
21c	Vegetation submerged or floating in salt water	III.D.3 Marine aquatic herbaceous	

Vegetation Classification Data Form QA/QC Checklist

This form is to be completed before leaving the field site.

Feature ID: W60T1009 Field Target: 187 Date: 6/3/14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. General Information

- ☒ Location data recorded?
- ☒ Photo taken and photo number recorded?

2. Location Description

- ☒ Location of site recorded with enough detail to help relocate?

3. Common Species

- ☒ Scientific name of common species recorded?
- ☒ Percent cover of dominant structure level noted?

4. Habitat Description

- ☒ Habitat described?

5. Classification

- ☒ All three levels of classification recorded?

6. Field Log Book

- ☒ Field form entries consistent with log book?
- ☒ Logbook clearly identifies the Field Target ID and Feature ID?

X Col Meade

Field Technician (print)

X Col Meade

Signature

X Valerie Watkins

Field Crew Chief (print)

X Valerie Watkins

Signature

QAQC
DEC

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline <input checked="" type="checkbox"/> Access Road (explain) _____ Other (explain) _____		Field Target: 186	Map #: 121 Map Date: 5/27
Date: 06-03-14	Project Name & No.: Alaska LNG 26221306		Feature Id: W60T1010
Investigators: VW, Zm			Team No.: W60
State: Alaska	Region: Alaska	Milepost: 691.1	
Latitude: 61° 56' 56.21"		Longitude: -150° 11' 37.74"	Datum: WGS84
Logbook No.: 1	Logbook Page No.: 8	Picture No.: P-W60T1010-N-S-pt-plug	

SITE PARAMETERS	
Subregion: interior	Landform (hillslope, terrace, hummocks, etc.): slight hummocks
Slope (%): 0-3	Local relief (concave, convex, none): slightly concave
Pre-mapped Alaska LNG/NWI classification: PEM1Bc	Soil Map Unit Name: -
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No _____ (if no explain in Notes)	
Are "Normal Circumstances" present: Yes <input checked="" type="checkbox"/> No _____ (If no, explain in Notes.)	
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed? No <input checked="" type="checkbox"/> (If yes, explain in Notes)	
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic? No <input checked="" type="checkbox"/> (If yes, explain in Notes.)	
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____	Wetland Type: PSS1/EM1B
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Alaska Vegetation Classification (Viereck): IIC2, IIIA2

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

The sketch shows a river on the left side. A vertical line represents the centerline, with a north arrow pointing upwards. To the right of the centerline, there are several areas labeled: 'upland' at the top, 'PSS4B' in the upper right, 'W60T1010 PSS1/EM1B' in the center, 'PEM1B' in the lower right, and 'upland burned area' at the bottom. The classification 'IIC2, IIIA2' is written at the bottom right.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)			
Tree Stratum (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1.			
2.			
3.			
4.			
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>			
Sapling/Shrub Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Betula nana</i>	65	Y	FAC
2. <i>Chamaedaphne calyculata</i>	20	Y	FACW
3. <i>Andromeda polifolia</i>	10		FACU
4.			
5.			
6.			
7.			
8.			
9.			
Total Cover: <u>95</u> 50% of total cover: <u>47.5</u> 20% of total cover: <u>19</u>			

Dominance Test worksheet:
 No. of Dominant Species that are OBL, FACW, or FAC: 4 (A)
 Total Number of Dominant Species Across All Strata: 4 (B)
 % Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species: 68 X 1 = 68
 FACW species: 30 X 2 = 60
 FAC species: 65 X 3 = 195
 FACU species: 0 X 4 = 0
 UPL species: 0 X 5 = 0
 Column Totals: 163 (A) 323 (B)
 PI = B/A = 1.98

VEGETATION (use scientific names of plants)			
Herb Stratum (<u>20'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status
1. <i>Andromeda polifolia</i>			
2. <i>Equisetum fluviale</i>	20	Y	OBL
3. <i>Comarum palustre</i>	3		OBL
4. <i>Menyanthes trifoliata</i>	5		OBL
5. <i>Carex aquatilis</i>	40	Y	OBL
6.			
7.			
8.			
9.			
10.			
Total Cover: <u>68</u> 50% of total cover: <u>34</u> 20% of total cover: <u>13.6</u>			

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 _____ Morphological Adaptations¹ (Provide supporting data in Notes)
 _____ Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

0 % Bare Ground
80 % Cover of Wetland Bryophytes
80 Total Cover of Bryophytes
8 % Cover of Water
Hydrophytic Vegetation Present (Y/N): Y
 Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

conductivity 25 μ m

SOIL		Date <u>6/3/14</u> Feature ID <u>656071010</u>				Soil Pit Required (Y/N) _____		
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-11							Fibric	organics
11-22							Fibric hemic	organics

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) <u>X</u>	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer _____
Thick Dark Surface (A12) _____		Other (Explain in Notes) _____

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric Soil Present (Y/N): Y

Notes: Saturated to surface could not dig deeper due to roots and water in pit.

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) <u>X</u>	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) <u>X</u>	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) <u>X</u>
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes: _____	
Algal Mat or Crust (B4) _____	Other (Explain in Notes): _____		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>Y</u>	Depth (in): <u>0</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>0</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>0</u>	

Notes: water table 0" Pockets of standing water up to 5 inches deep.

WETLAND DETERMINATION DATA FORM

VEGETATION VARIABLES		P= Plot, M= Matrix
Primary Vegetation Type (P): Vegetation Lacking _____ Forested-Deciduous-Needle-leaved _____ Forested-Deciduous-Broad-leaved _____ Forested-Evergreen-Needle-leaved _____ Scrub Shrub-Deciduous-Needle-leaved _____ Scrub Shrub-Deciduous-Broad-leaved <u>X</u> Scrub Shrub-Evergreen-Broad-leaved _____ Scrub Shrub-Evergreen-Needle-leaved _____ Emergent-Non-persistent _____ Emergent-Persistent _____ Aquatic Bed _____		
Percent Cover (P): Tree (>5 dbh, >6m tall) <u>0</u> Sapling (<5 dbh, <6m tall) <u>0</u> Tall shrub (2-6m) <u>0</u> Short shrub (0.5-2m) <u>65</u> Dwarf shrub (<0.5m) <u>30</u> Tall herb (≥1m) <u>0</u> Short herb (<1m) <u>10</u> Moss-Lichen <u>80</u> Floating <u>0</u> Submerged <u>0</u>		
Number of Wetland Types (M): <u>3</u> Evenness of Wetland Type Distribution (M): Even <u>X</u> Highly Uneven _____ Moderately even _____		
Vegetation Density/Dominance (P): Sparse (0-20%) _____ Low Density (20-40%) _____ Medium Density (40-60%) <u>X</u> High Density (60-80%) _____ Very High Density (80-100%) _____		
Interspersion of Cover & Open Water (P): 100% Cover or Open Water <u>X</u> <u>W</u> <25% Scattered/Peripheral Cover _____ 26-75% Scattered or Peripheral Cover _____ >75% Scattered or Peripheral Cover <u>X</u> N/A _____		
Plant Species Diversity (P): Low (< 5 plant species) _____ Medium (5-25 species) <u>X</u> High (>25) _____		
Presence of Islands (M): Absent (none) <u>/</u> One or Few _____ Several to Many _____ N/A <u>X</u>		
Cover Distribution of Dominant Layer (P): No Veg _____ Solitary, Scattered Stems _____ 1 or More Large Patches; Parts of Site Open <u>X</u> Small Scattered Patches _____ Continuous Cover _____		
Dead Woody Material (P): Low Abundance (0-25% of surface) <u>X</u> Moderately Abundant (25-50% of surface) _____ Abundant (>50% of surface) _____		
Vegetative Interspersion (P): Low (large patches, concentric rings) _____ Moderate (broken irregular rings) <u>X</u> High (small groupings, diverse and interspersed) _____		
HGM Class (P): Slope _____ Flat <u>X</u> <u>W</u> Lacustrine Fringe _____ Depressional <u>X</u> Riverine _____ Estaurine Fringe _____		

SOIL VARIABLES	
Soil Factors (P): Soil Lacking _____ Histosol:Fibric <u>X</u> Histosol:Hemic _____ Histosol:Sapric _____ Mineral: Gravelly _____ Mineral: Sandy _____ Mineral: Silty _____ Mineral: Clayey _____	

HYDROLOGIC VARIABLES	
Inlet/Outlet Class (P): No Inlet/Outlet <u>X</u> <u>W</u> No Inlet/Intermittent Outlet _____ No Inlet/Perennial Outlet _____ Intermittent Inlet/No Outlet <u>X</u> Intermittent Inlet/Intermittent Outlet _____ Intermittent Inlet/Perennial Outlet _____ Perennial Inlet/No Outlet _____ Perennial Inlet/Intermittent Outlet _____ Perennial Inlet/Perennial Outlet _____	
Wetland Water Regime (P): Drier: Seasonally Flooded, Temporarily Flooded, Saturated <u>X</u> Wet: Perm. Flooded, Intermittently Exposed, Semiperm. Flooded _____	
Evidence of Sedimentation (P): No Evidence Observed <u>X</u> Sediment Observed on Wetland Substrate _____ Fluvaquent Soils Sediment Created _____	
Microrelief of Wetland Surface (P): Absent _____ Poorly Developed (6in.) <u>X</u> Well Developed (6-18in.) _____ Pronounced (>18in.) _____	
Frequency of Overbank Flooding (P): No Overbank Flooding <u>X</u> Return Interval 1-2 yrs _____ Return Interval 2-5 yrs _____ Return Interval >5 yrs _____	
Degree of Outlet Restriction (P): No Outflow <u>X</u> Restricted Outflow _____ Unrestricted Outflow _____	
Water pH (P): No surface water _____ Circumneutral (5.5-7.4) _____ Alkaline (>7.4) _____ Acid (<5.5) <u>X</u> pH Reading <u>4.40</u>	
Surficial Glacial Deposit Under Wetland (P): High Permeability Stratified Deposits _____ Low Permeability Stratified Deposits <u>X</u> Glacial Till/Not Permeable _____	
Basin Topographic Gradient (M): Low Gradient (<2%) <u>X</u> High Gradient (≥2%) _____	
Evidence of Seeps and Springs (P): No Seeps or Springs <u>X</u> Seeps Observed _____ Intermittent Spring _____ Perennial Spring _____	

LANDSCAPE VARIABLES (M)	
Wetland Juxtaposition: Wetland Isolated _____ Wetlands within 400m, Not Connected _____ Only Connected Below _____ Only Connected Above _____ Connected Upstream & Downstream <u>X</u> Unknown _____	
Wetland Land Use: High Intensity (i.e., ag.) _____ Moderate Intensity (i.e., forestry) _____ Low Intensity (i.e. open space) <u>X</u>	
Watershed Land Use: 0-5% Rural <u>X</u> 5-25% Urbanized _____ 25-50% Urbanized _____ >50% Urbanized _____	
Size: Small (<10 acres) <u>X</u> Medium (10-100 acres) _____ Large (>100 acres) _____	

Crew Chief QA/QC check:

W

GPS Technician QA/QC check:

3m

QAQC

Wetland Determination Form QA/QC Checklist

This form to be completed before leaving the field site.

Feature ID: WGOTI010

Field Target: 180

Date: 06-03-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. Site Description

- ☒ Site description, site parameters and summary of findings are complete?
- ☒ A detailed site sketch is included in logbook?

2. Vegetation

- ☒ At least 80% of onsite vegetation has been keyed to species, or collected for later identification?
- ☒ Vegetation names are entered legibly for all strata present?
- ☒ Cover calculations are complete and correct?
- ☒ All dominant species have been determined and recorded per strata?
- ☒ Indicator status is correct for each species?
- ☒ Dominance Test and Prevalence Index have been completed?

3. Soil

- ☒ Soil profile is complete?
- ☒ Appropriate hydric soil indicators are marked?

4. Hydrology

- ☒ Appropriate hydrology indicators are marked?
- ☒ Surface water, water table, and saturation depths are recorded if present?

5. Functions and Values

- ☒ Vegetation, soil, hydrologic variables, and landscape variables complete if site is a wetland?

6. Field Logbook

- ☒ Notes have been recorded at each site, including general description, sketch, and accuracy of pre-mapped wetland boundary as appropriate?
- ☒ Each logbook page is initialed and dated?

7. Maps

- ☒ Wetland boundaries have been corrected if necessary?
- ☒ Maps are initialed and dated?

8. Photos

- ☒ Four photos were taken for each Wetland Determination Data Form (2 vegetation, 1 soil pit, 1 soil plug)?
- ☒ Two photos were taken for each Observation Point (vegetation/site overview)?

X Joe Meade

Wetland Scientist (print)

X Joe Meade

Signature / Date

X Valerie Watkins

Field Crew Chief (print)

X Valerie Watkins

Signature / Date

PAQC
DEC

Vegetation Classification Data Form

Site Description		
Date: 4/3/14	Project Name & #: Alaska LNG 26221306	Field Target: 186
Investigators: VW, ZM	Feature ID: W60T1011	
Latitude: 61°56'53.37	Longitude: -150°11'39.56"	Datum: WGS84
Logbook #: 1	Logbook Page #: 9	Picture #: P-W60T1011-
Location Description:		
South of W60T1010		
Common Species Observed (Scientific Name)		
Betula neoalaskana	Equisetum sylvaticum	
Rhododendrum tomentosum		
Betula nana		
Vaccinium vitis-idaea		
Percent Cover of Dominant Structure Level: 40		
Habitat Description:		
Burned upland area - previous spruce / birch forest		
Alaska Vegetation Classification: Level I, Level II, Level III		
II B2	II C2	
Notes:		

Field Crew Chief: VW

Field Scientist/Technician: ZM

QAQC
2/22

Vegetation Classification Data Form

Table I-Alaska vegetation classification to level III

Level I	Level II	Level III
I Forest	A. Needleleaf (conifer) forest	(1) Closed needleleaf (conifer) forest (2) Open needleleaf (conifer) forest (3) Needleleaf (conifer) woodland
	B. Broadleaf forest	(1) Closed broadleaf forest (2) Open broadleaf forest (3) Broadleaf woodland
	C. Mixed forest	(1) Closed mixed forest (2) Open mixed forest (3) Mixed woodland
II Scrub	A. Dwarf tree scrub	(1) Closed dwarf tree scrub (2) Open dwarf tree scrub (3) Dwarf tree scrub woodland
	B. Tall scrub	(1) Closed tall scrub (2) Open tall scrub
	C. Low scrub	(1) Closed low scrub (2) Open low scrub
	D. Dwarf scrub	(1) Dryas dwarf scrub (2) Ericaceous dwarf scrub (3) Willow dwarf scrub
III Herbaceous	A. Graminoid herbaceous	(1) Dry graminoid herbaceous (2) Mesic graminoid herbaceous (3) Wet graminoid herbaceous (emergent)
	B. Forb herbaceous	(1) Dry forb herbaceous (2) Mesic forb herbaceous (3) Wet forb herbaceous (emergent)
	C. Bryoid herbaceous	(1) Mosses (2) Lichens
	D. Aquatic (nonemergent) herbaceous	(1) Freshwater aquatic herbaceous (2) Brackish water aquatic herbaceous (3) Marine aquatic herbaceous

Descriptions of levels I, II, III, and IV follow the classification table.

1a	Trees over 3 meters (10 ft) tall are present and have a canopy cover of 10 percent or more	I Forest	2
1b	Trees over 3 meters (10 ft) tall are absent or nearly so. Less than 10 percent cover. (Dwarf trees, less than 3 meters [10 ft] tall may be present and abundant)		7
2a	Over 75 percent of tree cover contributed by needleleaf (conifer) species	I A Needleleaf forest	3
2b	Less than 75 percent of tree cover contributed by needleleaf (conifer) species		4
3a	Tree canopy of 60-100 percent cover	I A.1 Closed needleleaf forest	
3b	Tree canopy of 25-59 percent cover	I A.2 Open needleleaf forest	
3c	Tree canopy of 10-24 percent cover	I A.3 Needleleaf woodland	
4a	Over 75 percent of tree cover contributed by broadleaf species	I B Broadleaf forest	5
4b	Broadleaf or needleleaf species contribute 25 to 75 percent of the tree cover		6
5a	Tree canopy of 60-100 percent cover	I B.1 Closed broadleaf forest	
5b	Tree canopy of 25-59 percent cover	I B.2 Open broadleaf forest	
5c	Tree canopy of 10-24 percent cover	I B.3 Broadleaf woodland	
6a	Tree canopy of 60-100 percent cover	I C.1 Closed mixed forest	
6b	Tree canopy of 25-59 percent cover	I C.2 Open mixed forest	
6c	Tree canopy of 10-24 percent cover	I C.3 Mixed woodland	
7a	Vegetation with at least 25 percent cover of erect to decumbent shrubs or with at least 10 percent cover of dwarf trees (less than 3 meters [10 ft] tall)		8
7b	Vegetation herbaceous (may have up to 25 percent shrub cover)		15

II. Scrub			
8a	Vegetation with at least 10 percent cover of dwarf trees	II A Dwarf tree scrub	9
8b	Vegetation with at least 25 percent cover of shrubs and less than 10 percent cover of dwarf trees		10
9a	Dwarf tree canopy of 60-100 percent cover	II.A.1 Closed dwarf tree scrub	
9b	Dwarf tree canopy of 25-59 percent cover	II.A.2 Open dwarf tree scrub	
9c	Dwarf tree canopy of 10-24 percent cover	II A.3 Dwarf tree scrub woodland	
10a	Shrubs more than 1.5 meters (5 ft) tall	II B Tall scrub	11
10b	Shrubs less than 1.5 meters (5ft) tall		12
11 a	Shrub canopy cover greater than 75 percent	II B.1 Closed tall scrub	
11 b	Shrub canopy cover of 25-74 percent	II B.2 Open tall scrub	
12a	Shrubs 20 centimeters to 1.5 meters tall	II.C Low scrub	13
12b	Shrubs under 20 centimeters in height	II D Dwarf scrub	14
13a	Shrub canopy cover greater than 75 percent	II C.1 Closed low scrub	
13b	Shrub canopy cover of 25-74 percent, or as low as 2 percent if little or no other vegetation cover present	II.C.2 Open low scrub	
14a	Dryas species dominant in the dwarf shrub layer	II D.1 Dryas dwarf scrub	
14b	Ericaceous species dominant in the dwarf shrub layer	II D.2 Ericaceous dwarf scrub	
14c	Willow species dominant in the dwarf scrub layer	II D.2 Willow dwarf scrub	
III. Herbaceous			
15a	Terrestrial vegetation, or if growing in the water, dominated by emergent vegetation		16
15b	Dominant vegetation growing submerged in water or floating on the water surface, but not emerging above the water	III D Aquatic herbaceous	21

16a	Grasses, sedges, or rushes (graminoid) plants dominant	III A Graminoid herbaceous	17
16b	Forbs or bryophytes dominant		18
17a	Grasslands of well-drained, dry sites, such as south-facing bluffs, old beaches, and sand dunes. Typically (but not always) dominated by <i>Elymus</i> spp., <i>Festuca</i> spp., and <i>Deschampsia</i> spp.	III A.1 Dry graminoid herbaceous	
17b	On moist sites, but usually not with standing water. Usually dominated by <i>Calamagrostis</i> spp., <i>Carex</i> spp. or <i>Eriophorum</i> spp., tussocks often present	III A.2 Mesic graminoid herbaceous	
17c	On wet sites, standing water present for part of the year; dominated by either sedges or grasses; includes wet tundra bogs, marshes, and fens	III A.3 Wet graminoid herbaceous	
18a	Vegetation dominated by forbs (broadleaf herbs, ferns, or horsetails)	III B Forb herbaceous	19
18b	Vegetation dominated by mosses or lichens	III C Bryoid herbaceous	20
19a	On dry sites, usually rocky and well drained, mostly tundra sites	III B.1 Dry forb herbaceous	
19b	On moist sites but without standing water, mostly within forested areas	III B.2 Mesic forb herbaceous	
19c	On wet sites, usually with standing water for part of the year	III B.3 Wet forb herbaceous	
20a	Vegetation cover dominated by mosses	III C.1 Bryoid moss	
20b	Vegetation cover dominated by lichens	III C.2 Bryoid lichen	
21a	Vegetation submerged or floating in fresh water	III D.1 Freshwater aquatic herbaceous	
21b	Vegetation submerged or floating in brackish water	III D.2 Brackish water aquatic herbaceous	
21c	Vegetation submerged or floating in salt water	III D.3 Marine aquatic herbaceous	

Vegetation Classification Data Form QA/QC Checklist

This form is to be completed before leaving the field site.

W6071011 *uv*
Feature ID: W6071011 Field Target: 186 Date: 06-03-14

For all items not checked, please provide detailed explanation in the notes section of data form.

1. General Information

- ☒ Location data recorded?
- ☒ Photo taken and photo number recorded?

2. Location Description

- ☒ Location of site recorded with enough detail to help relocate?

3. Common Species

- ☒ Scientific name of common species recorded?
- ☒ Percent cover of dominant structure level noted?

4. Habitat Description

- ☒ Habitat described?

5. Classification

- ☒ All three levels of classification recorded?

6. Field Log Book

- ☒ Field form entries consistent with log book?
- ☒ Logbook clearly identifies the Field Target ID and Feature ID?

X *Joe Meade*

Field Technician (print)

X *Joe Meade*

Signature

X *Valent Watkins*

Field Crew Chief (print)

X *Valent Watkins*

Signature

QAQC
WEE

WETLAND DETERMINATION DATA FORM

SITE DESCRIPTION			
Survey Type: Centerline W Access Road (explain) _____ Other (explain) <u>common</u>		Field Target: <u>185</u>	Map #: <u>120</u> Map Date: <u>5/27/14</u>
Date: <u>06-03-14</u>	Project Name & No.: <u>Alaska LNG 26221306</u>		Feature Id: <u>W60TI 012</u>
Investigators: <u>Valerie Watkins, Zoe Meade</u>			Team No.: <u>W60 1011</u>
State: <u>Alaska</u>	Region: <u>Alaska</u>	Milepost: <u>CAO.7</u>	
Latitude: <u>61° 57' 19.13"</u>		Longitude: <u>-150° 11' 28.21"</u>	Datum: <u>WGS84</u>
Logbook No.: <u>1</u>	Logbook Page No.: <u>9</u>	Picture No.: <u>P-W60TI012-F-W-PA-plug</u>	

SITE PARAMETERS	
Subregion: <u>interior</u>	Landform (hillslope, terrace, hummocks, etc.): <u>hummocks</u>
Slope (%): <u>0-3</u>	Local relief (concave, convex, none): <u>none</u>
Pre-mapped Alaska LNG/NWI classification: <u>PSS1B</u>	Soil Map Unit Name: _____
Are climatic/hydrologic conditions on the site typical for this time of year? Yes <u>X</u> No _____ (if no explain in Notes)	
Are "Normal Circumstances" present: Yes <u>X</u> No _____ (if no, explain in Notes.)	
Are Vegetation _____, Soil _____, or Hydrology _____ Significantly Disturbed?	No <u>X</u> (If yes, explain in Notes)
Are Vegetation _____, Soil _____, or Hydrology _____ Naturally Problematic?	No <u>X</u> (If yes, explain in Notes.)
SUMMARY OF FINDINGS	
Hydrophytic Vegetation Present? Yes <u>✓</u> No _____	Is the Sampled Area within a Wetland? Yes _____ No <u>✓</u>
Hydric Soil Present? Yes _____ No <u>✓</u>	Wetland Type: <u>upland</u>
Wetland Hydrology Present? Yes <u>✓</u> No _____	Alaska Vegetation Classification (Viereck): <u>IIc2</u>

Notes and Site Sketch: Please include Directional & North Arrow, Centerline, Length of feature, Distances from Centerline, Photo Locations, and Survey corridor.

WETLAND DETERMINATION DATA FORM

VEGETATION (use scientific names of plants)				
Tree Stratum (Plot sizes: _____)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Dominance Test worksheet: No. of Dominant Species that are OBL, FACW, or FAC: <u>3</u> (A) Total Number of Dominant Species Across All Strata: <u>34</u> (B) % Dominant Species that are OBL, FACW, or FAC: <u>100</u> (A/B) <u>75</u>
1.				
2.				
3.				
4.				
Total Cover: <u>0</u> 50% of total cover: <u>0</u> 20% of total cover: <u>0</u>				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: OBL species: <u>2</u> X 1 = <u>2</u> FACW species: <u>30</u> X 2 = <u>60</u> FAC species: <u>40</u> X 3 = <u>120</u> FACU species: <u>10</u> X 4 = <u>40</u> UPL species: <u>0</u> X 5 = <u>0</u> Column Totals: <u>72</u> (A) <u>222</u> (B) PI = B/A = <u>3.1</u>
Sapling/Shrub Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	
1. <i>Salix pulchra</i>	30	Y	FACW	
2. <i>Betula nana</i>	5	Y	FAC	
3. <i>Betula neoalaskana</i>	10	Y	FACU	
4. <i>Vaccinium uliginosum</i>	2		FAC	
5.				
6.				
7.				
8.				
9.				
Total Cover: <u>47</u> 50% of total cover: <u>23.5</u> 20% of total cover: <u>9.4</u>				

VEGETATION (use scientific names of plants)				
Herb Stratum (<u>26'</u>)	Absolute % Cover	Dominant Species? (Y/N)	Indicator Status	Hydrophytic Vegetation Indicators: <u>Y</u> Dominance Test is > 50% <u>N</u> Prevalence Index is ≤ 3.0 _____ Morphological Adaptations ¹ (Provide supporting data in Notes) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
1. <i>Calamagrostis Canadensis</i>	30	Y	FAC	
2. <i>Comarum palustre</i>	2		OBL	
3. <i>Equisetum arvense</i>	2		FAC	
4. <i>Iris setosa</i>	1		FAC	
5.				
6.				
7.				
8.				
9.				
Total Cover: <u>35</u> 50% of total cover: <u>17.5</u> 20% of total cover: <u>7</u>				_____ % Bare Ground _____ % Cover of Wetland Bryophytes _____ Total Cover of Bryophytes _____ % Cover of Water Hydrophytic Vegetation Present (Y/N): <u>Y</u> Notes: (If observed, list morphological adaptations below):

WETLAND DETERMINATION DATA FORM

SOIL		Date <u>06/03/14</u> Feature ID <u>W60TJ 012</u>					Soil Pit Required (Y/N) <u>Y</u>	
SOIL PROFILE DESCRIPTION: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Notes
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-5							Fibric	Organics
5-12							hemisapric	organics
12-18	2.5Y 3/3	50	5YR 3/4	50	C	M	Silt loam	
18-21	10YR 3/4	60	5YR 3/4	40	C	M	Silt loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

HYDRIC SOIL INDICATORS		INDICATORS FOR PROBLEMATIC HYDRIC SOILS ³
Histosol or Histel (A1) _____	Alaska Gleyed (A13) _____	Alaska Color Change (TA4) ⁴ _____
Histic Epipedon (A2) _____	Alaska Redox (A14) _____	Alaska Alpine Swales (TA5) _____
Black Histic (A3) _____	Alaska Gleyed Pores (A15) _____	Alaska Redox with 2.5Y Hue _____
Hydrogen Sulfide (A4) _____		Alaska Gleyed without 5Y Hue or Redder Underlying Layer
Thick Dark Surface (A12) _____		Other (Explain in Notes)

³One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
⁴Give details of color change in Notes.

Restrictive Layer (if present): Type: N/A Depth (inches): N/A

Hydric Soil Present (Y/N): N

Notes:

HYDROLOGY PRIMARY INDICATORS (any one indicator is sufficient)		SECONDARY INDICATORS (2 or more required)	
Surface Water (A1) _____	Surface Soil Cracks (B6) _____	Water-stained Leaves (B9) _____	Stunted or Stressed Plants (D1) _____
High Water Table (A2) _____	Inundation Visible on Aerial Imagery (B7) _____	Drainage Patterns (B10) _____	Geomorphic Position (D2) _____
Saturation (A3) <u>X</u>	Sparsely Vegetated Concave Surface (B8) _____	Oxidized Rhizospheres along Living Roots (C3) _____	Shallow Aquitard (D3) _____
Water Marks (B1) _____	Marl Deposits (B15) _____	Presence of Reduced Iron (C4) _____	Microtopographic Relief (D4) _____
Sediment Deposits (B2) _____	Hydrogen Sulfide Odor (C1) _____	Salt Deposits (C5) _____	FAC-Neutral Test (D5) <u>X</u>
Drift Deposits (B3) _____	Dry-Season Water Table (C2) _____	Notes:	
Algal Mat or Crust (B4) _____	Other (Explain in Notes):		
Iron Deposits (B5) _____			

Surface Water Present (Y/N): <u>N</u>	Depth (in): <u>N/A</u>	Wetland Hydrology Present (Y/N): <u>Y</u>
Water Table Present (Y/N): <u>Y</u>	Depth (in): <u>15</u>	
Saturation Present (Y/N): <u>Y</u> (includes capillary fringe)	Depth (in): <u>05</u>	

Notes: Saturation at 5"