APPENDIX H

WETLAND VERIFICATION REPORT

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Kivalina Evacuation and School Site Access Road

Wetland Verification Report

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Executive Summary

The Alaska Department of Transportation and Public Facilities (DOT&PF) and the Federal Highway Administration (FHWA), in partnership with the Northwest Arctic Borough (NAB), Native Village of Kivalina, and the City of Kivalina, propose community safety improvements in Kivalina, Alaska by constructing an evacuation road between Kivalina Island and a site on Kisimigiuqtuq Hill (K-Hill) where a school planned for construction by the NAB would also serve as a safe emergency evacuee assembly site.

A desktop *Wetland Delineation and Functions & Values Assessment* was conducted by Arctic Slope Regional Corporation (ASRC) Energy Services in 2015 (ASRC 2015). This report updates that desktop delineation and functional assessment with ground observations and other information gathered during the following efforts:

- March/April 2015 Golder Associates geotechnical investigations (Golder Associates 2015)
- September 2016 Stantec site reconnaissance (Stantec 2016)
- October 2016 Stantec cultural resources investigation (Stantec 2017)
- August 2017 USACE wetland determination (USACE 2017)
- August 2017 Stantec site reconnaissance (this report)
- 2011 aerial imagery, updated LIDAR (Light Detection and Ranging)
- Agency coordination

The Study Area is a large wetland complex with a variety of emergent, dwarf, and low shrub habitat. Rivers, lakes, and ponds are common defining characteristics. Most of the subsurface data gathered found at least shallow soil saturation, and many field observations described seasonal or permanently flooded regimes.

There are a limited number of uplands scattered throughout the Study Area. K-Hill dominates the eastern end of the Study Area, and provides elevated upland topography with wetlands surrounding its base.

Vegetation consists of low and dwarf shrub, and wet and mesic herbaceous polygons. These provide a variety of wildlife habitat. Most importantly, in consultation with the US Fish and Wildlife Service (USFWS), low scrub habitat was identified as important bird nesting habitat.

Wetlands in the Study Area are high functioning and common. They are largely undisturbed, and operating in their natural state. Rivers, lakes, ponds, estuaries, ocean, and bird nesting habitat was increased to the highest functional value to aid project planners in avoiding these important features.

All wetlands and Waters of the United States were determined to be hydrologically connected to the Kivalina River, Wulik River, or Kivalina Lagoon, which are connected to the Chukchi Sea, a traditional navigable Water of the U.S. For this reason, wetlands and Waters of the U.S. in the Study Area are presumed jurisdictional by the USACE under Section 404 of the CWA and Section III.D.2 of the Jurisdictional Determination Form.

Abbreviations

ANSRAM	Arctic North Slope Rapid Assessment Method
ASRC	Arctic Slope Regional Corporation
AVC	Alaska Vegetation Classification
cm	centimeter
DOT&PF	Department of Transportation and Public Facilities
E1UB	Estuarine, Subtidal, Unconsolidated Bottom
E2US	Estuarine, Intertidal, Unconsolidated Shore
FHWA	Federal Highway Administration
GPS	Global Positioning System
K-Hill	Kisimigiuqtuq Hill
L1UB	Lacustrine, Limnetic, Unconsolidated Bottom
LiDAR	Light Detection and Ranging
m	meter
M1UB	Marine, Subtidal, Unconsolidated Bottom
M2US	Marine, Intertidal, Unconsolidated Shore
NA	Not Applicable
NAB	Northwest Arctic Borough
NWI	National Wetlands Inventory
OFS	Overall Functional Score
PEM1/SS1B	Palustrine Persistent Emergent/ Broad-Leaved Deciduous Scrub Shrub, Saturated
PEM1/SS1C	Palustrine Persistent Emergent/ Broad-Leaved Deciduous Scrub Shrub, Seasonally Flooded
PEM1/SS1F	Palustrine Persistent Emergent/Broad-Leaved Deciduous Scrub Shrub, Semi-permanently Flooded
PEM1C	Palustrine Persistent Emergent, Seasonally Flooded
PEM1F	Palustrine Persistent Emergent, Semi-permanently Flooded
PSS1/EM1B	Palustrine Broad-Leaved Deciduous Scrub Shrub/ Persistent Emergent, Saturated
PSS1/EM1C	Palustrine Broad-Leaved Deciduous Scrub Shrub/ Persistent Emergent, Seasonally Flooded
PSS1/EM1E	Palustrine Broad-Leaved Deciduous Scrub Shrub/ Persistent Emergent, Seasonally Flooded/Saturated
PSS1C	Palustrine Broad-Leaved Deciduous Scrub Shrub, Seasonally Flooded
PSS1J	Palustrine Broad-Leaved Deciduous Scrub Shrub, Intermittently Flooded
PUBH	Palustrine, Unconsolidated Bottom, Permanently Flooded
R2UB	Riverine, Lower Perennial, Unconsolidated Bottom
R2US	Riverine, Lower Perennial, Unconsolidated Shore
R3UB	Riverine, Upper Perennial, Unconsolidated Bottom
USACE	US Army Corps of Engineers
USFWS	US Fish and Wildlife Service

USGS	US Geological Survey
W	Water

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

The Alaska Department of Transportation and Public Facilities (DOT&PF) and the Federal Highway Administration (FHWA), in partnership with the Northwest Arctic Borough (NAB), Native Village of Kivalina, and the City of Kivalina, propose community safety improvements in Kivalina, Alaska, by constructing an evacuation road between Kivalina Island and a site on Kisimigiuqtuq Hill (K-Hill) where a school planned for construction by the NAB would also serve as a safe emergency evacuee assembly site. Figure 1 (Appendix A) displays the location and vicinity of the proposed project.

1.2 SITE LOCATION

The proposed project origin is at the City of Kivalina, located on the southeast tip of the barrier island located between the Chukchi Sea (Arctic Ocean) and Kivalina Lagoon (Figure 1). The project terminus is located on the mainland across the Kivalina Lagoon approximately six -miles northeast at a community selected evacuation site on Kisimigiuqtuq Hill (K-Hill). The Study Area encompasses the Kivalina barrier island, the southern portion of Kivalina Lagoon, and the lower Wulik and Kivalina River drainages.

2.0 BACKGROUND INFORMATION

A proposed inland access route in the Kivalina region has been the subject for study for many years. This wetland verification report is the compilation of at least three years of effort evaluating wetlands for the access alternatives. The intent of this report is to integrate the previous desktop and field efforts to provide one comprehensive wetlands resource.

A desktop only wetland delineation was conducted in 2015 (ASRC 2015) for a smaller Study Area, commissioned by the Northwest Arctic Borough (NAB). Subsequently, at least four field efforts (March/April 2015 [Golder Associates 2015], September 2016 [Stantec 2016], October 2016 [Stantec 2017], August 2017 [USACE 2017 and this report]) were conducted and provide on the ground verification for the initial desktop delineation.

This report updates and expands the ASRC (2015) desktop effort by compiling the field efforts, and generating USACE Wetland Datasheets and photo points. These points document the vegetation, soil, and hydrology characteristics of the area. This report also provides an updated functional assessment using the same method (updated with field data) as the previous desktop assessment. By compiling the previous efforts, this wetland verification report provides the best available information on wetlands in the Study Area.

2.1 EXISTING WETLAND INFORMATION

A desktop *Wetland Delineation and Functions & Values Assessment* was conducted in 2015 by ASRC Energy Services (ASRC 2015). ASRC conducted aerial photography interpretation, using information from:

- *National Wetlands Inventory* (NWI);
- U.S. Geological Survey (USGS) topographic maps;
- Kivalina Evacuation and School Access Road Reconnaissance Study (WHPacific 2014);
- Kivalina Evacuation Road Preliminary Environmental Report (WHPacific 2012a); and
- Kivalina Evacuation Route Significant Biotic Resources Baseline Report and Preliminary, Essential Fish Habitat Analysis (WHPacific 2012b).

ASRC produced wetland pdf maps with polygons classified by the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979). ASRC also conducted a desktop Functions and Values Assessment using a method they developed, ANSRAM (Arctic North Slope Rapid Assessment Method).

The ASRC wetland report found that the area was composed almost exclusively of high quality wetlands, and that little to no disturbance has taken place on the mainland. The wetlands were of such uniformly high quality, that certain features (e.g. waters and rivers) were elevated from a Category I to a Category I+. This allowed project planners to avoid features of inherent elevated importance when planning features across the landscape.

The lack of field data to support this desktop effort was addressed by at least four field efforts (March/April 2015 [Golder Associates 2015], September 2016 [Stantec 2016], October 2016 [Stantec 2017], August 2017 [USACE 2017 and this report]).

2.2 EXISTING VEGETATION INFORMATION

The Study Area has National Wetland Inventory Cowardin classification mapping available, which was used as a guide in classifications. The previous desktop Wetland Delineation effort also used the Alaska Vegetation Classification (AVC) System (Viereck 1992) to Level III. The Viereck classification system is an Alaskan specific habitat classification system, particularly useful for evaluating wildlife habitat. It is subtly different than Cowardin, and provides a greater level of detail in habitat classifications (e.g. tall, short, dwarf shrubs).

The Stantec site reconnaissance field efforts included vegetation photographs. This involved taking GPS-linked site photographs, and brief notes on wetlands, hydrology, and plant cover. These photographs provide key vegetation cover information for this wetland report. The photographs and notes allow vegetation to be classified on the Cowardin and Viereck systems. Species composition and percent cover can also be assigned from this effort, allowing the completion of USACE Wetland Datasheets.

2.3 EXISTING SOILS INFORMATION

The USDA Soil Survey does not have information available for the Study Area and no such information has been reported on in previous wetland reports.

We developed key soil information from multiple sources. The first soil field effort occurred in March and April of 2015. Golder Associates conducted spring geotechnical investigations primarily around gravel source exploration in the Study Area (Golder Associates 2015). The profiles provide evidence of deep organics and high levels of water content in the soils. This supports both wetland soil and hydrology characteristics.

Second, in October 2016 and August 2017, Stantec and the USACE conducted a cultural and wetland field efforts (Stantec 2016, 2017, USACE 2017). These efforts conducted site testing at multiple sites, providing logs of soil profiles. These soil profiles do not have Munsell color notations (Munsell 2010), but do provide valuable soil information (e.g. organic depths, colors, texture, saturation) about the organic layers in the Study Area.

Cultural resource investigations typically focus on rises, ridges, and uplands; which are common historic gathering places. Areas of standing water and similar polygonal tundra are not high probability landforms to find cultural materials within the region. As a result, soil profiles available from these efforts are most likely upland sites. This underscores their importance, as the relatively rare upland sites the wetland delineation is seeking are the most likely to have soil information available.

2.4 EXISTING HYDROLOGY INFORMATION

Hydrology information in the ASRC report was limited and interpreted solely from aerial photography and online databases. The subsequent field efforts provided important additional hydrology insights needed to map wetlands more accurately.

Site photographs and notes from the Stantec and USACE field efforts made evident that most of the Study Area is seasonally or permanently flooded, and provided evidence of subtle, but critical, hydrological differences (e.g. saturation, seasonally flooded, standing water). This information allowed aerial signatures to be groundtruthed, particularly on flooded low centered polygon complexes which are surrounded by seasonally flooded wetlands.

The Golder Geotechnical field effort (Golder Associates 2015) also had valuable hydrology notations collected during soil profiling (e.g. saturation, ice wedges). These notations allowed the USACE Standard Forms to be completed. Often a shallow water table was not specifically noted (this information is not typically collected during cultural and geotechnical investigations), and had to be assumed.

This report also uses new Light Detection and Ranging (LiDAR) and aerial imagery to understand the important topography and hydrology changes. These allow the tracing of topographic features that were not evident in the ASRC report.

3.0 METHODOLOGY

The wetland verification efforts compiled data from the ASRC wetland report (ASRC 2015); and field datasets: March/April 2015 [Golder Associates 2015], September 2016 [Stantec 2016], October 2016 [Stantec 2017], August 2017 [USACE 2017 and this report]. The data analysis was conducted and report written by Professional Wetland Scientists to provide a comprehensive groundtruthed analysis of wetlands in the Study Area.

Methodology for this wetland verification do not follow the transect methods outlined in the *Corps of Engineers Wetlands Delineation Manual* (USACE, 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region (Version 2.0)* (USACE, 2007). Instead, this verification uses the general guidance of the regional supplement to provide a best available information compilation of knowledge of the Study Area.

Mapping in the Study Area is divided into two categories. National Wetlands mapping boundaries was used for the entire Study Area, and classifications were updated with results from the field efforts. Inside the core Study Area (the region studied by the NAB), mapping boundaries and classification was updated in fine scale resolution. This method allowed broad scale alternative evaluation on the entire Study Area, and fine scale mapping for proposed impacts.

3.1 WETLAND VERIFICAITON

<u>Digitizing Existing ASRC Data:</u> The wetland shapefiles from the ASRC report were not available. but the pdfs in the ASRC wetland map had location information electronically embedded in them, allowing the creation of a mosaic of geoTiffs. These were brought into ArcGIS, and wetland polygons were digitized and attributed at 1:3,000 scale. While digitizing the maps, wetland boundaries and Cowardin classifications were updated for polygons as needed, using more recent and high resolution aerial imagery. In addition, field data (photos and soil profiles) were reviewed to further verify wetland boundaries and classifications where available.

<u>Data Compilation:</u> Standard USACE Wetland Determination Data Forms were completed at all locations where sufficient vegetation, soils, and hydrology information could be extrapolated from ground observations. Data forms were completed at 11 locations within the Study Area and are included in Appendix B. Each data form fully documents which field effort the vegetation, soils, and hydrology data came from.

Photo points (Appendix C) allow best professional judgment to apply wetland designations to specific habitats and were completed where vegetation, soils, and hydrology data were partially available, but did not give enough detail to complete full determination forms. Photo points are intended to provide ground observations to confirm desktop mapping for wetland indicators such as saturation, restrictive layers, and hydrophytic vegetation. Each standard and photo point location sampled during the field investigation was collected in a handheld global positioning system (GPS) unit. Photo point forms were completed at 37 locations within the Study Area.

Wetland delineation data form and photo point locations are shown on maps included in Appendix A.

3.2 FUNCTIONAL ASSESSMENT

The ASRC (2015) methodology used a rapid desktop functional assessment (ANSRAM). The methodology and previous datasheets are included in the previous wetland report (ASRC 2015). The ASRC report found that almost all wetlands were Category I, with a few Category II saturated wetlands. For that report, under best professional judgement; all riverine, tidal, estuarine, and lacustrine water bodies, as well as flooded palustrine wetlands were elevated to Category I+. This was done to aid project planners in avoiding important wetlands.

For this report's analysis, we had additional consultation with agencies to determine the functional rankings. Similar to the ASRC report; all ponds, riverine, tidal, estuarine, and lacustrine water bodies were elevated to the Category I+. All saturated wetlands (PSS1/EM1B) were ranked as a Category II, also similar to ASRC.

For this project, the USFWS has indicated that high quality shrub areas are important migratory bird habitat. This habitat was mapped and identified in this report as Closed Low Scrub habitat (II.C.I). This 'low scrub' habitat is the highest vegetation habitat in the region (taller than 'dwarf shrub'). To accommodate this important function, all Closed Low Scrub habitat (II.C.I) was promoted one functional level. PSS1/EM1B wetlands that were bird habitat were upgraded to Category I, the rest of bird habitat was elevated to Category I+. The primary difference between the ASRC (2015) report and this method, was that we did not find all flooded palustrine wetlands to be I+. This value was overstated, when compared to the bird habitat.

4.0 RESULTS AND DISCUSSION

4.1 WETLANDS AND WATERS

Table 1 below summarizes the standard and photo data points.

Table 1: Summary of Standard and Photo Data Points

Type	Point
Standard (Appendix B)	HP40, P7, P12, P14, P16, P20, P27, P32, P37, P45, P56
Photo (Appendix C)	HP1, HP4, HP11, HP15, HP19, HP21, HP22, HP24, HP36, HP37, HP38, HP39, JAJ-17-009, JRH-17-12, P1, P2, P3, P4, P22, P24, P25, P30, P34B, P35, P36, P41A, P41B, P42, P48, P50, P54, P58, P59, USACE1, USACE2, USACE3, WCP1

The majority of habitat within the Study Area is comprised of wetlands (74%) or waters (23%) within the Wulik and Kivalina River drainages (Figure 2). K-Hill, an isolated hill in the northeastern section of the Study Area, is upland. Other uplands are scattered throughout the Study Area, including pingos, relic river banks, and large ice wedges that have been elevated above the surrounding topography.

In general, vegetation and hydrology determined key wetland characteristics. The Study Area is a mostly a pristine ecosystem (99.9% undeveloped lands) with a variety of emergent, dwarf, and low shrub habitats. Rivers, lakes, and ponds are common throughout the Study Area and are defining characteristics of the general landscape. The test pits found shallow saturation, and observations described saturated, seasonal, or permanently flooded regimes. It is important to note that field data were mostly collected in September and October.

4.2 COWARDIN CLASSIFICATIONS

Table 2 summarizes the different wetlands, Waters of the U.S., and upland habitat types found within the Study Area.

Table 2: Summary of Wetlands, Waters of the U.S., and Uplands

Habitat Type		Cowardin	Acres	% Study Area
Wetlands	Palustrine Saturated & Seasonally Flooded	PEM1C	580.9	1.6%
		PEM1/SS1B	296.2	0.7%
		PEM1/SS1C	13,559.8	36.7%
		PSS1/EM1B	6,023.8	16.3%
		PSS1/EM1C	2,042.0	5.5%
		PSS1C	1,391.3	3.8%
	Palustrine Flooded	PEM1F	1,296.6	3.5%
		PEM1/SS1F	581.0	1.6%
		PSS1/EM1E	1,430.6	3.9%
		PSS1J	231.9	0.6%
Total Wetlands			**27434.1**	**74.2%**
Waters of the U.S.				
Estuarine		E1UB	3,686.9	10.0%
		E2US	135.1	0.4%
Lacustrine		L1UB	1,164.3	3.2%
Marine		M1UB	109.1	0.3%
		M2US	73.7	0.2%
Pond		PUBH	949.5	2.6%
Riverine		R2UB	1,378.4	3.7%
		R2US	737.8	2.0%
		R3UB	176.0	0.5%
Total Waters of the US			**8,410.8**	**22.9%**
Uplands		Upland	**1071.5**	2.9%
Total Study Area			**36,916.4**	100.0%

4.2.1 Palustrine Saturated & Seasonally Flooded

Palustrine Saturated & Seasonally Flooded areas consisted of saturated and seasonally flooded wetlands. Cowardin classification within this type include:

- PEM1C: Palustrine Persistent Emergent, Seasonally Flooded
- PEM1/SS1B: Palustrine Persistent Emergent/ Broad-Leaved Deciduous Scrub Shrub, Saturated

- PEM1/SS1C: Palustrine Persistent Emergent/ Broad-Leaved Deciduous Scrub Shrub, Seasonally Flooded
- PSS1/EM1B: Palustrine Broad-Leaved Deciduous Scrub Shrub/ Persistent Emergent, Saturated
- PSS1/EM1C: Palustrine Broad-Leaved Deciduous Scrub Shrub/ Persistent Emergent, Seasonally Flooded
- PSS1C: Palustrine Broad-Leaved Deciduous Scrub Shrub, Seasonally Flooded

Vegetation in saturated wetlands include both shrub and emergent vegetation. Shrub species, such as cranberry (*Vaccinium vitis-idaea*), Labrador Tea (*Rhododendron tomentosum*), Blueberry (*Vaccinium uliginosum*), and small willows, provide limited structure in tundra ecosystems. Grasses and sedges are present, particularly on low centered polygons scattered through the area. Soils consists of Histic Epipedons, with shallow organic layers underlain by dark mineral soils (which have dense roots intermixed in the horizons).

Throughout the Study Area, saturated wetlands can be found on slight rises that border the lagoon or ponds, or are underlain by elevated ice wedges. Hydrology is the key characteristic for this wetland type, controlling the species present and relative ratios of shrubs and emergent plants.

Seasonally flooded wetlands usually have more emergent species (e.g. grasses, sedges, herbaceous plants) due to the soil conditions. Shrubs grow only on local high reliefs, with low points having grasses and sedges growing in standing water. Shrubs include blueberry and willows growing up to a few feet high. The topographic differences driving the hydrologic regime can be traced back to the braided nature of the Wulik and Kivalina River, and the interactions of relic channels and sediment deposits.

4.2.2 Palustrine Flooded

Palustrine flooded wetlands were grouped based on a gradient between permanently flooded and seasonally flooded/saturated Cowardin classifications, including:

- PEM1F: Palustrine Persistent Emergent, Semi-permanently Flooded
- PEM1/SS1F: Palustrine Persistent Emergent/Broad-Leaved Deciduous Scrub Shrub, Semi-permanently Flooded
- PSS1/EM1E: Palustrine Broad-Leaved Deciduous Scrub Shrub/ Persistent Emergent, Seasonally Flooded/Saturated
- PSS1J: Palustrine Broad-Leaved Deciduous Scrub Shrub, Intermittently Flooded

Palustrine flooded wetlands are dominated during the growing season by surface water and grass/sedge interspersion. Often tussocks have developed to elevate root zones above the water level. These can be important habitat for wildlife, providing forage and nesting habitat for shorebirds. Shrubs are rarer in these areas, and typically are the results of periodic flooding, as can be seen in the PEE1/EM1E and PSS1J habitats.

The intermittently flooded scrub shrub (PSS1J) habitat plays a unique ecosystem role in the Study Area, as they generally contain river sloughs that provide habitat for juvenile fishes. These wetlands border riverine areas, and are composed of low shrub as opposed to dwarf shrub species. These areas often have little emergent vegetation, and appear to be willow species of similar age classes. These habitats appear to be subject to spring seasonal floods, which scour the emergent vegetation.

4.2.3 Soils Discussion

For both *Palustrine Saturated & Seasonally Flooded* and *Palustrine Flooded* wetlands, soil profiles were the most difficult to evaluate for primary and secondary wetland characteristics. Munsell colors were not collected for any of the profiles; but descriptions on depth, organics, and texture were available. Soil profiles demonstrated a shallow layer of organics, underlain by a saturated mixture of 'brown…loam' and organic mixture. We interpreted these to be histic epipedons.

While the definition of a histic epipedon is '8-16 inches of organics, underlain by dark mineral soil with chroma of 2 or less;' we included plots with only a few inches of organics. Our observation was that the cultural investigators often defined layers as 'mineral with roots' where wetland biologists would call them 'organic' (extending the thickness to 8 inches).

These wetlands determinations were also supported by the saturation observations. Due to the fact that shallow layers of saturation were described in October (well outside the June – August window), we believe these wetlands are at least saturated throughout the growing season. The USACE Alaska Supplement defines a hydric soil "as a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part." It further states "a soil that meets the definition of a hydric soil is hydric whether or not it exhibits indicators" specifically described in the USACE Alaska Supplement. Because of this, we believe these shallower organics meet the definition of a hydric soil.

4.2.4 Marine and Estuarine

There are many types of Waters of the United States in the Study Area; consisting of Marine, Estuary, Lacustrine, Ponds, and Riverine habitat. Cowardin classifications include:

- E1UB: Estuarine, Subtidal, Unconsolidated Bottom
- E2US: Estuarine, Intertidal, Unconsolidated Shore

- M1UB: Marine, Subtidal, Unconsolidated Bottom
- M2US: Marine, Intertidal, Unconsolidated Shore

The Chukchi Sea provides the marine habitat west of Kivalina. The Chukchi Sea is listed as a traditional navigable water of the United States by the USACE. Separating Kivalina and the mainland is the estuarian habitat of the Kivalina Lagoon. The lagoon, adjacent estuarine wetlands, and Chukchi Sea are frequently used by local residents to engage in subsistence activities and to travel to other villages.

4.2.5 Riverine

Moving inland, the dominate feature within the Study Area is the Wulik and Kivalina River. The Wulik provides an important subsistence transportation route inland for local residents. The Wulik drains the western Brooks Range, and is a listed ADF&G Anadromous Water for Chum Salmon, Coho Salmon, King Salmon, Pink Salmon, Sockeye Salmon, Dolly Varden, and Whitefish (ADFG 2017). Riverine Cowardin classifications include:

- R2UB: Riverine, Lower Perennial, Unconsolidated Bottom
- R2US: Riverine, Lower Perennial, Unconsolidated Shore
- R3UB: Riverine, Upper Perennial, Unconsolidated Bottom

4.2.6 Lacustrine and Ponds

As the Wulik and Kivalina Rivers have meandered throughout the landscape, they have formed many oxbow lakes and relic sloughs, which span the Study Area. These lacustrine environments are scattered throughout the Study Area, and provide important buffering of flood flows.

Lakes and ponds have also developed from the permafrost/ice wedge cycle. This cycle consists of water freezing and expanding cracks in the permafrost during the winter, and water filling in the cracks during the summer. If the ice wedges become exposed, they hold the summer heat, and cause ponds to form. These are present throughout the landscape in various stages of development, and provide important habitat heterogeneity.

Lacustrine and pond Cowardin classifications include:

Cowardin classifications include:

- L1UB: Lacustrine, Limnetic, Unconsolidated Bottom
- PUBH: Palustrine, Unconsolidated Bottom, Permanently Flooded

4.2.7 Uplands

There are a limited number of uplands (3% of the area) scattered throughout the Study Area. K-Hill is the most visually significant to the project, as the adjacent area is the destination for the road. This large cropping dominates the eastern end of the Study Area.

Outside of K-Hill, uplands are isolated, topographic rises above the surrounding wetlands with dryer soil regimes, often bordering lake or riverine systems. These uplands could be the result of relic depositions from the Wulik or Kivalina River, or geologic formations.

Other isolated uplands are scattered throughout the Study Area; including small pingos, which have risen above the surrounding wetlands, elevating the plant communities above the water table. Vegetation differences among uplands/compared to wetlands included larger shrub species, and visible outcroppings or ridgelines. Confirmation of pingos was greatly improved through the LiDAR datasets now available.

4.3 WILDLIFE (VIERECK) HABITAT

Wildlife habitat within the Study Area, as defined by Viereck (1992), is summarized below. In addition, the USFWS found that II.C.1 (Closed Low Scrub) habitat is likely to hold important bird habitat.

Table 3: Summary of wildlife habitat

Habitat Type	Acres	% Study area
Developed	64.8	0.2%
II.C.1 (Closed Low Scrub)	3,228.7	8.7%
II.D.2 (Willow Dwarf Shrub)	9,057.3	24.5%
III.A.2 (Mesic Graminoid Herbaceous)	14,348.7	38.9%
III.A.3 (Wet Graminoid Herbaceous)	1,877.6	5.1%
W (Water)	8,339.3	22.6%
Total Study area	**36,916.4**	**100.0%**

4.3.1 II.C.1 (Closed Low Scrub)

Closed Low Scrub is the classification for all important bird shrub habitat (Figure 3 and 4. Appendix A). These shrubs are 20 cm (centimeter) to 1.5 m (meter) tall, and are often found bordering waterways. They are the highest canopy vegetation available in the Study Area, and provide some of the only perching locations for birds in the area. These provide nesting habitat, elevated above predators, and locations for surveillance. Morning and evening song behavior from perching locations helps to establish territories, and attract mates. This habitat is less common in the Study Area, and was promoted from previous reports/assessments by one functional value (e.g. II to I or I to I+) to account for its local importance.

4.3.2 II.D.2 (Willow Dwarf Shrub)

Willow Dwarf Shrub is shrub dominated habitat (>25% shrub cover), with heights below 20 cm. Willows are the dominant species evident in the field data, although other species such and blueberry are present. The areas tend to have slightly dryer hydrologic regimes compared to emergent habitat allowing the growth of additional species. They can provide important ground nesting bird habitat, along with berry species to support omnivores.

4.3.3 III.A.2 (Mesic Graminoid Herbaceous)

Mesic Graminoid Herbaceous habitat has up to 25% shrub cover, and are moist sites, usually with seasonal flooding but without standing water. Tussocks are present, along with high centered polygons. This microtopographic relief can be used for nesting by shorebirds, and supports important sedges and grasses for herbivores. This habitat is common both in the Study Area and in the region as a whole.

4.3.4 III.A.3 (Wet Graminoid Herbaceous)

Wet Graminoid Herbaceous habitat has standing water present for most of the year, with up to 25% shrub cover. It tends to be dominated by obligate sedges and grasses. The sedges and grasses can provide important forage habitat for herbivores, and shorebirds often feed on invertebrates present in the standing water.

4.3.5 W (Water)

Viereck summarizes all ponds, lakes, rivers, estuaries, and ocean habitat as Water. This habitat comprises about 22% of the Study Area. Water habitats are important fish and wildlife habitat. In particular, deep pools provide overwintering locations for resident fish species.

4.4 FUNCTIONAL ASSESSMENT

This report's functional assessment mirrored the methodology presented in ASRC (2015) to maintain a consistent approach. Similar to the last assessment, wetlands were found to be high ranking (Figure 5, Table 4). Waters of the United States (ponds, riverine, tidal, estuarine, and lacustrine) were promoted to Category I+ to indicate their intrinsic importance. Saturated wetlands (PSS1/EM1B) were ranked as Category II.

Important bird habitat was found to consist of Closed Low Scrub habitat (II.C.I). Upon consultation with the USFWS, all Closed Low Scrub (II.C.I) was promoted one functional level (e.g. II to I or I to I+).

Table 4: Final Functional Assessment Acreage

Habitat Type	Acres	USFWS Bird Shrub Habitat? (II.C.I)	Functional Value/Category
Wetlands			
PEM1/SS1B	296.2	No	II
PEM1/SS1C	71.1	Yes	I+
	13488.7	No	I
PEM1/SS1F	581.0	No	I
PEM1C	17.1	Yes	I+
	563.8	No	I
PEM1F	1296.6	No	I
PSS1/EM1B	150.3	Yes	I
	5873.5	No	II
PSS1/EM1C	857.7	Yes	I+
	1184.3	No	I
PSS1/EM1E	587.4	Yes	I+
	843.2	No	I
PSS1C	1301.7	Yes	I+
	89.6	No	I
PSS1J	172.0	Yes	I+
	59.9	No	I
Total Wetlands	**27434.1**	-	-
Waters of the U.S.			
E1UB	3686.9	No	I+
E2US	135.1	No	I+
L1UB	1164.3	No	I+
M1UB	109.1	No	I+
M2US	73.7	No	I+
PUBH	949.5	No	I+
R2UB	1378.4	No	I+
R2US	737.8	No	I+
R3UB	176.0	No	I+
Total Waters	**8410.8**		
Uplands			
Upland	**1071.5**	-	-
Total Study Area	**36916.4**	-	-

4.4.1 Category I+

Category I+ polygons were reserved for ponds, rivers, lakes, oceans, estuaries, and elevated bird habitat (discussed below). These landscape features have a higher intrinsic value than neighboring wetlands due to their roles in the environment. To aid in project planning, it was determined to be important to raise these features above Category I.

4.4.2 Category I

67% of wetlands (which are not Waters of the US) in the Study Area are Category I. This is due to the low level of disturbance in the ecosystem. Wetlands are relatively pristine, and fully functioning within their natural environment. Few wetlands are providing unique functions or services, and instead work as a large interrelated network extending far beyond the Study Area boundaries.

4.4.3 Category II

Category II habitats comprised the smallest functional category. These were saturated shrub habitat, which provide relatively low levels of flood flow alteration and sediment removal. Saturated wetlands are the least wet, and it is common for them to be the lowest ranked due to their similarities with uplands. These often are on small ridges or pingos, bordering uplands and wetter wetlands.

4.4.4 Bird Habitat

The USFWS has indicated that Low Scrub Habitat (II.C.I) provides important bird habitat in the Study Area. The functional assessment promoted all Low Scrub Habitat one functional level (e.g. II to I, or I to I+) to incorporate these comments. These habitats tended to be near riverine systems.

Due to the slight differences in Viereck and Cowardin Classification systems, bird habitat (II.C.1) is found in a variety of wetland classifications (PEM1/SS1C, PEM1C, PSS1/EM1B, PSS1/EM1C, PSS1/EM1E, PSS1C, PSS1J).

This is particularly important to note, because not all Low Scrub Habitat is ranked as Category I+. The important bird habitat was elevated one level, which depending on the Cowardin classification elevated polygons from II to I or I to I+ (Table 4).

4.5 CONCLUSION AND JURISDICTION

Development activities from construction of the proposed project would likely impact wetlands and/or Waters of the U.S. under the jurisdiction of USACE. Based on the review of existing hydrology information, drainage within the Study Area flows into the Kivalina River, Wulik River, or directly into the Chukchi Sea, a traditional navigable Water of the U.S. The Kivalina River and Wulik River also flows into the Kivalina Lagoon, a tidal estuary of the Chukchi Sea.

Wetlands in the Study Area have a clear direct surface connection to the Kivalina River, Wulik River, Kivalina Lagoon, or Chukchi Sea. For this reason, wetlands and Waters of the U.S. in the Study Area are presumed jurisdictional by the USACE under Section 404 of the CWA and Section III.D.2 of the Jurisdictional Determination Form.

5.0 REFERENCES

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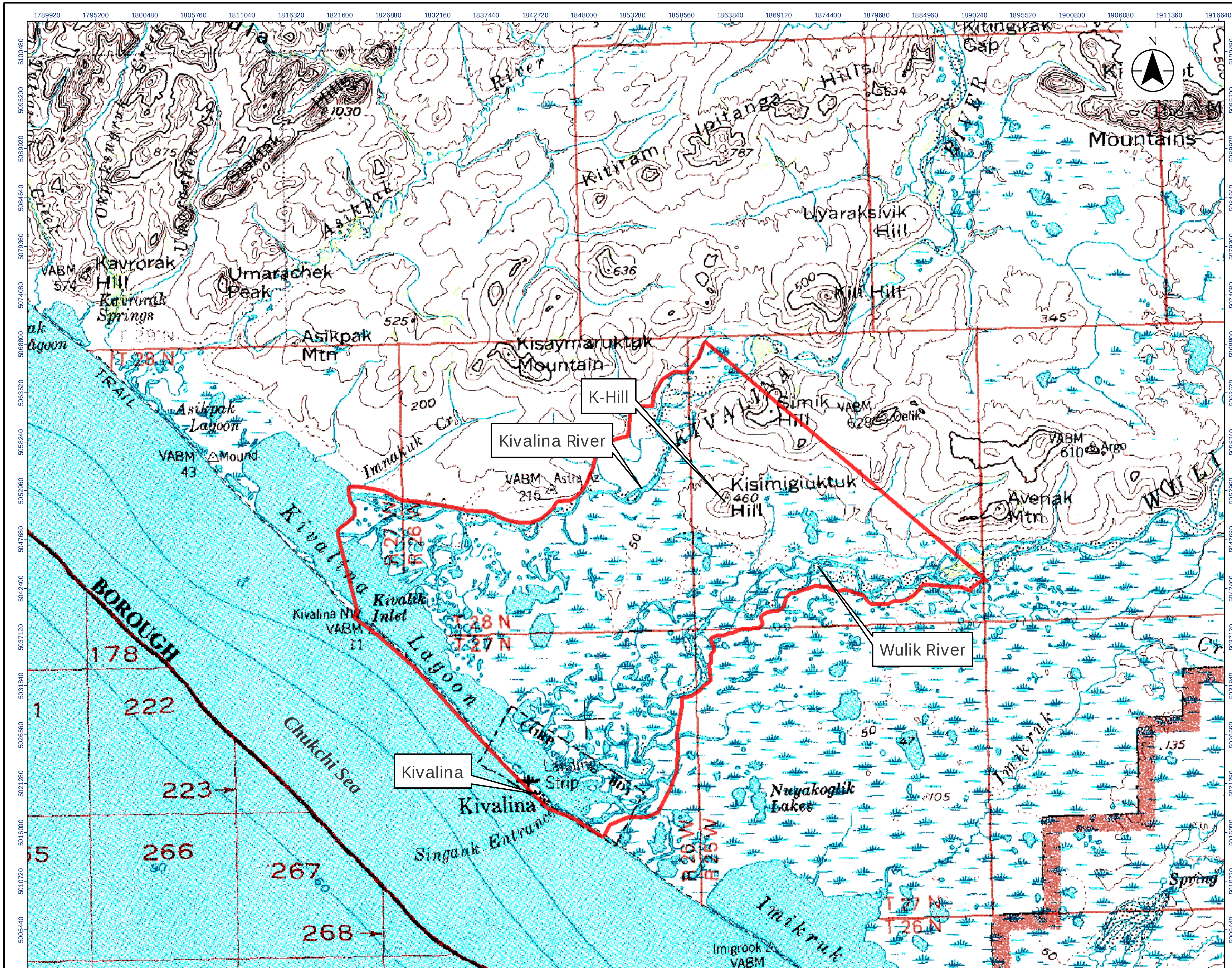
Appendix A SITE MAPS



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Study Area

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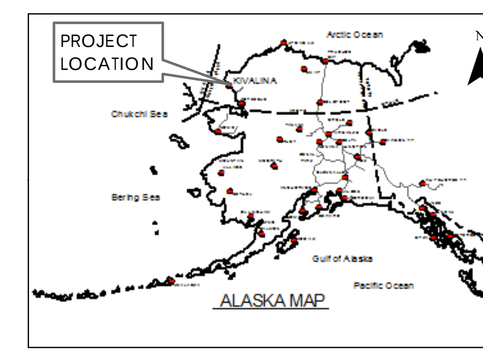
Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

NFHWYP00162-002(384) REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

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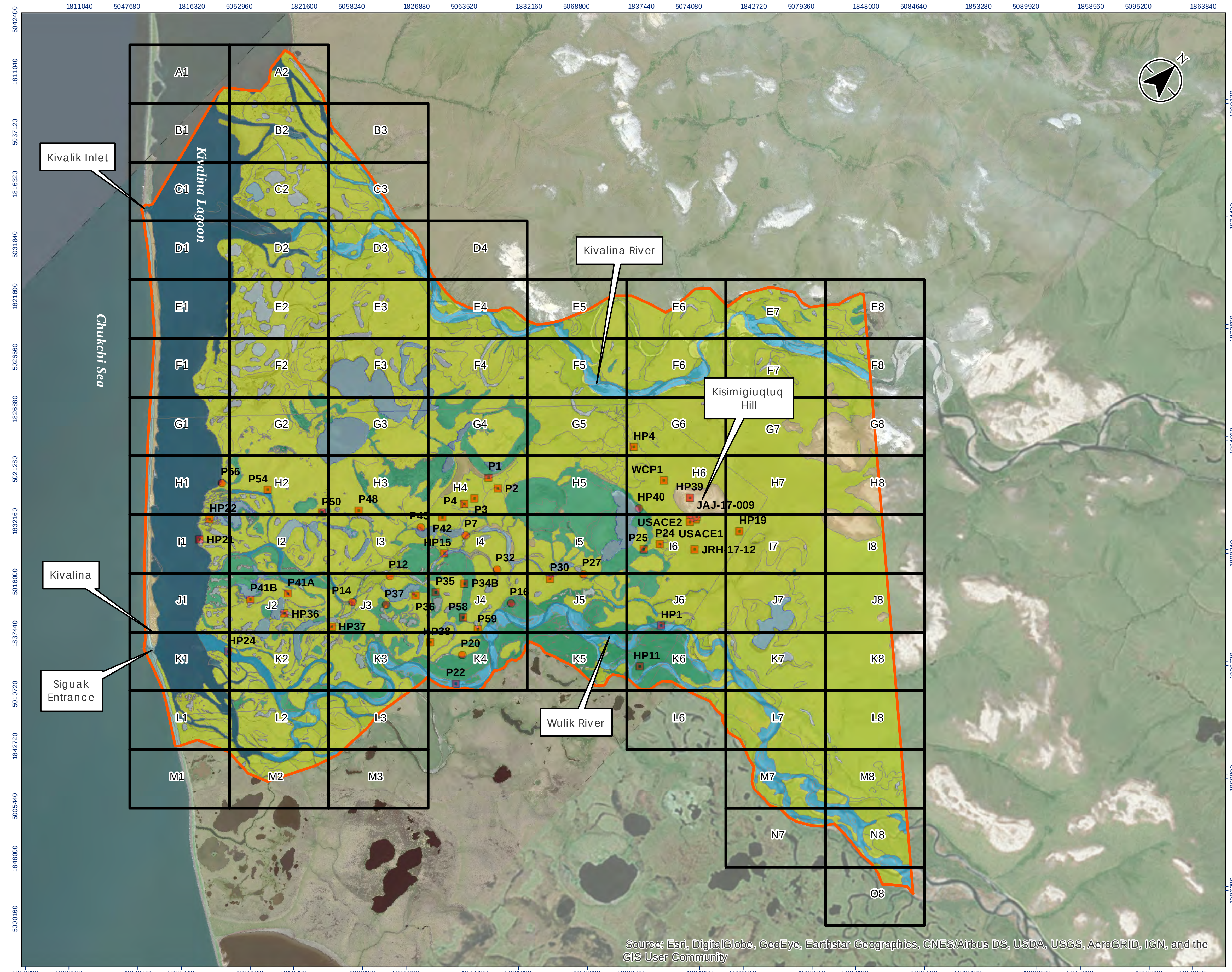
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
1

Title
Kivalina Evacuation and School Site Access Road - Location & Vicinity Maps

Page 1 of 87



Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetlands

- Estuarine
- Lacustrine
- Marine
- Palustrine Flooded
- Palustrine Saturated & Seasonally Flooded
- Pond
- Riverine
- Upland
- Study Area

0 1 2 Miles

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Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
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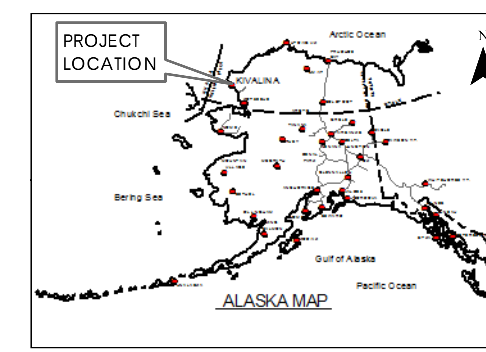

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Section 21, Township 27N, Range 26W
Kateel River Meridian

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Kivalina Evacuation and School Site Access Road

Figure No.
2

Title
Kivalina Evacuation and School Site Access Road - Wetlands Overview

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Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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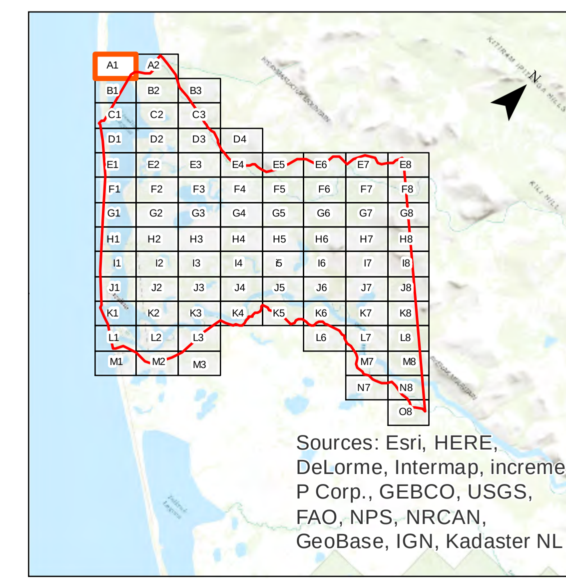

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

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Kivalina Evacuation and School Site Access Road

Figure No.
2 - A1

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
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Notes

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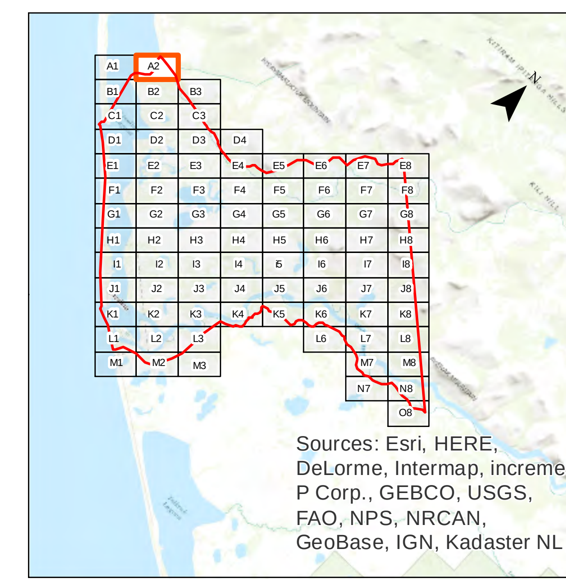

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

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Figure No.
2 - A2

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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Feet

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Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
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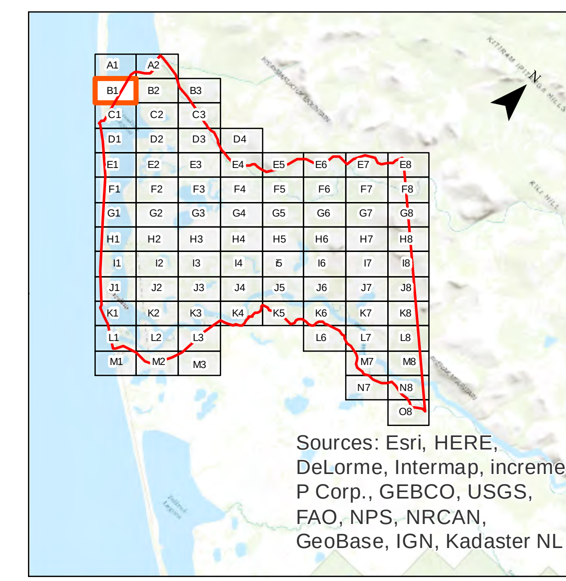

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Kateel River Meridian

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Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - B1

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
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Notes

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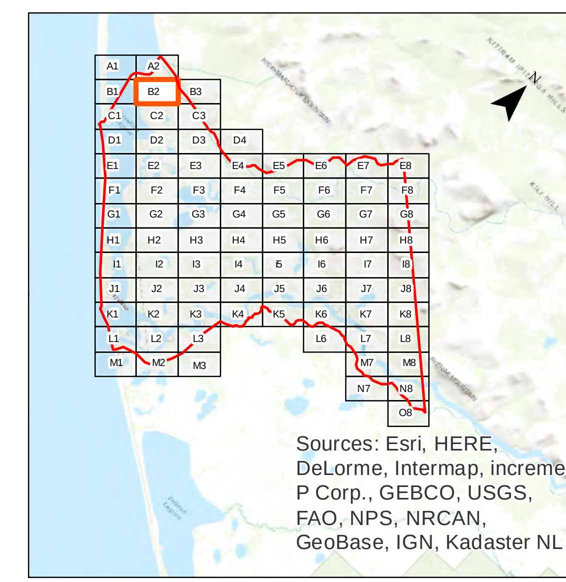

Project Location
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Kateel River Meridian

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Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - B2

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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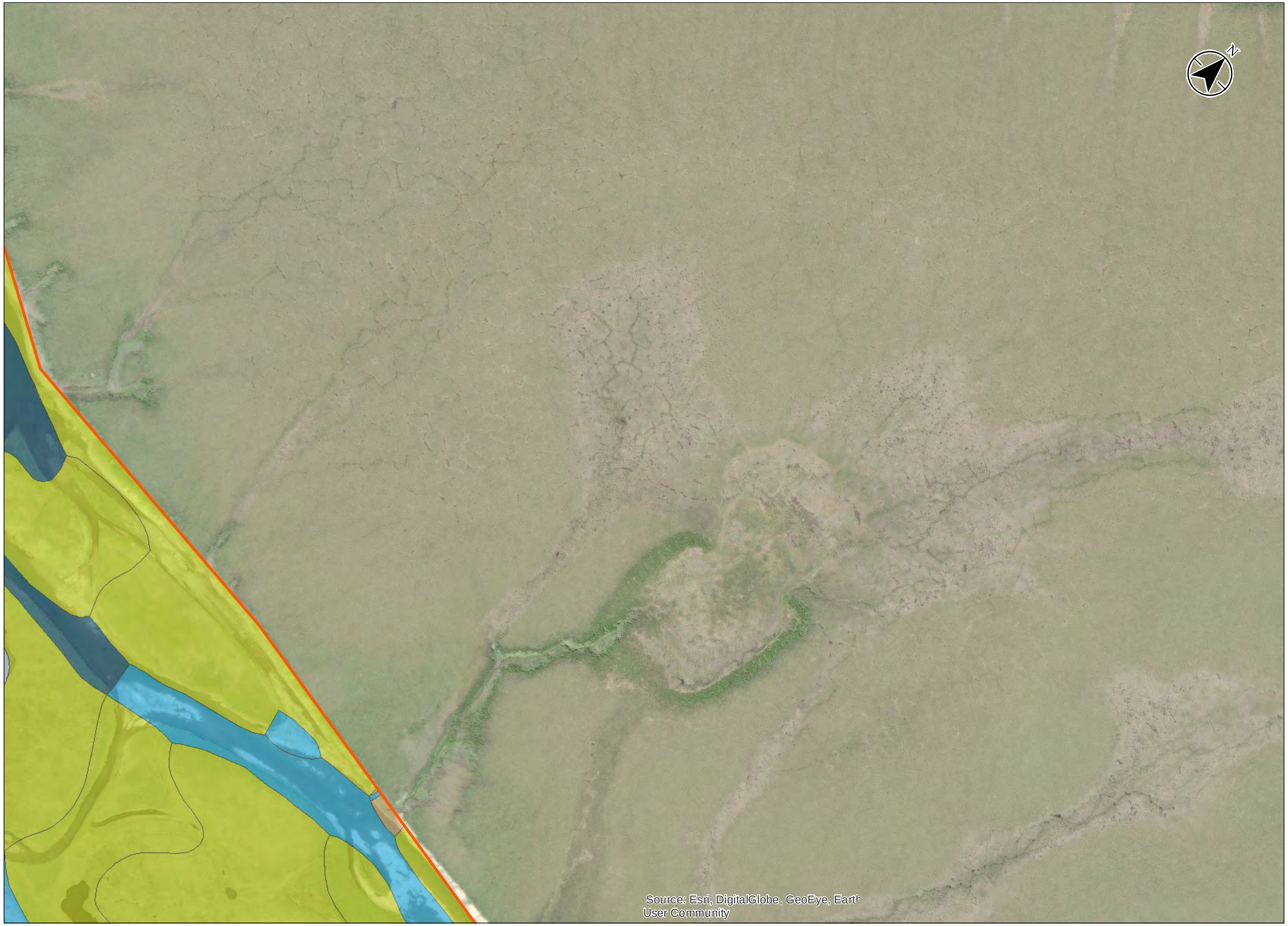

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Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
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Notes

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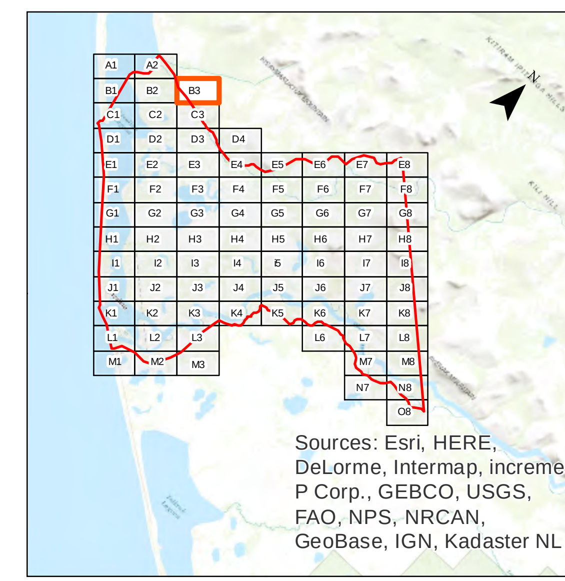

Project Location
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Kateel River Meridian

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Kivalina Evacuation and School Site Access Road

Figure No.
2 - B3

Title
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Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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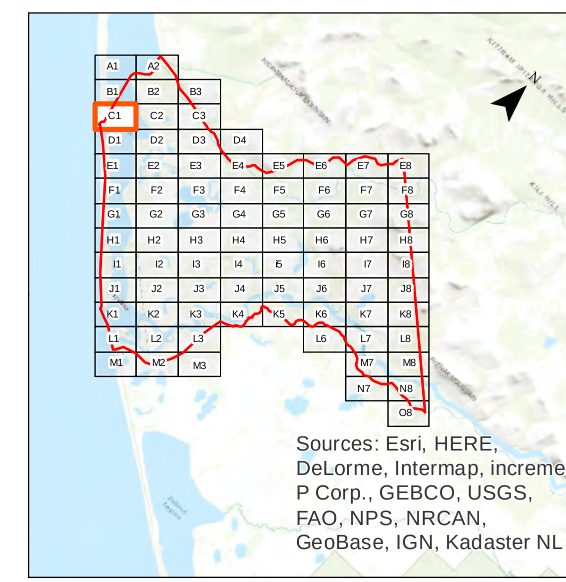

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

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Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - C1

Title
Kivalina Evacuation and School Site Access Road - Wetlands

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
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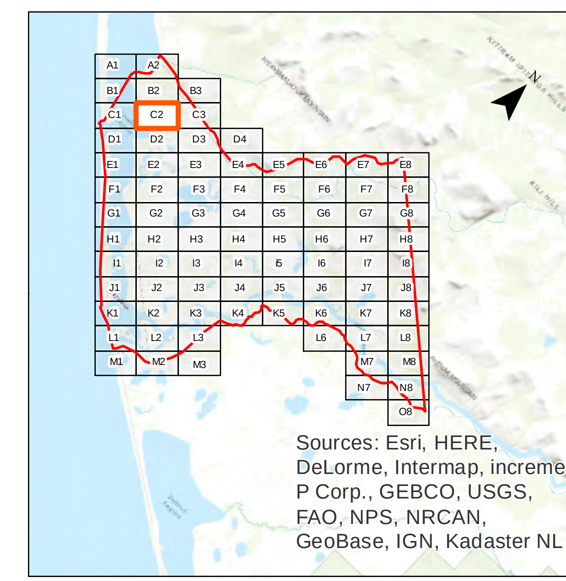

Project Location
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Section 21, Township 27N, Range 26W
Kateel River Meridian

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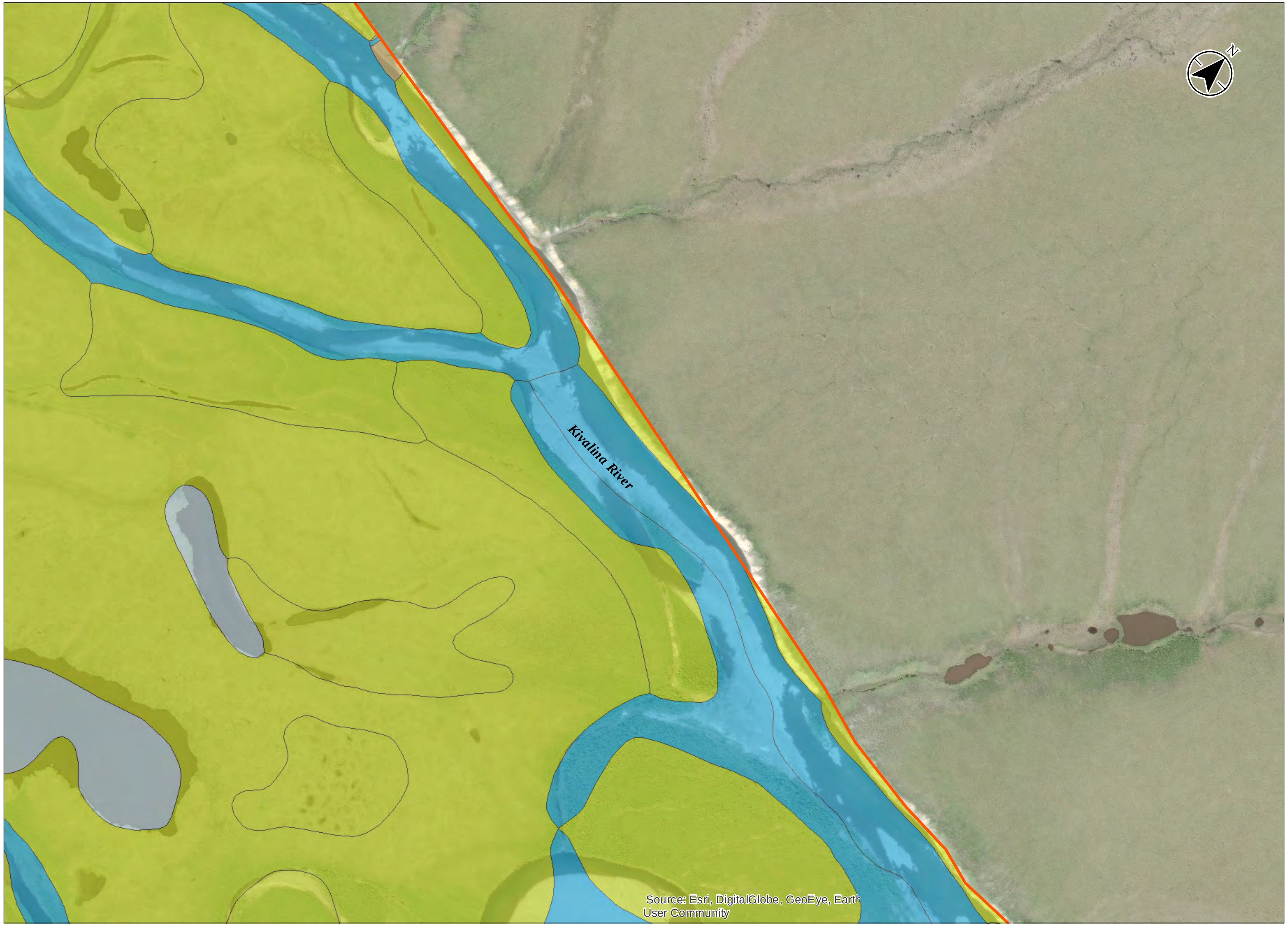
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - C2

Title
Kivalina Evacuation and School Site Access Road - Wetlands



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Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
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Notes

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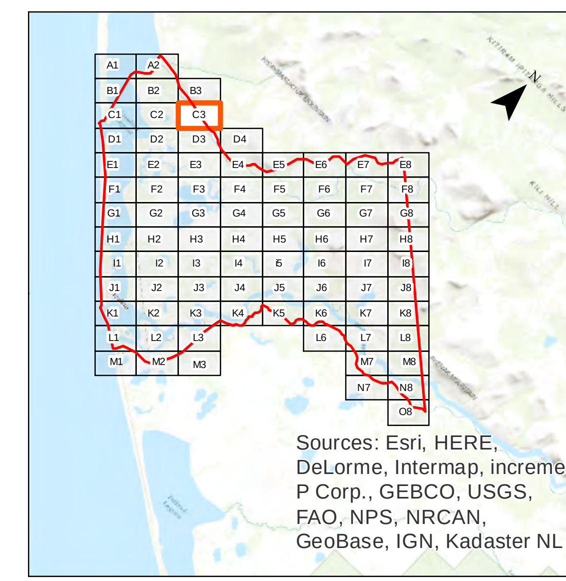

Project Location
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Section 21, Township 27N, Range 26W
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Client/Project
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Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - C3

Title
Kivalina Evacuation and School Site Access Road - Wetlands

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
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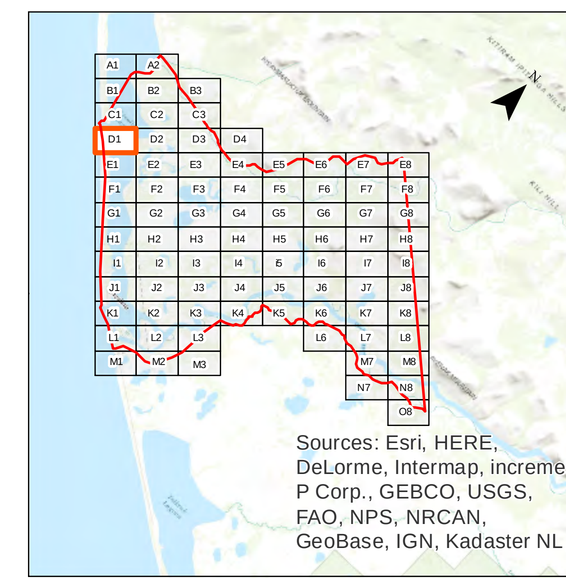

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Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - D1

Title
Kivalina Evacuation and School Site Access Road - Wetlands

Stantec

Legend

Data Points (2016)

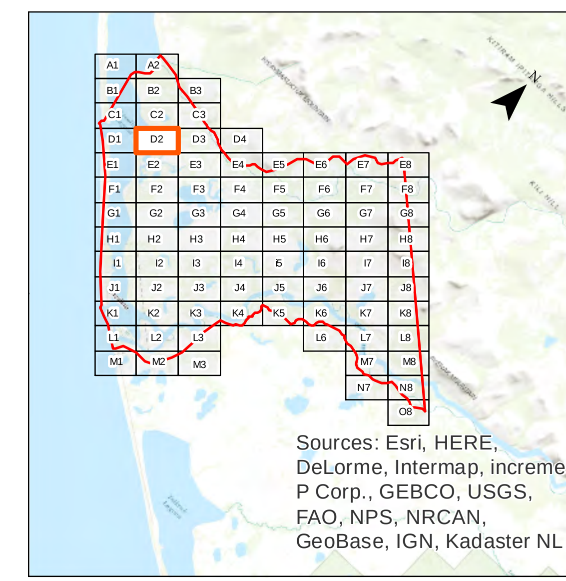
- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - D2

Title
Kivalina Evacuation and School Site Access Road - Wetlands

0 250 500 1,000 1,500 2,000 Feet

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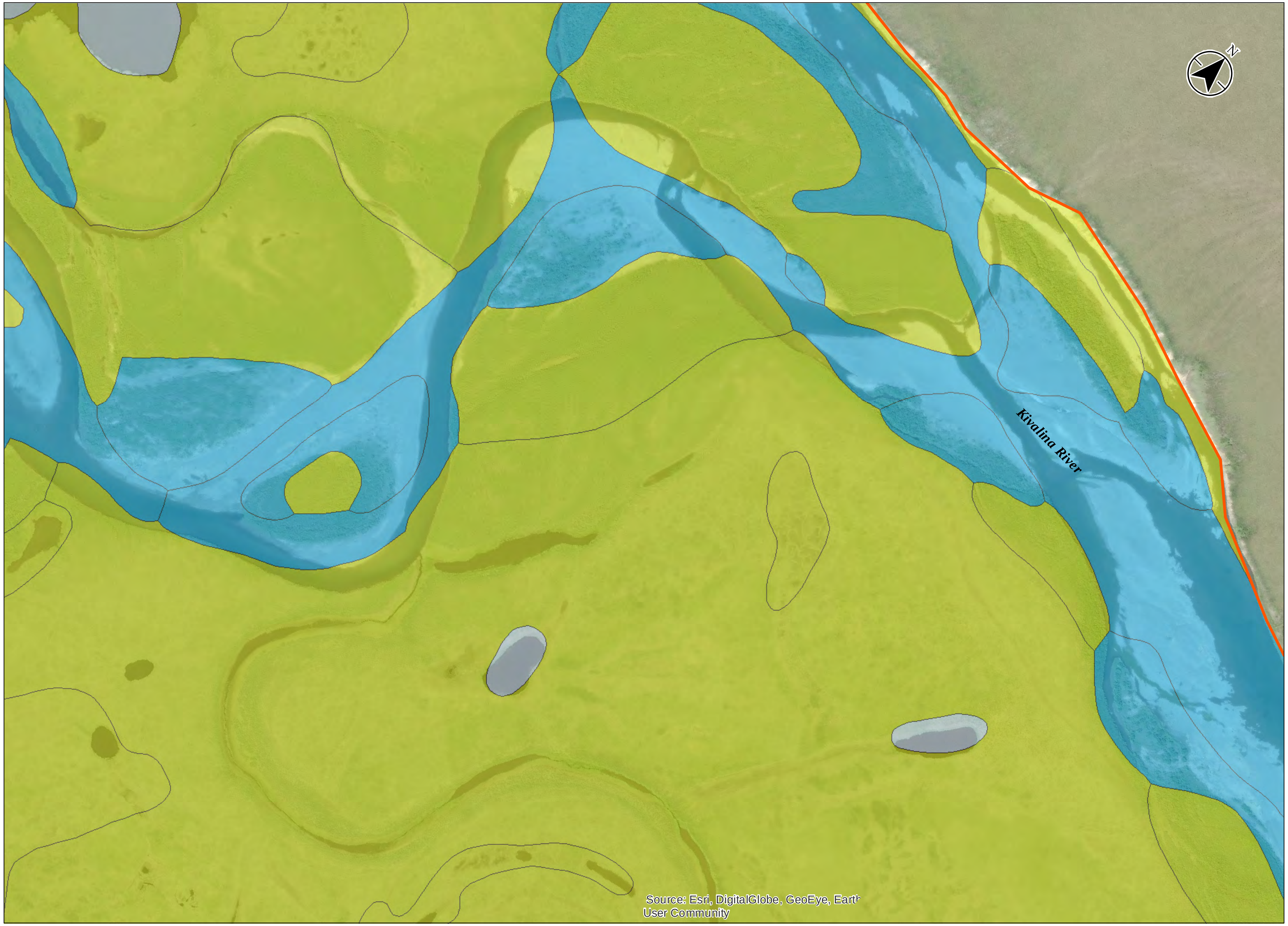

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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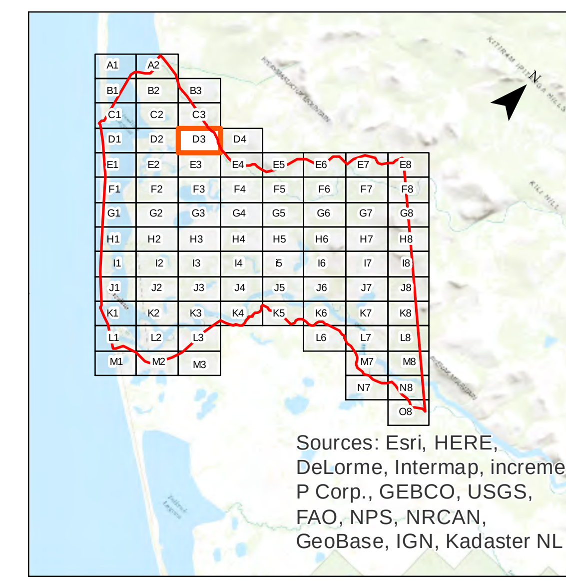


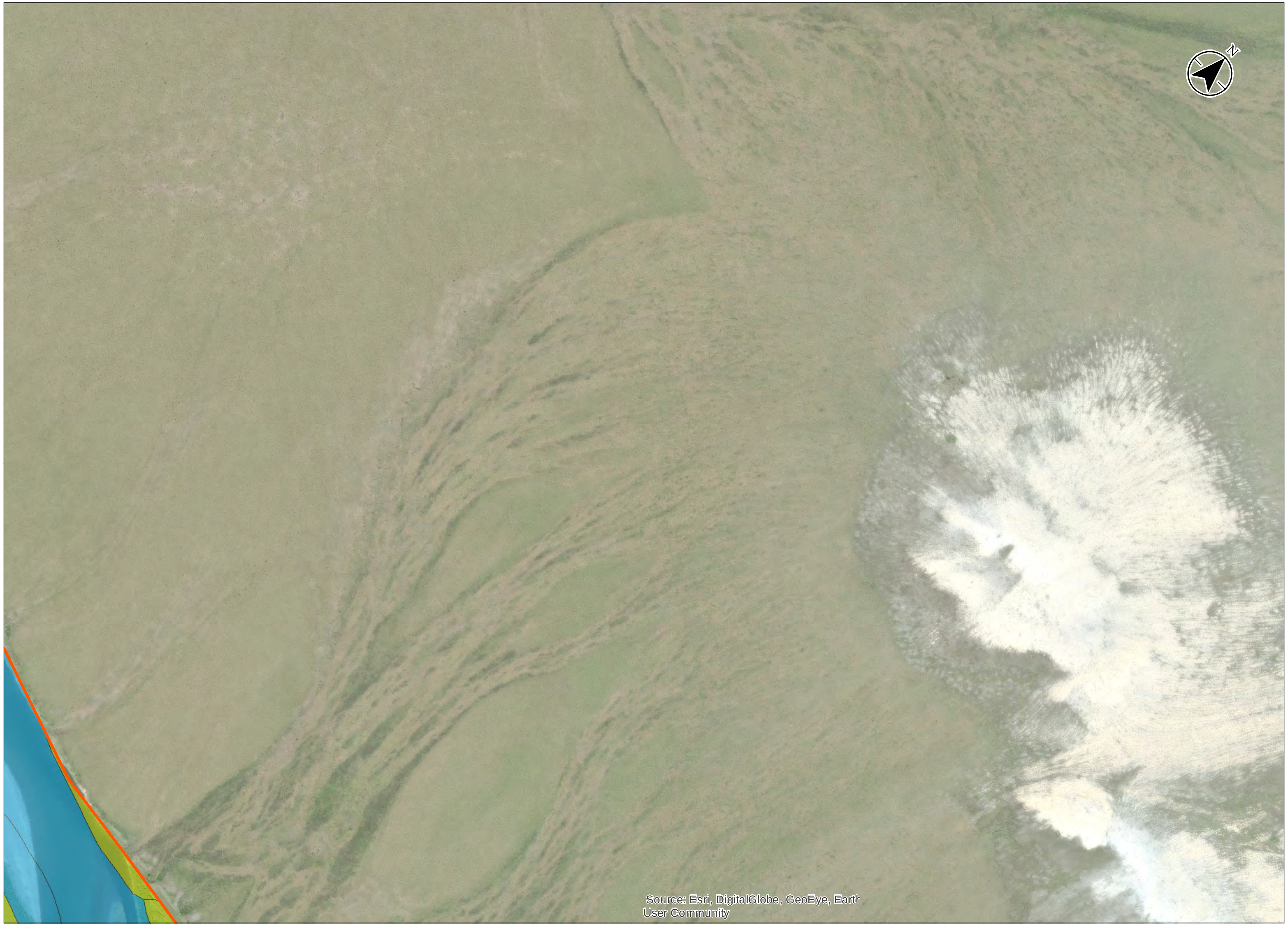
Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - D3

Title
Kivalina Evacuation and School Site Access Road - Wetlands



0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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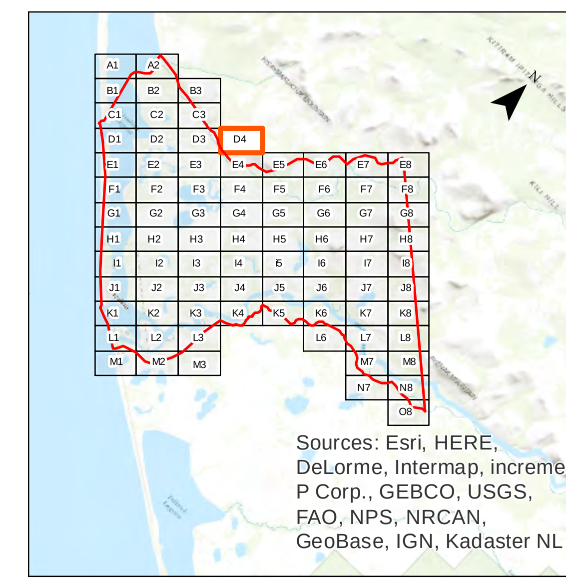

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - D4

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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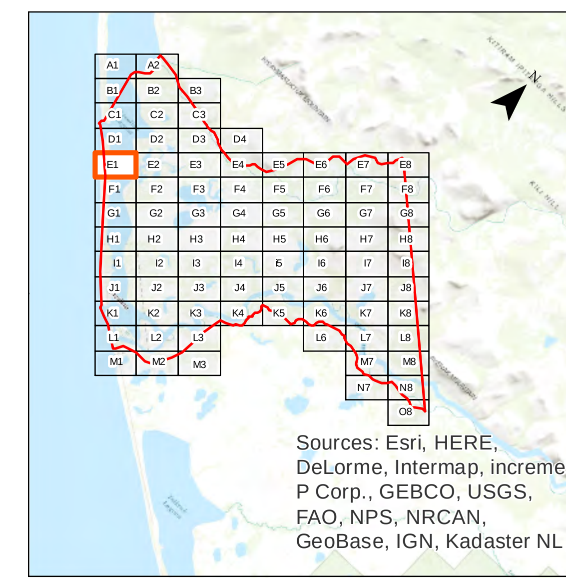

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - E1

Title
Kivalina Evacuation and School Site Access Road - Wetlands

Page 15 of 87

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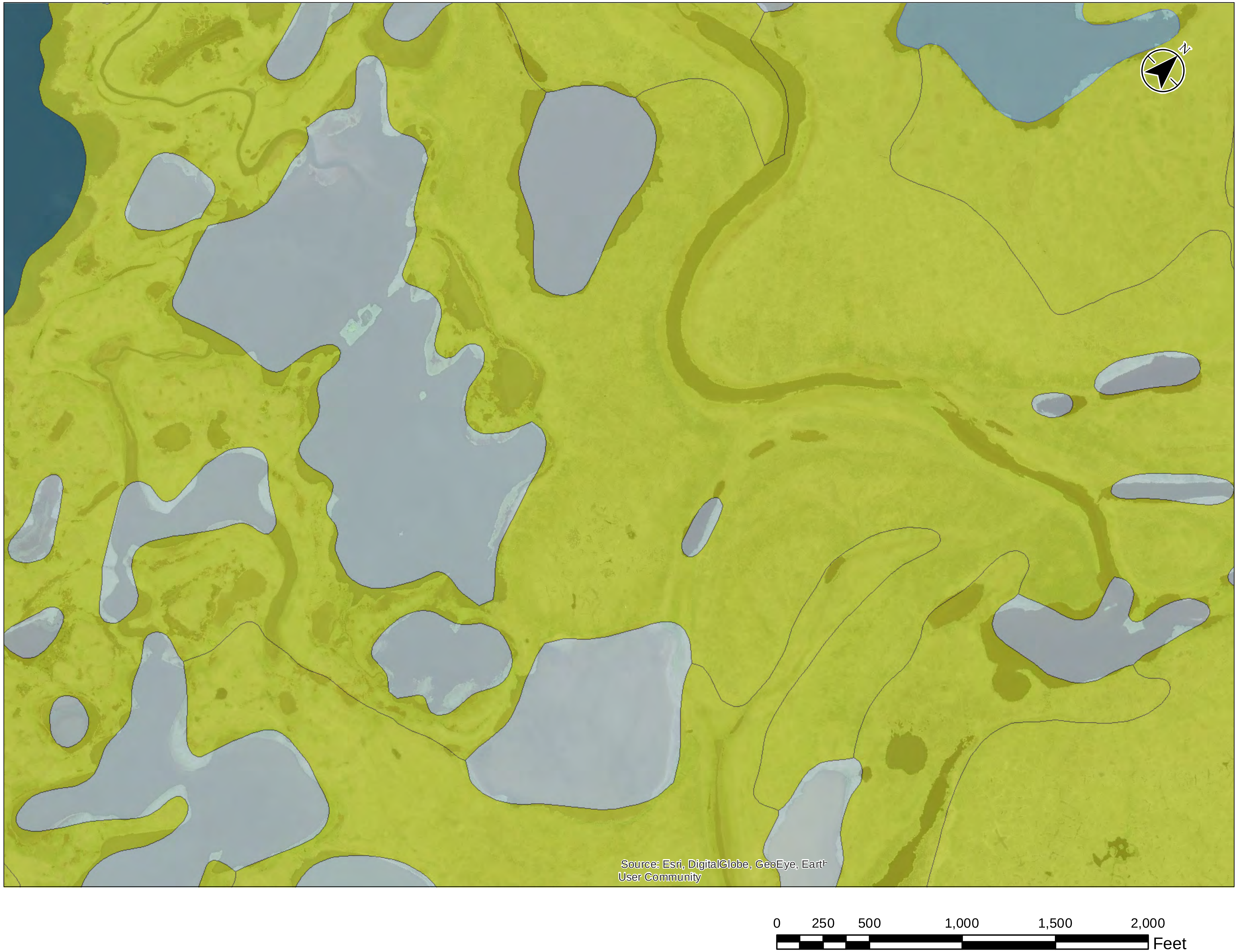

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Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
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- Riverine
- Upland
- Study Area

Notes

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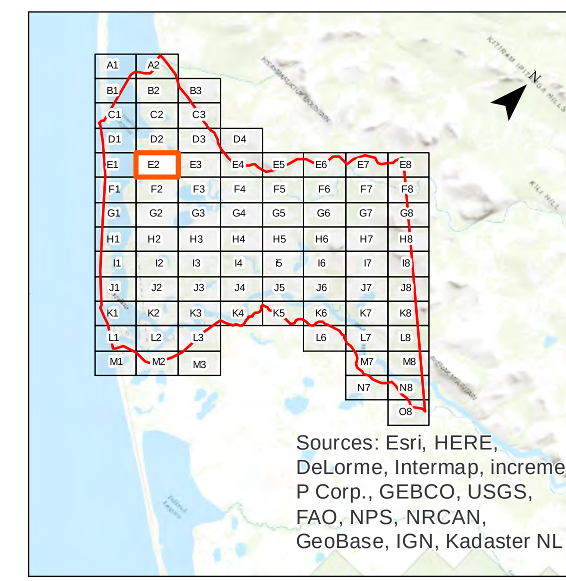


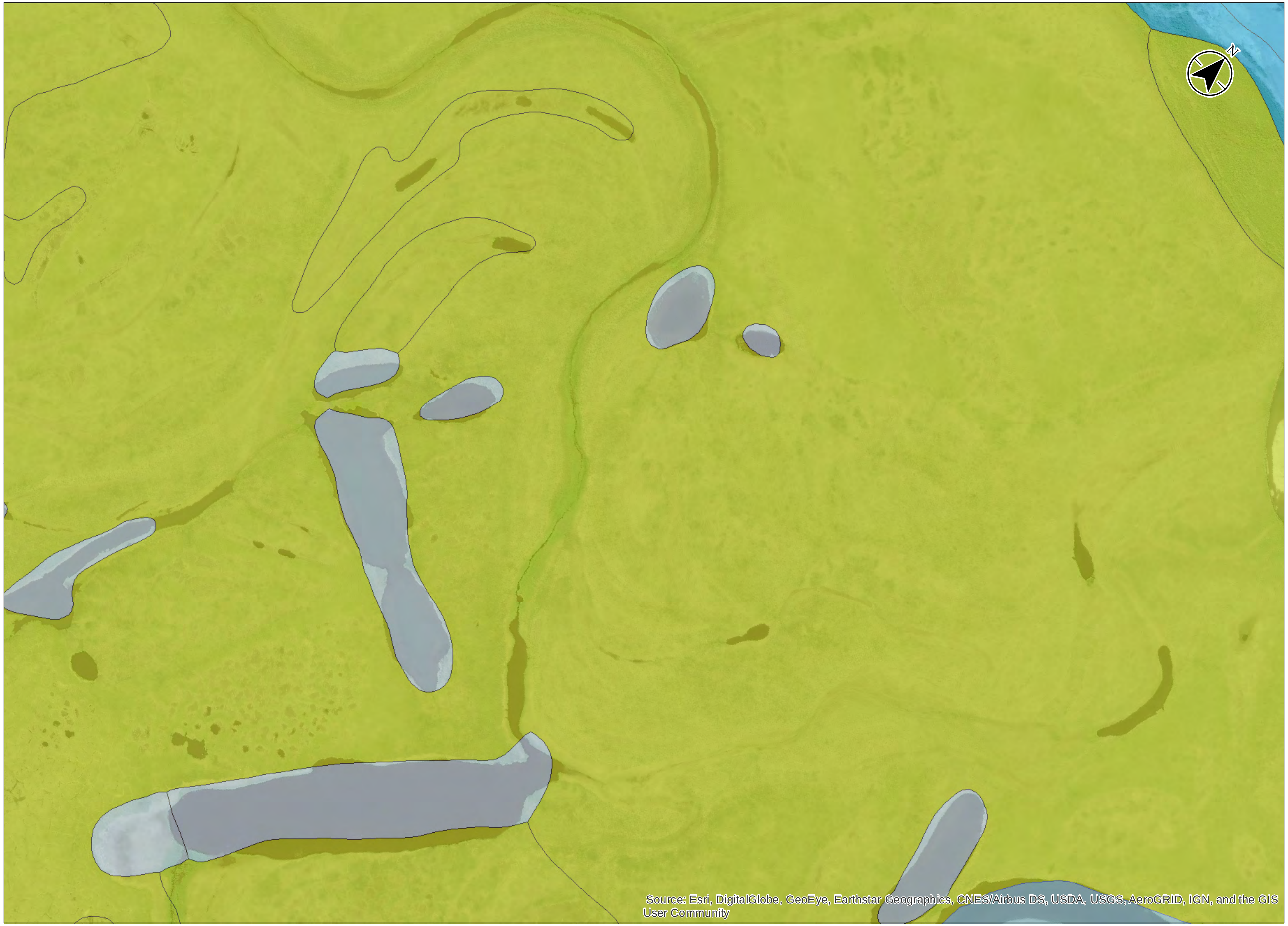
Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - E2

Title
Kivalina Evacuation and School Site Access Road - Wetlands



0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
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- Upland
- Study Area

Notes

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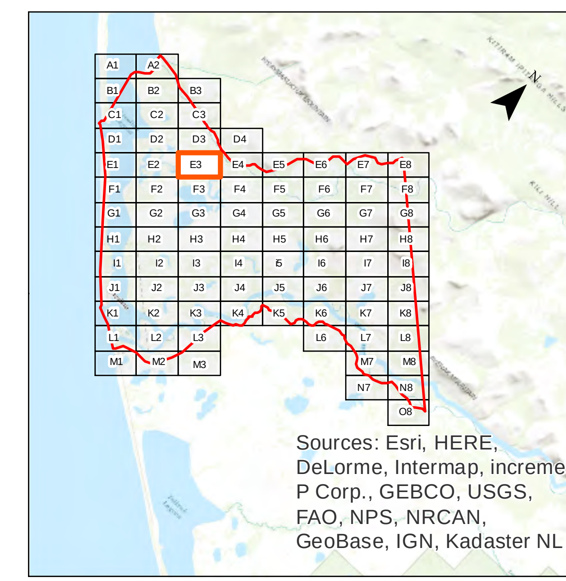

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - E3

Title
Kivalina Evacuation and School Site Access Road - Wetlands

0 250 500 1,000 1,500 2,000
Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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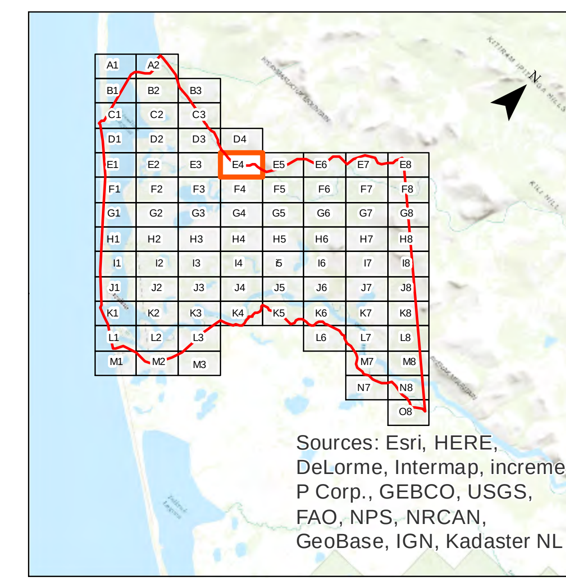

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - E4

Title
Kivalina Evacuation and School Site
Access Road - Wetlands

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0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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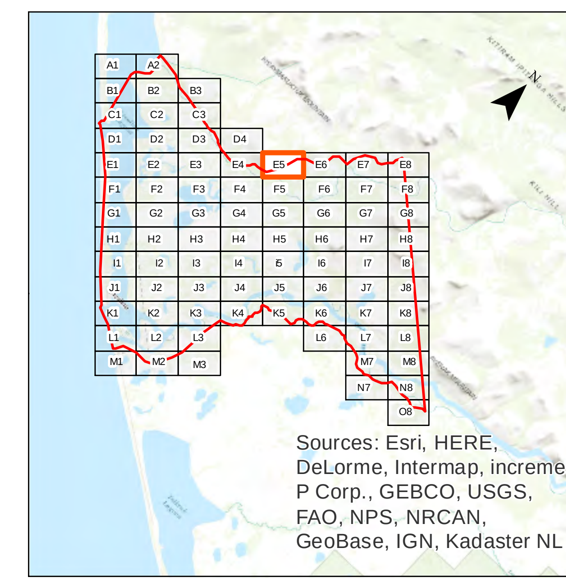

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - E5

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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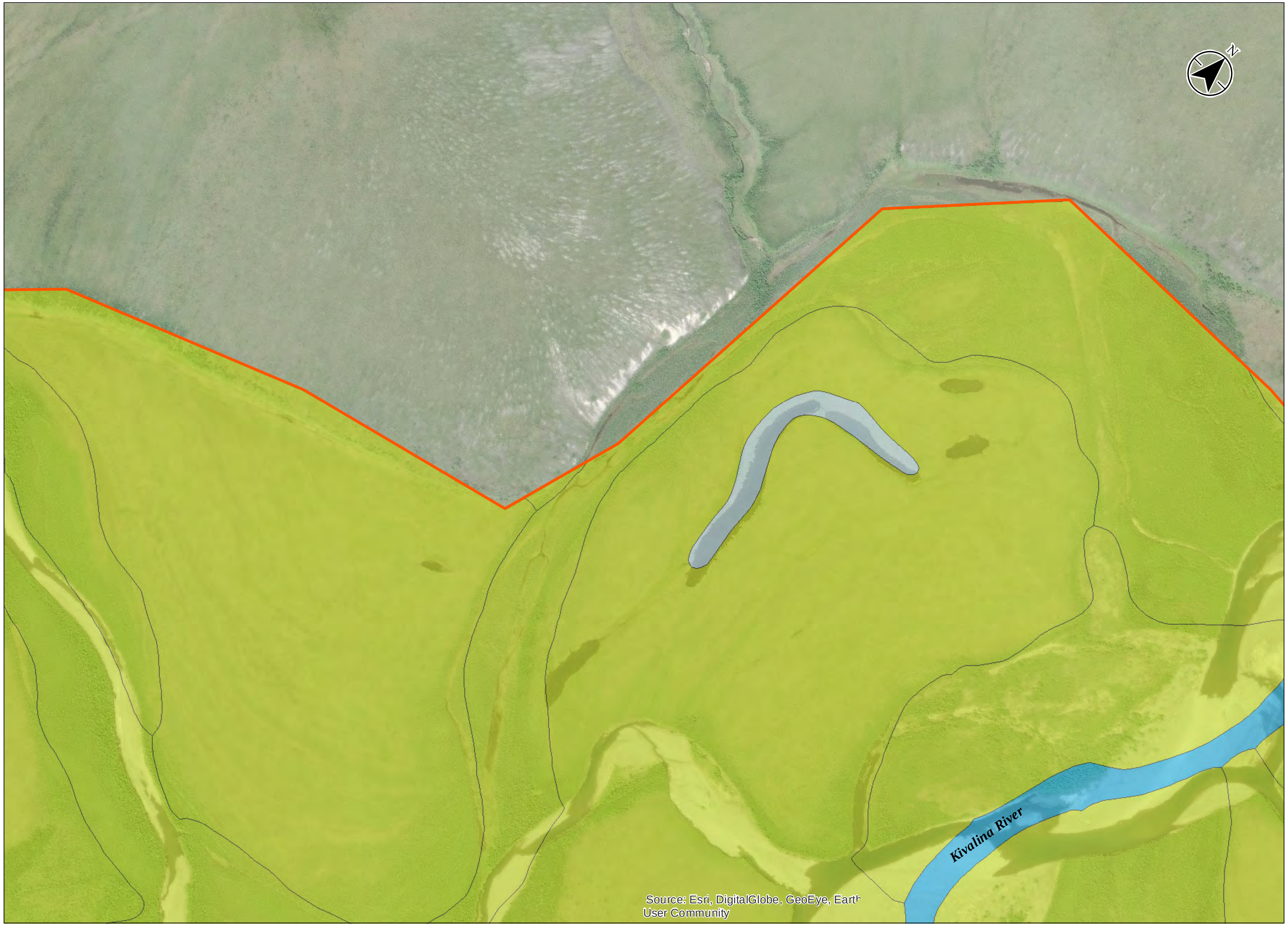

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Feet

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Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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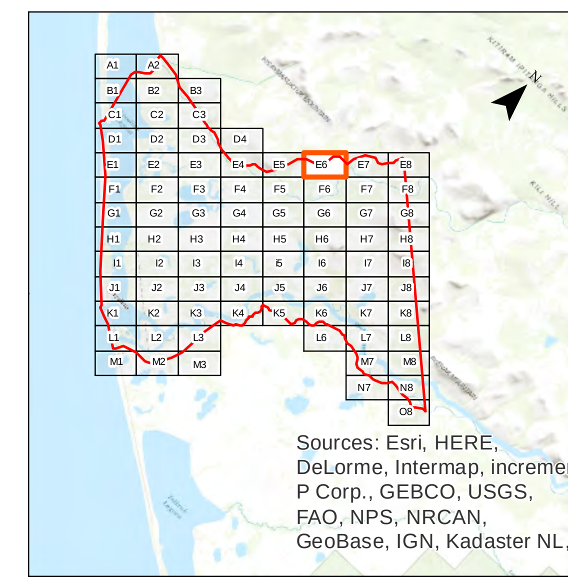

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - E6

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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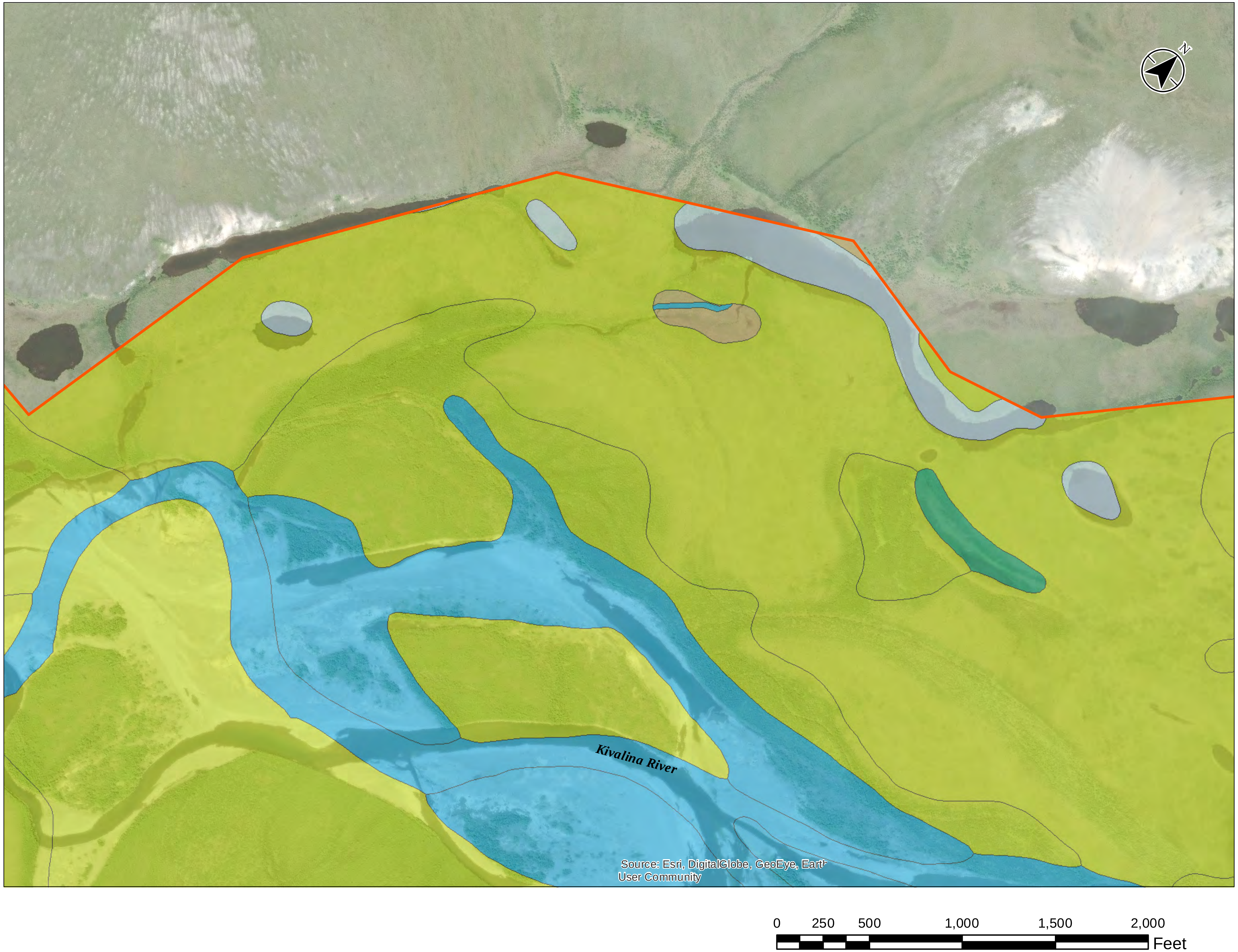

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Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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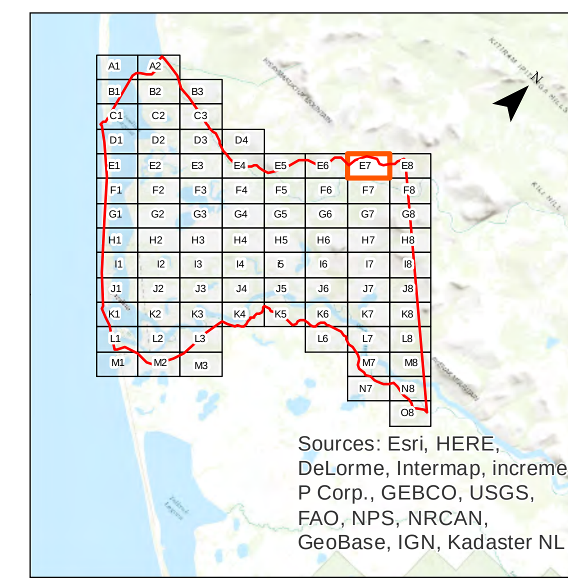

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - E7

Title
Kivalina Evacuation and School Site Access Road - Wetlands

Page 21 of 87

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Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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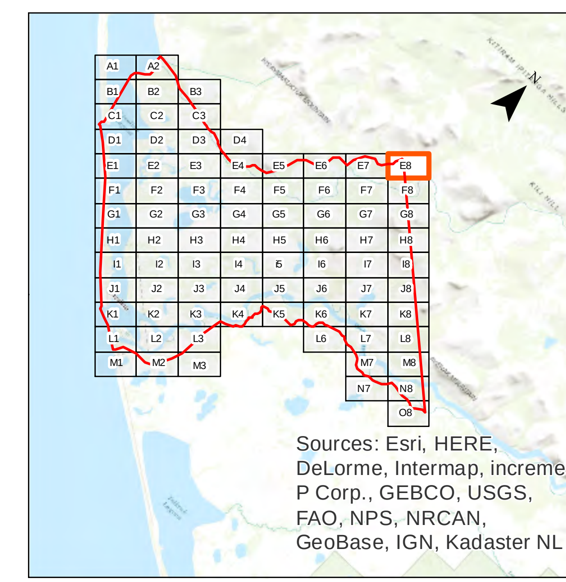

Project Location	002(384)/NFHWYP00162 REVA
Project Origin: Kivalina, Alaska	Prepared by CDP on 2017-06-23
Section 21, Township 27N, Range 26W	Technical Review by ABC on 2017-0X-XX
Kateel River Meridian	Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - E8

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
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- Riverine
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- Study Area

Notes

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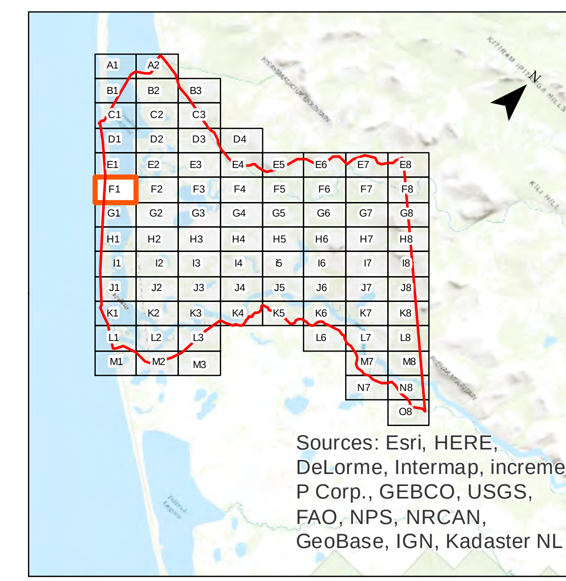

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - F1

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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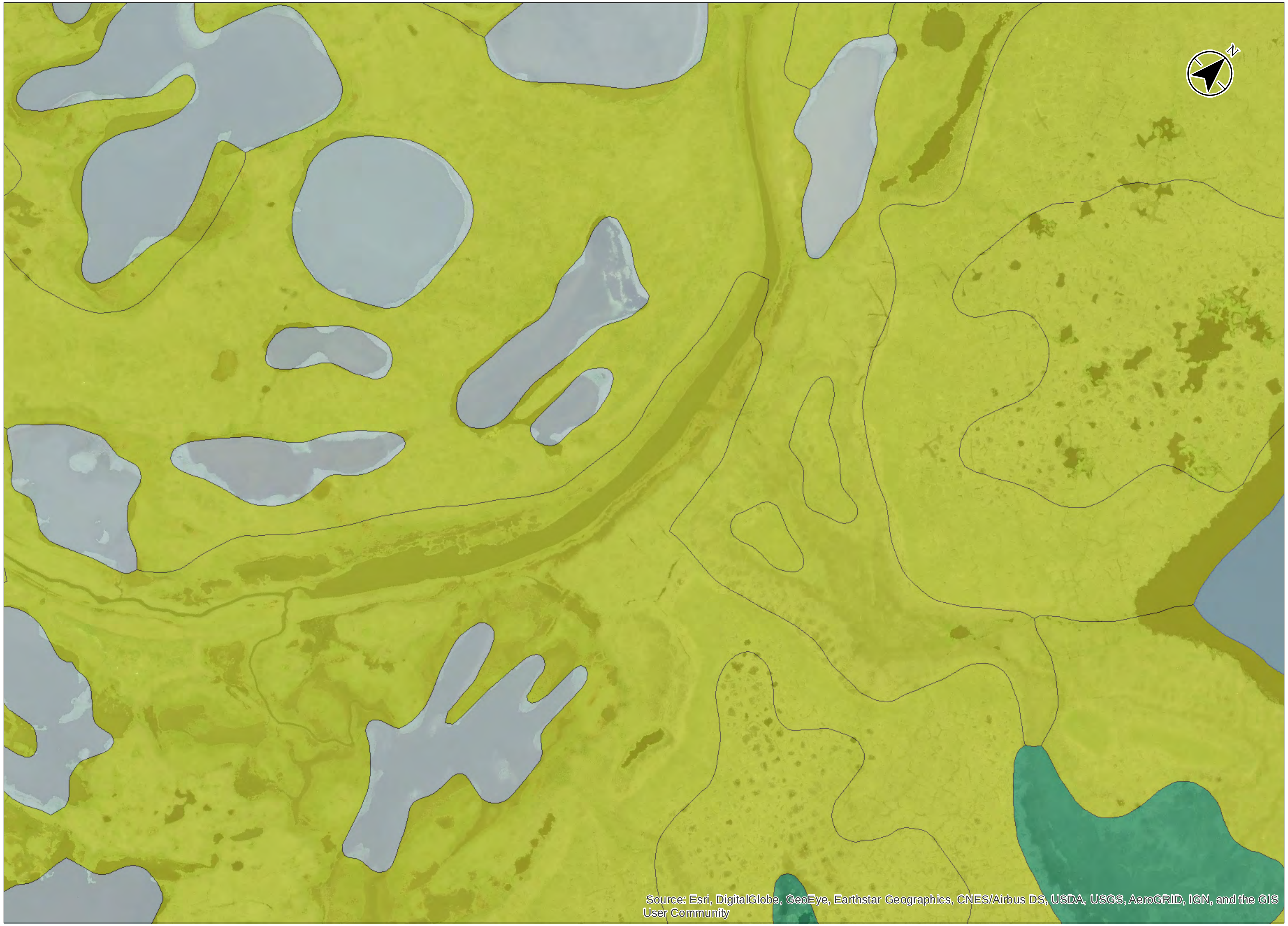

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
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- Study Area

Notes

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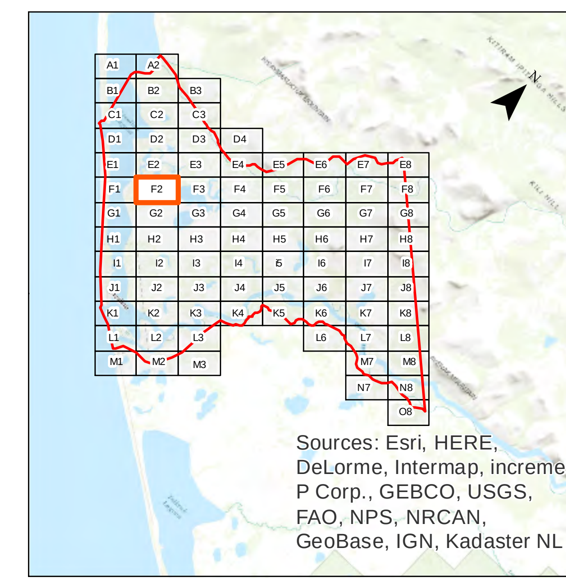

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
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Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - F2

Title
Kivalina Evacuation and School Site Access Road - Wetlands

0 250 500 1,000 1,500 2,000
Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

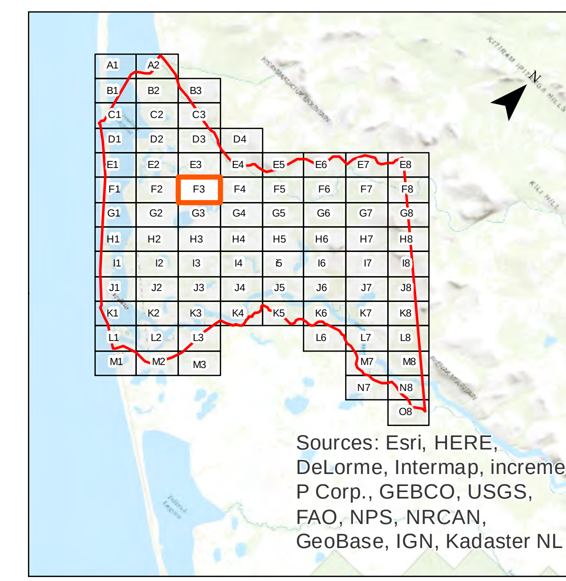
- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - F3

Title
Kivalina Evacuation and School Site Access Road - Wetlands

0 250 500 1,000 1,500 2,000
Feet
1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

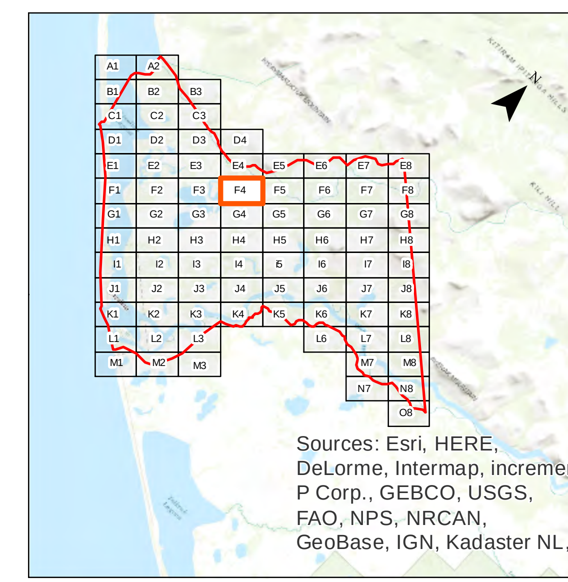
- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - F4

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

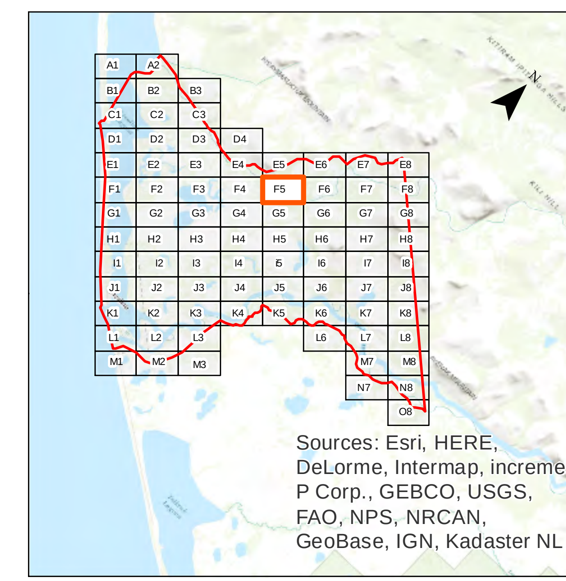
- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - F5

Title
Kivalina Evacuation and School Site Access Road - Wetlands

0 250 500 1,000 1,500 2,000
Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

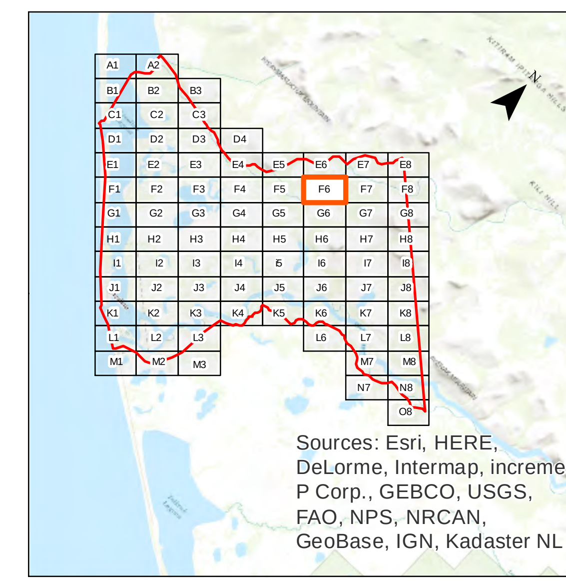
- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - F6

Title
Kivalina Evacuation and School Site Access Road - Wetlands

0 250 500 1,000 1,500 2,000
Feet

1:6,500 (At original document size of 11x17)

Legend

Data Points (2016)

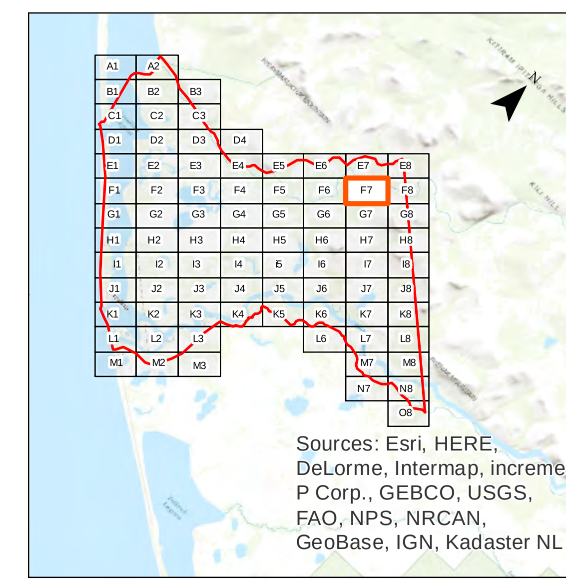
- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



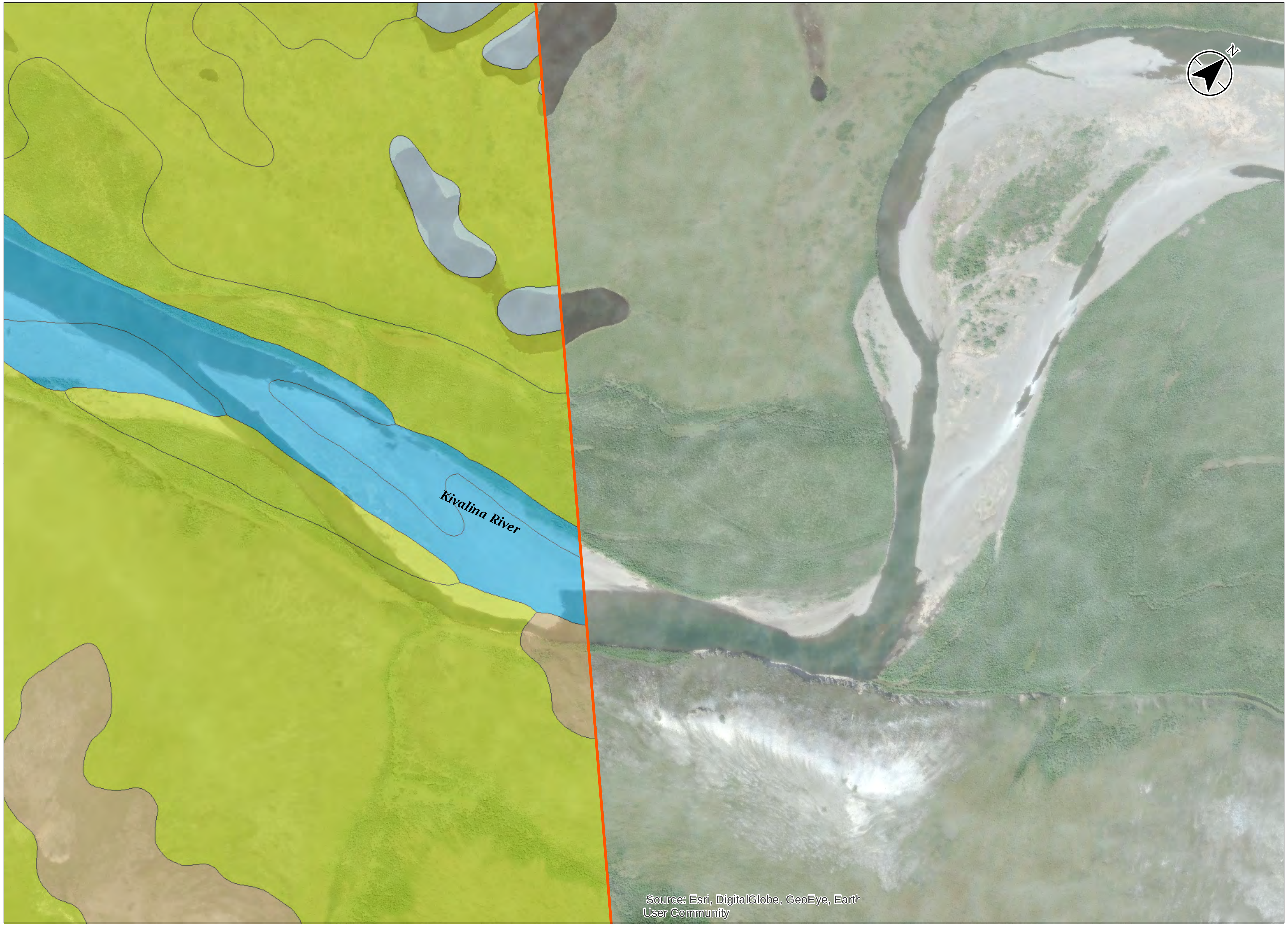
Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - F7

Title
Kivalina Evacuation and School Site Access Road - Wetlands



0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
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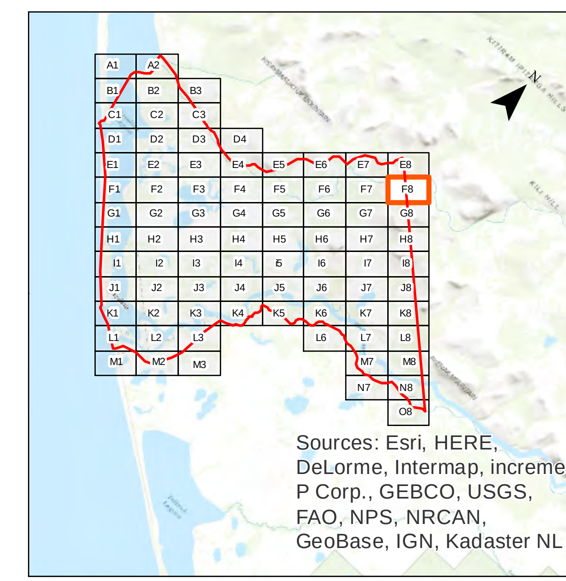

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - F8

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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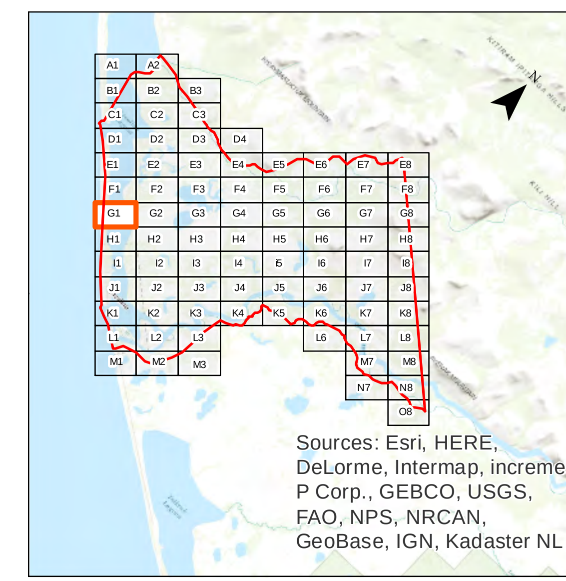


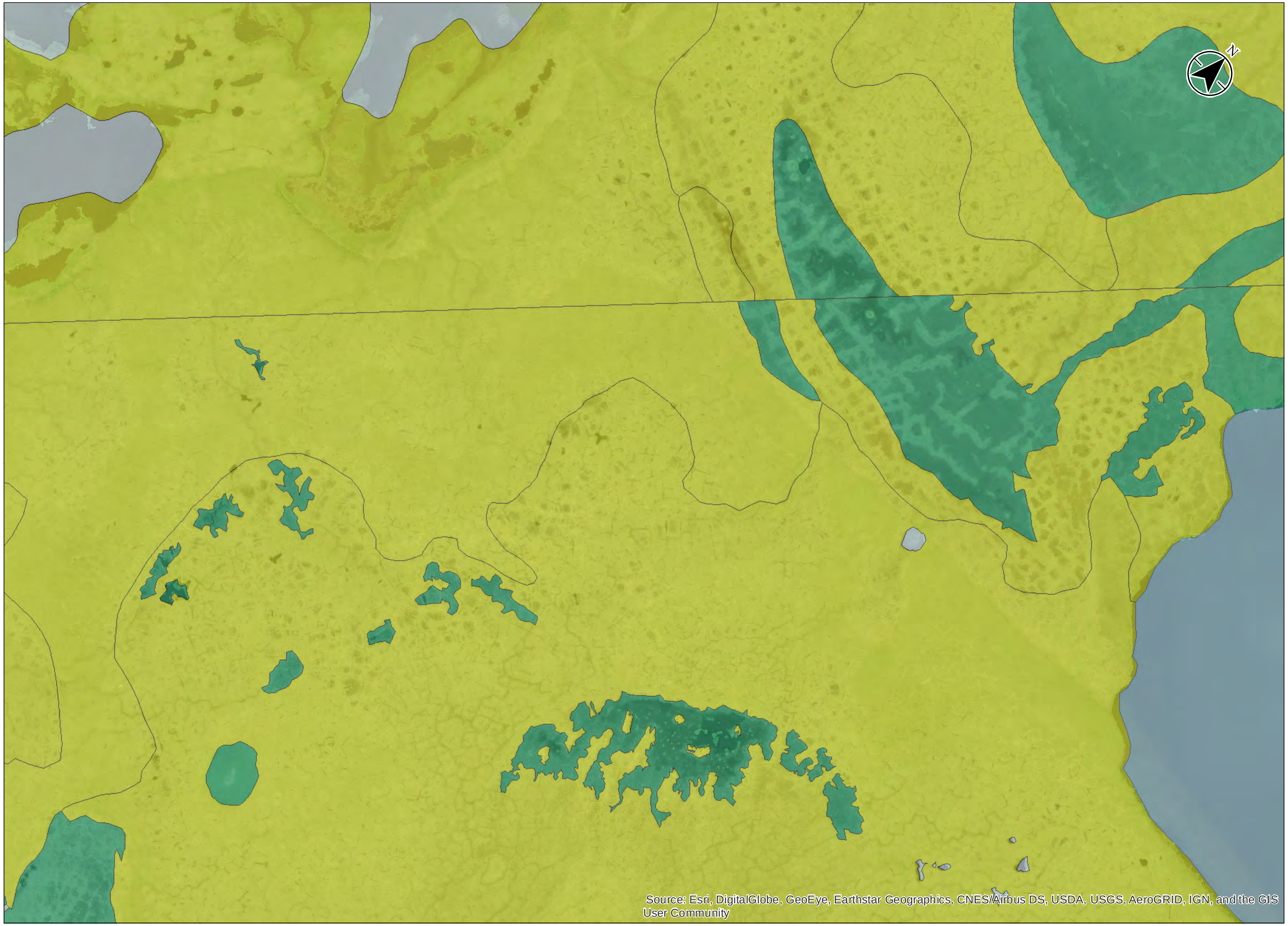
Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - G1

Title
Kivalina Evacuation and School Site Access Road - Wetlands



0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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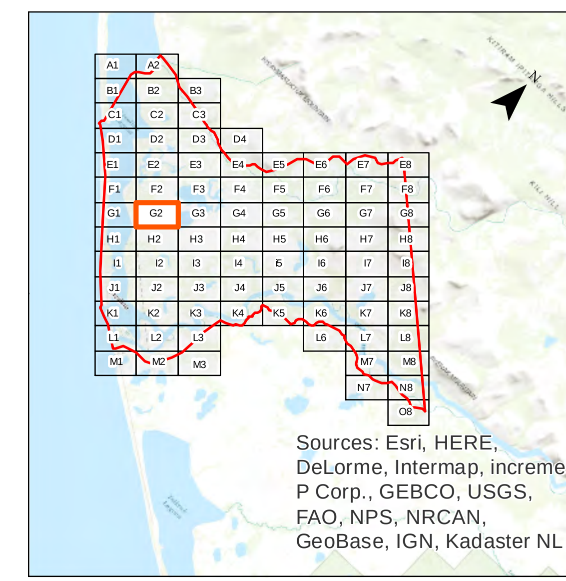

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - G2

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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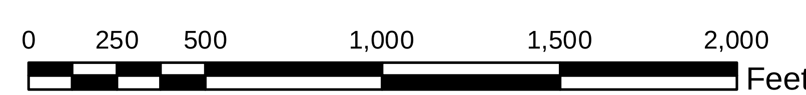

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
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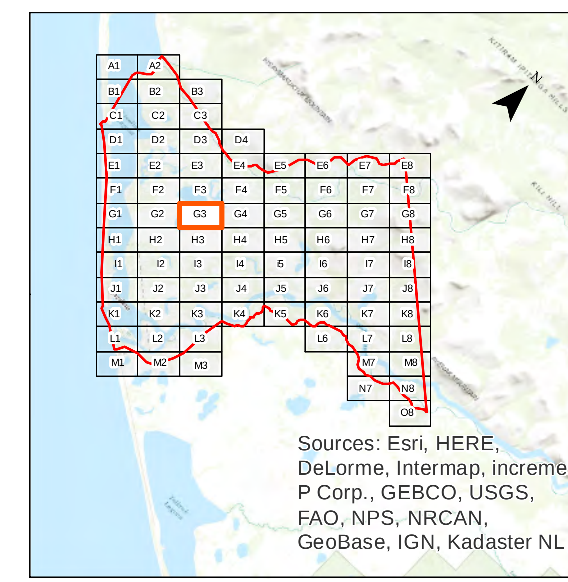

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - G3

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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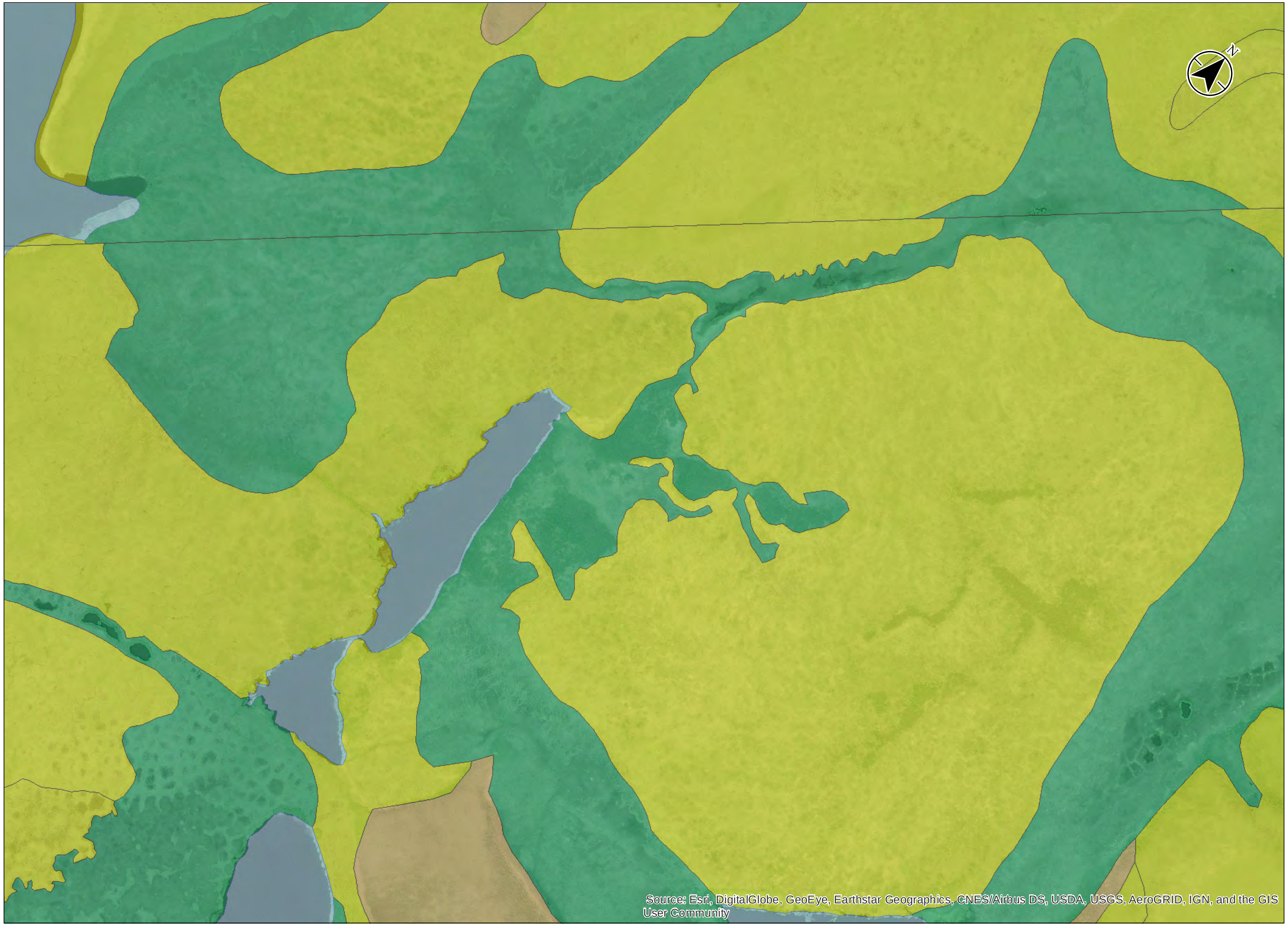

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
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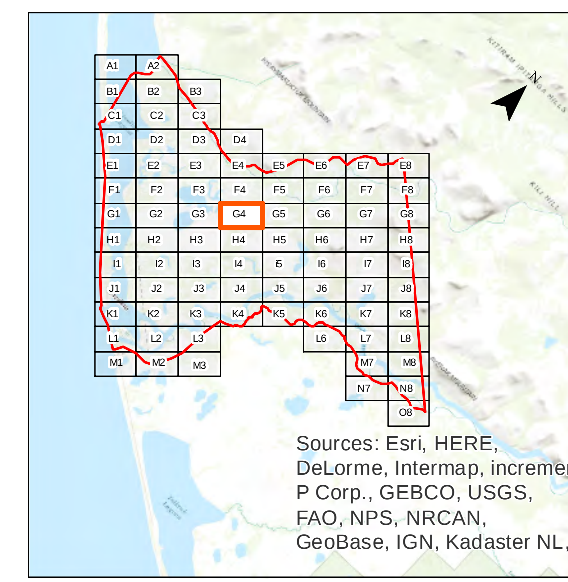

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - G4

Title
Kivalina Evacuation and School Site Access Road - Wetlands

U:\2047055102\GIS\mxd\Wetland Report Figs\Fig 2-1 2-XXX Cowardin draft.mxd Revised: 2017-09-14 By: cpannone

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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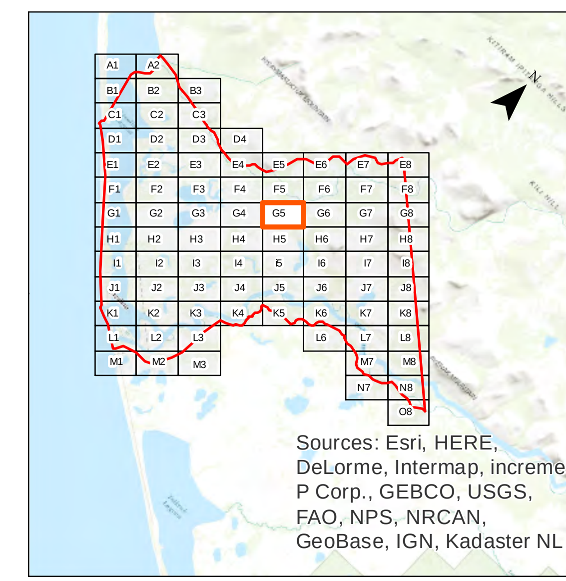
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - G5

Title
Kivalina Evacuation and School Site Access Road - Wetlands

Page 35 of 87

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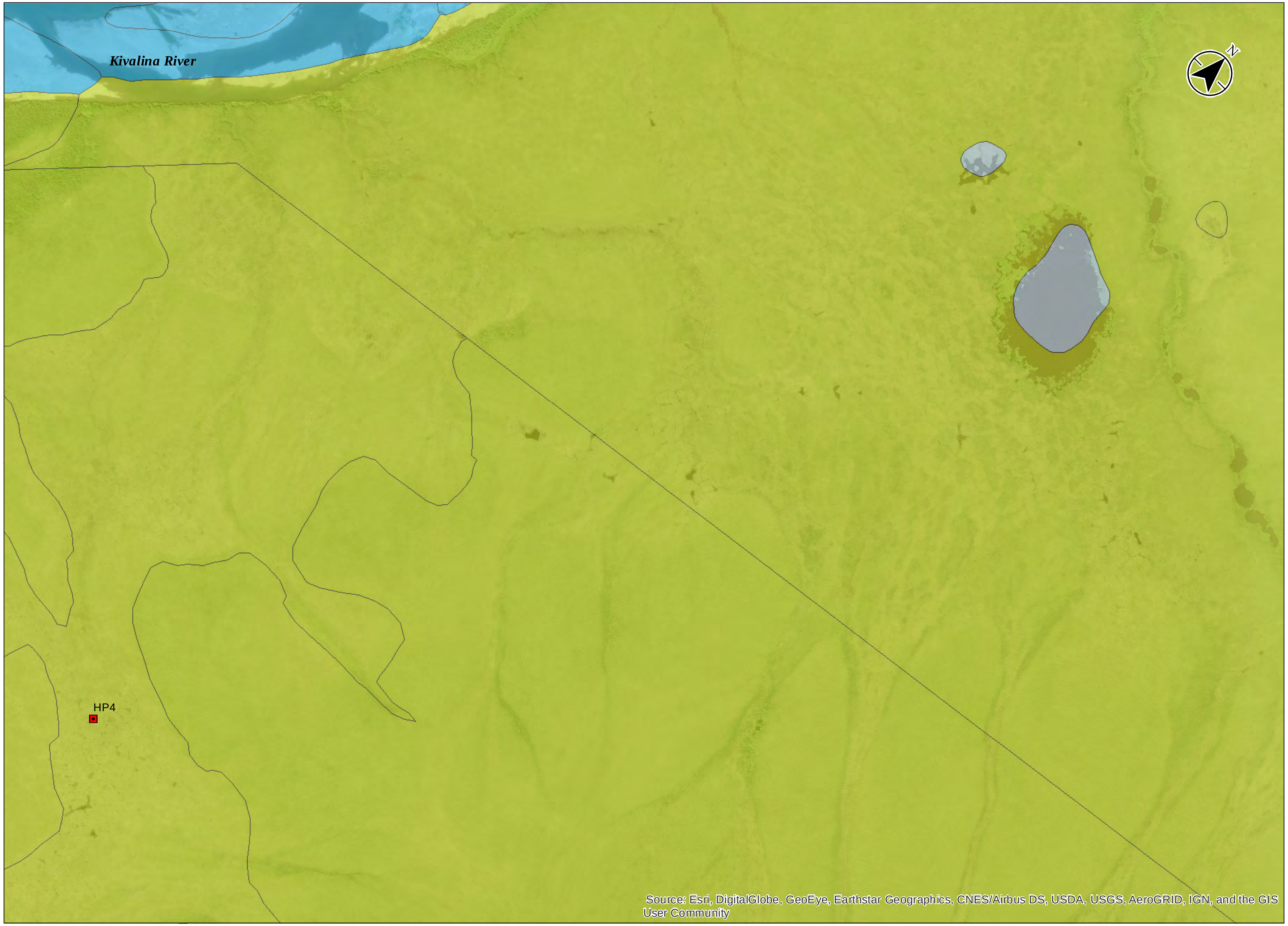

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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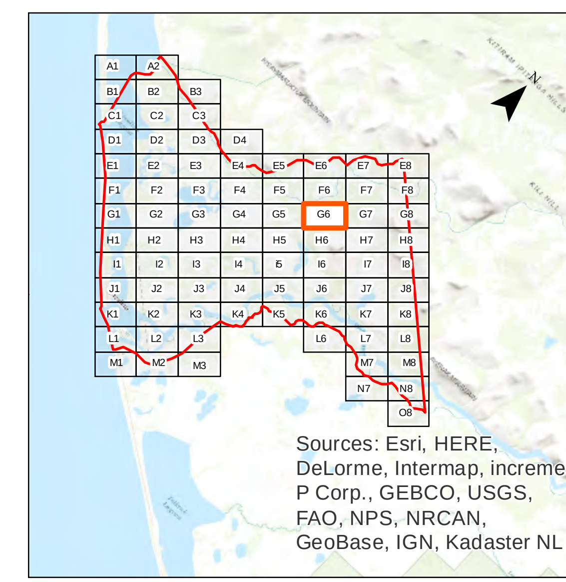

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL,

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - G6

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
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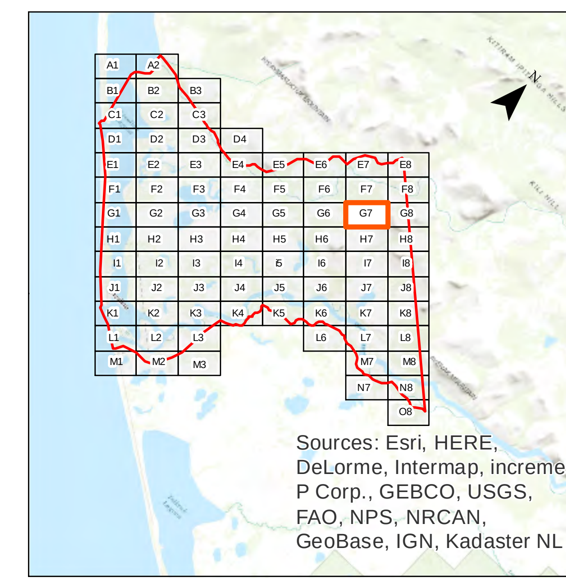

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - G7

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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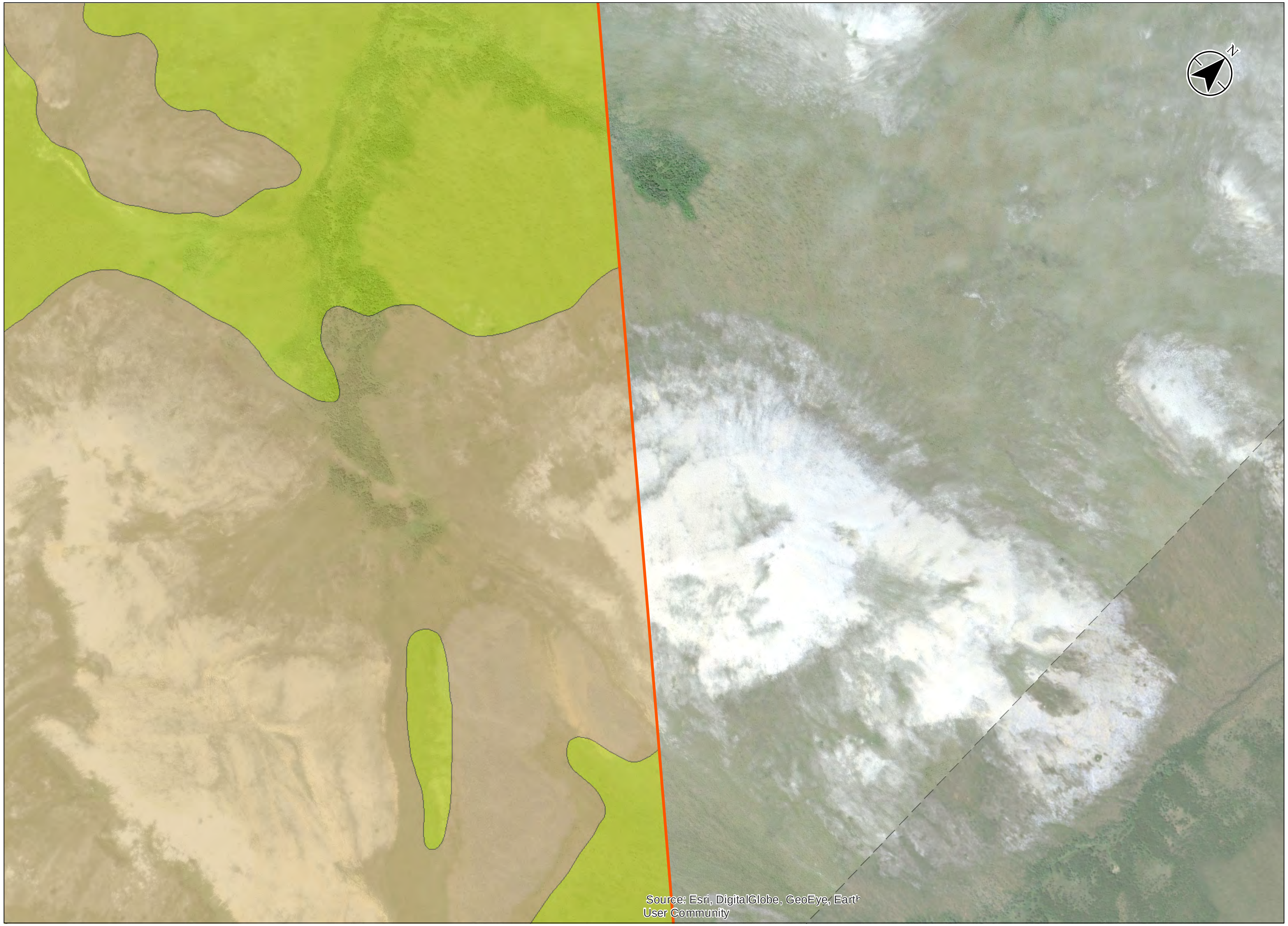

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
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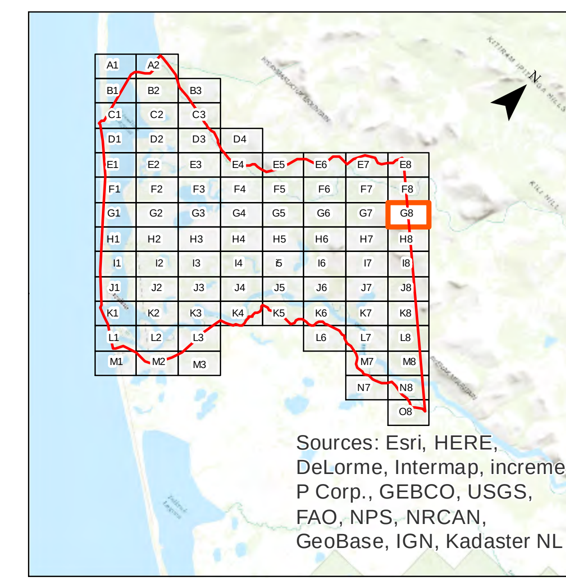
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - G8

Title
Kivalina Evacuation and School Site Access Road - Wetlands

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
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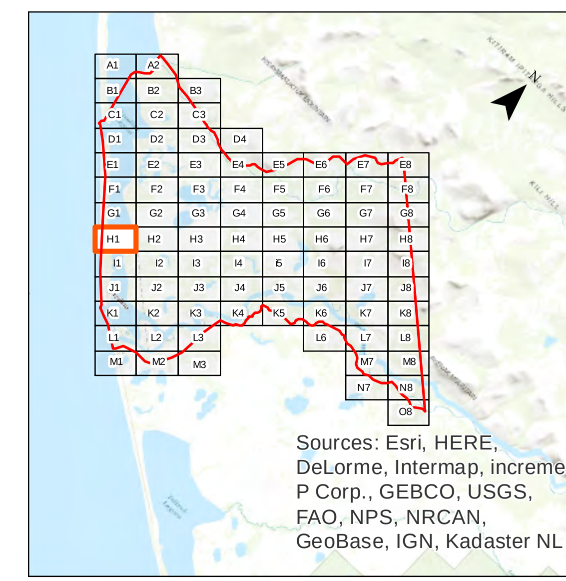

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - H1

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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0 250 500 1,000 1,500 2,000
Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
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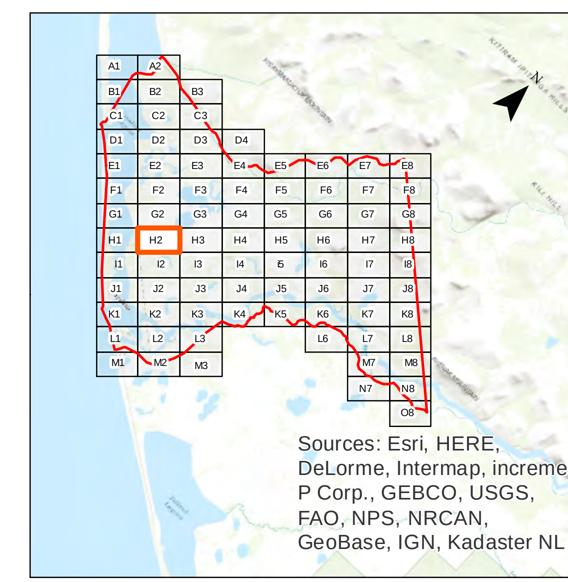

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - H2

Title
Kivalina Evacuation and School Site Access Road - Wetlands

U:\2047055102\GIS\mxd\Wetland Report Figs\Fig 2-1 2-XXX Cowardin draft.mxd Revised: 2017-09-14 By: cpannone

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
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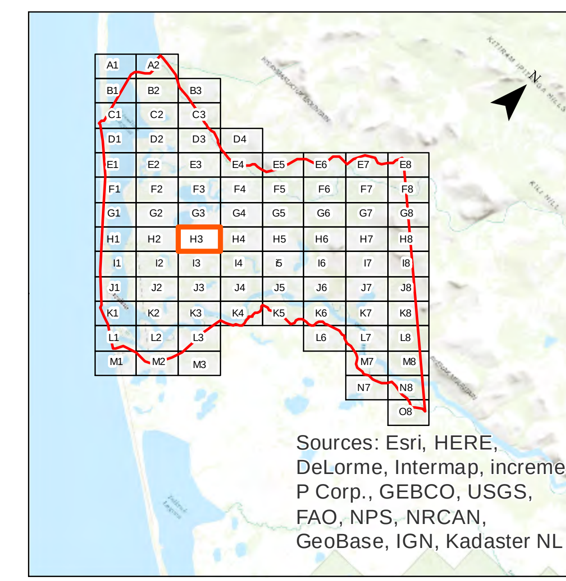

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - H3

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
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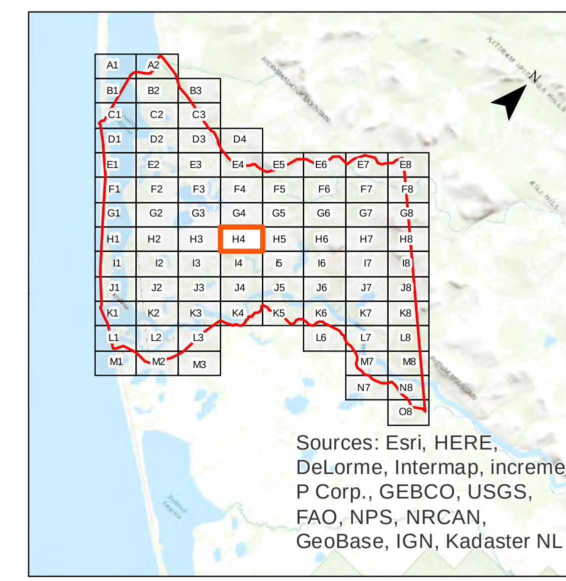

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - H4

Title
Kivalina Evacuation and School Site Access Road - Wetlands

U:\2047055102\GIS\mxd\Wetland Report Figs\Fig 2-1 2-XXX Cowardin draft.mxd Revised: 2017-09-14 By: cpannone

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
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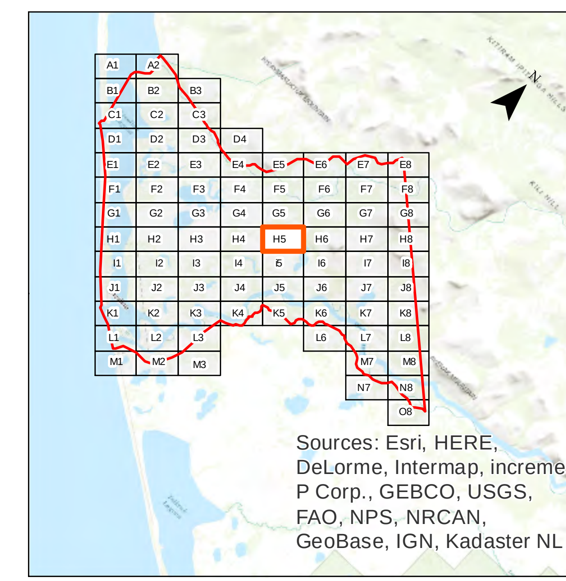

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - H5

Title
Kivalina Evacuation and School Site Access Road - Wetlands

Page 43 of 87

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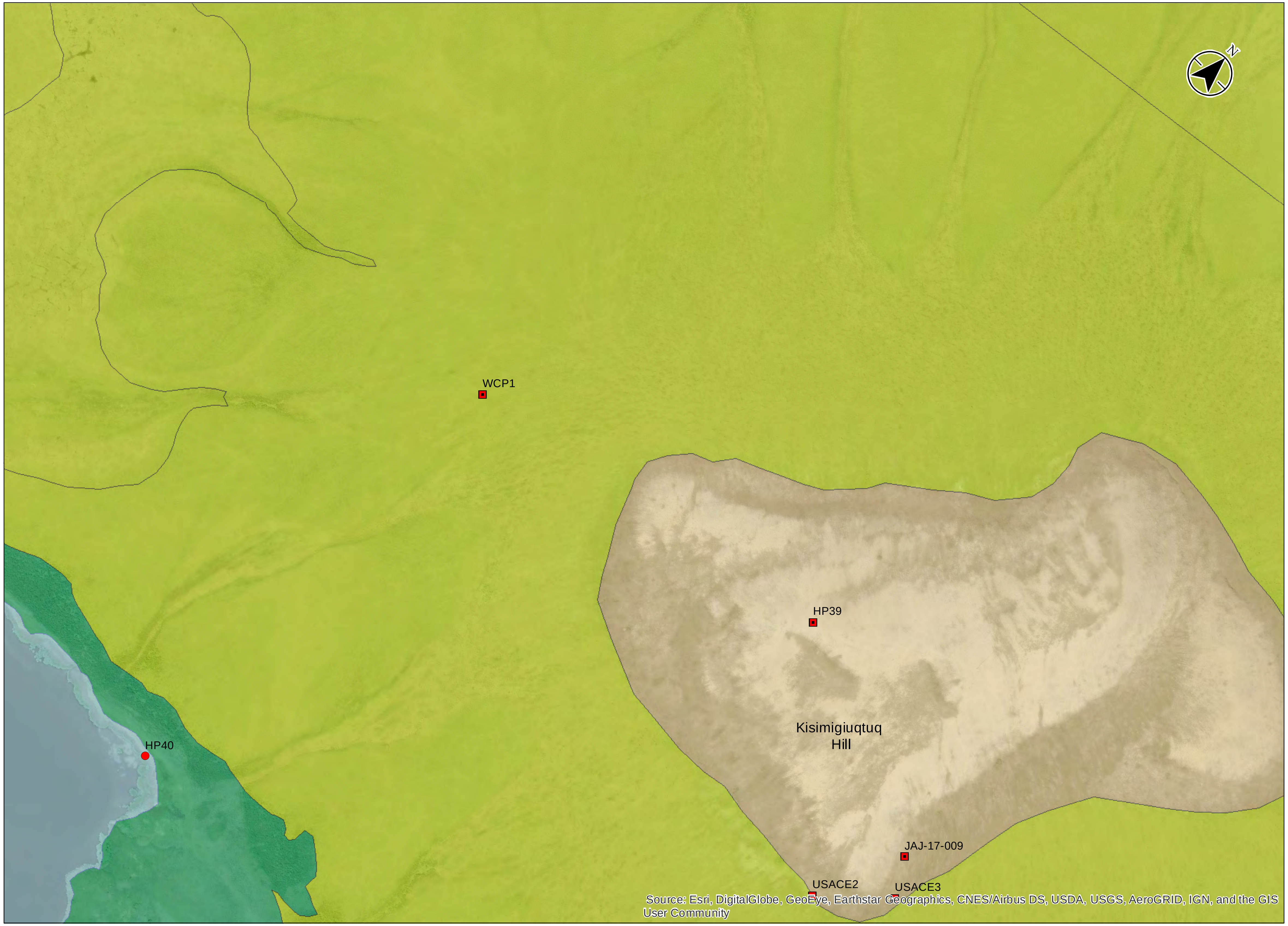

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
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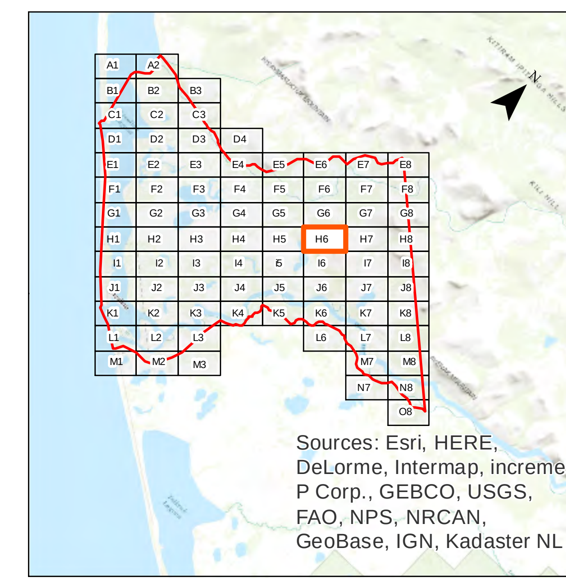

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - H6

Title
Kivalina Evacuation and School Site Access Road - Wetlands

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
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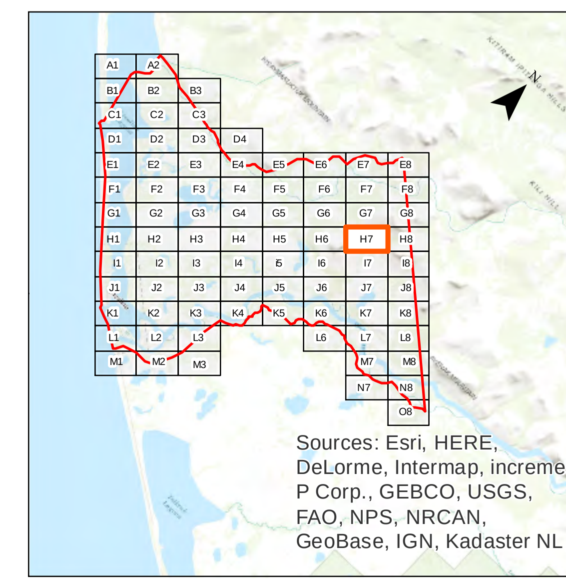


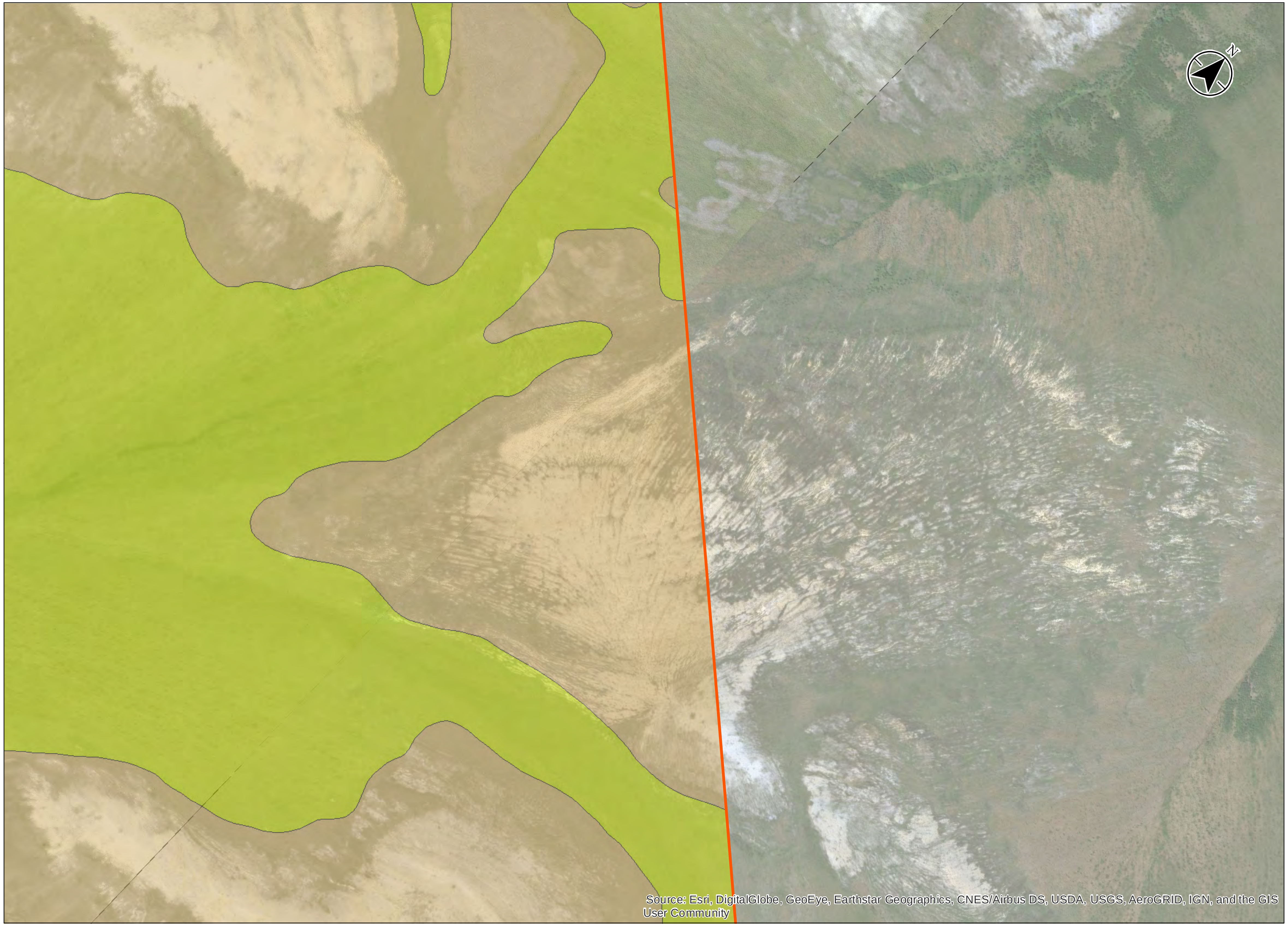
Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - H7

Title
Kivalina Evacuation and School Site Access Road - Wetlands



0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
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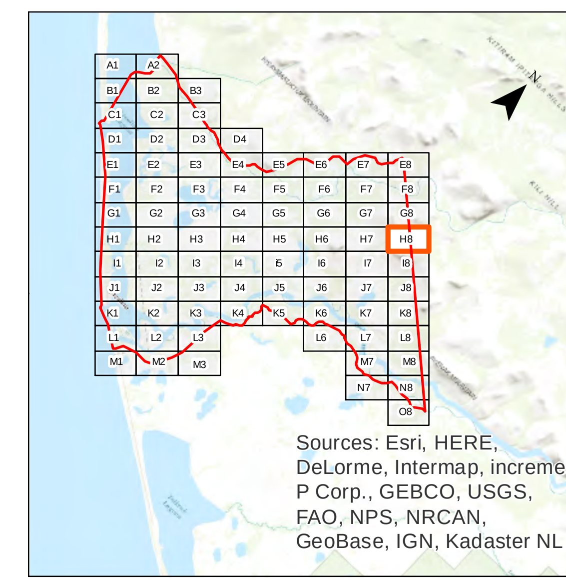

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - H8

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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0 250 500 1,000 1,500 2,000 Feet

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Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
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- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
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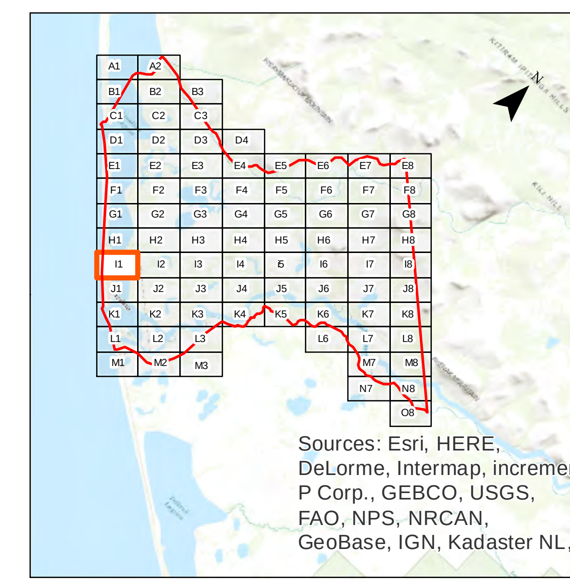

Project Location	002(384)/NFHWYP00162 REVA
Project Origin: Kivalina, Alaska	Prepared by CDP on 2017-06-23
Section 21, Township 27N, Range 26W	Technical Review by ABC on 2017-0X-XX
Kateel River Meridian	Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - I1

Title
Kivalina Evacuation and School Site Access Road - Wetlands

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

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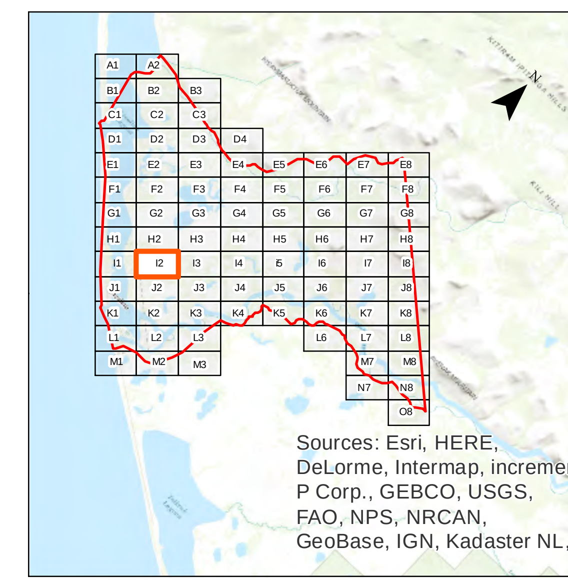

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - I2

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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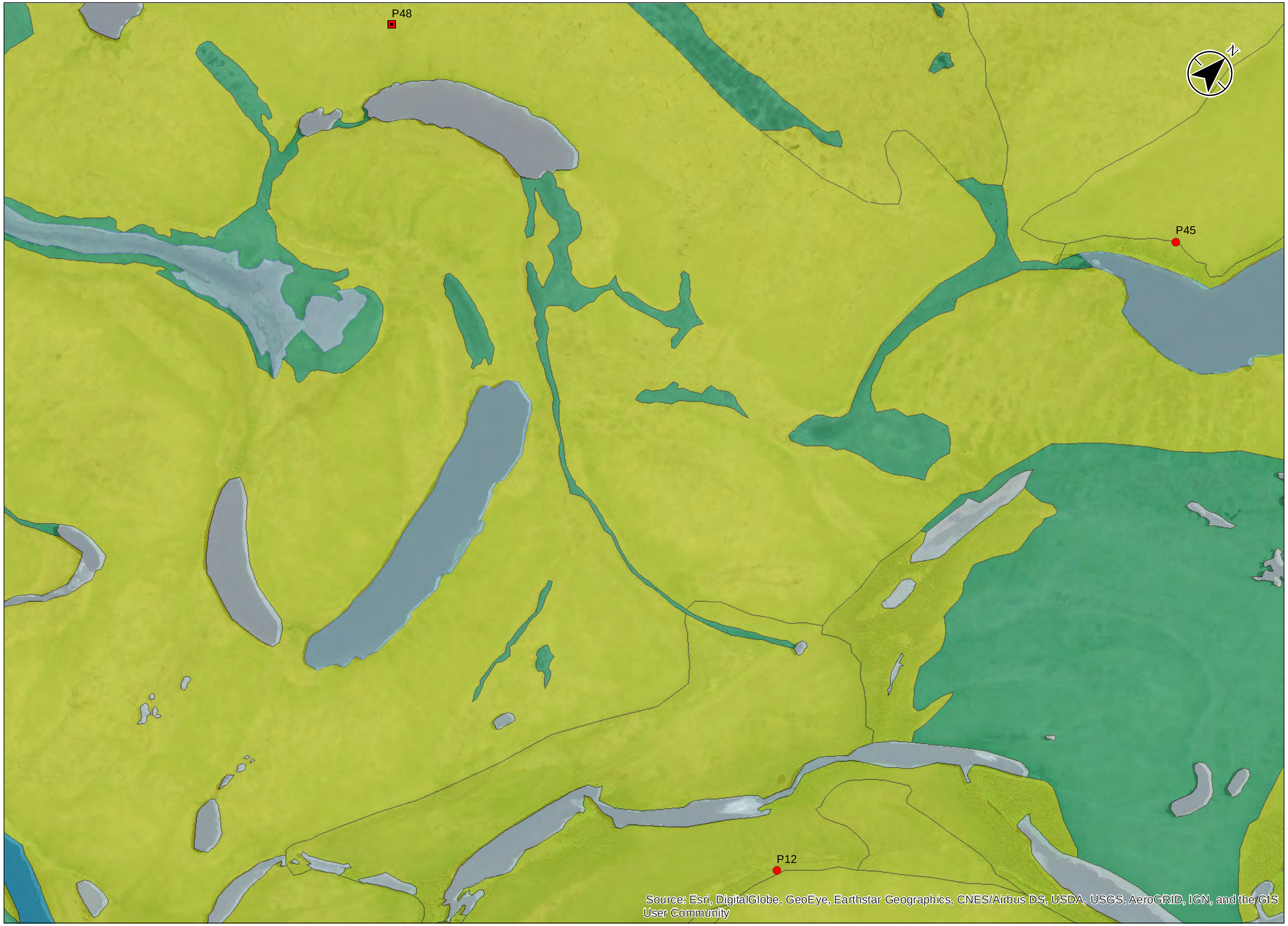

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
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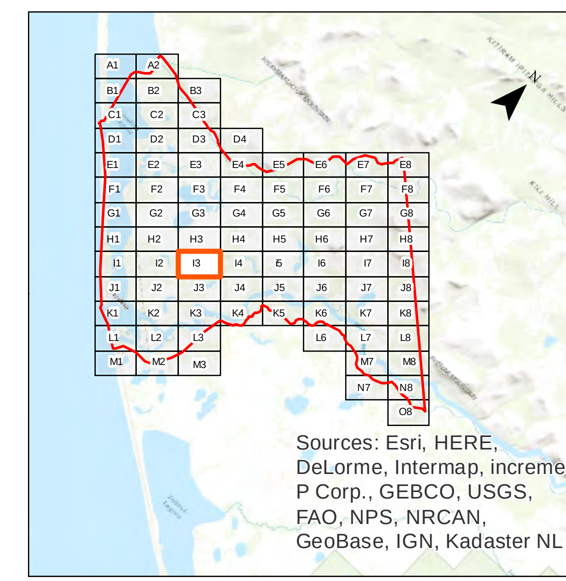

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - I3

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
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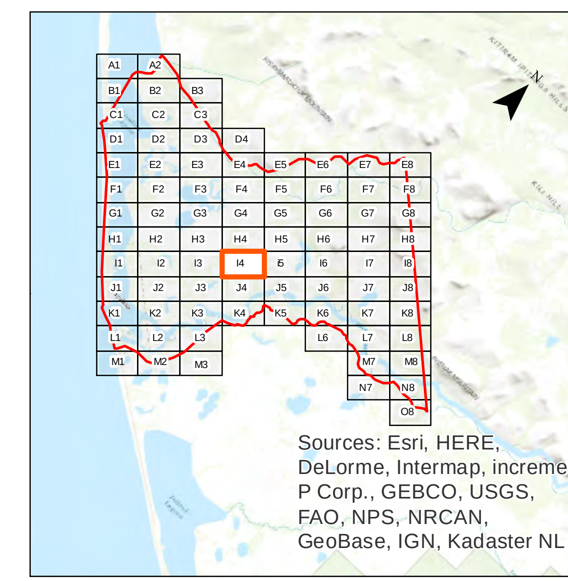

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Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - I4

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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U:\2047055102\GIS\mxd\Wetland Report Figs\Fig 2-1 2-XXX Cowardin draft.mxd Revised: 2017-09-14 By: cpannone

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
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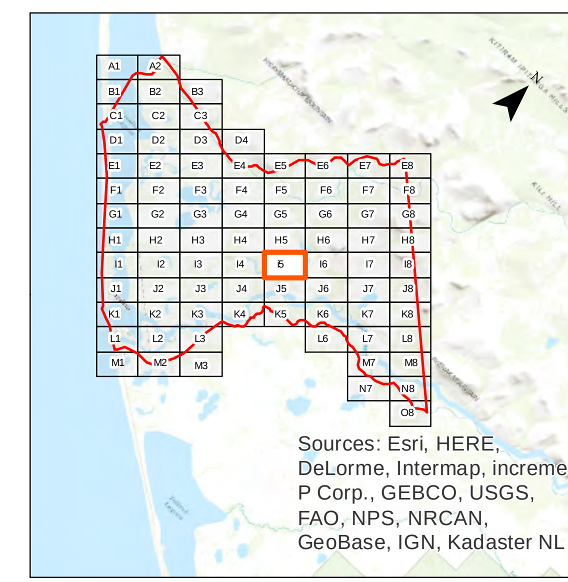
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - i5

Title
Kivalina Evacuation and School Site Access Road - Wetlands

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
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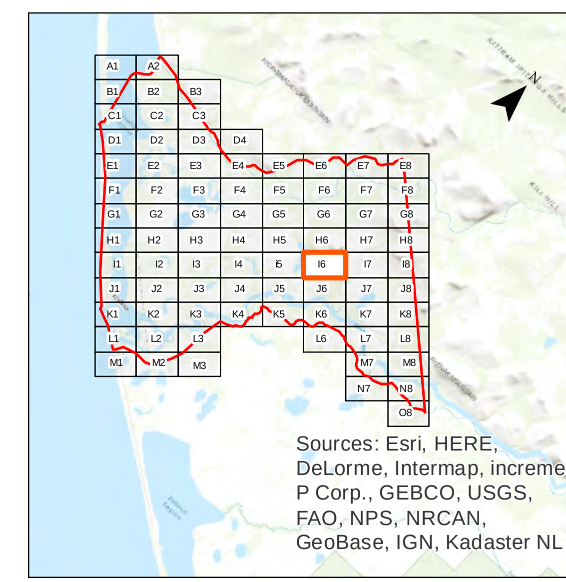
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - I6

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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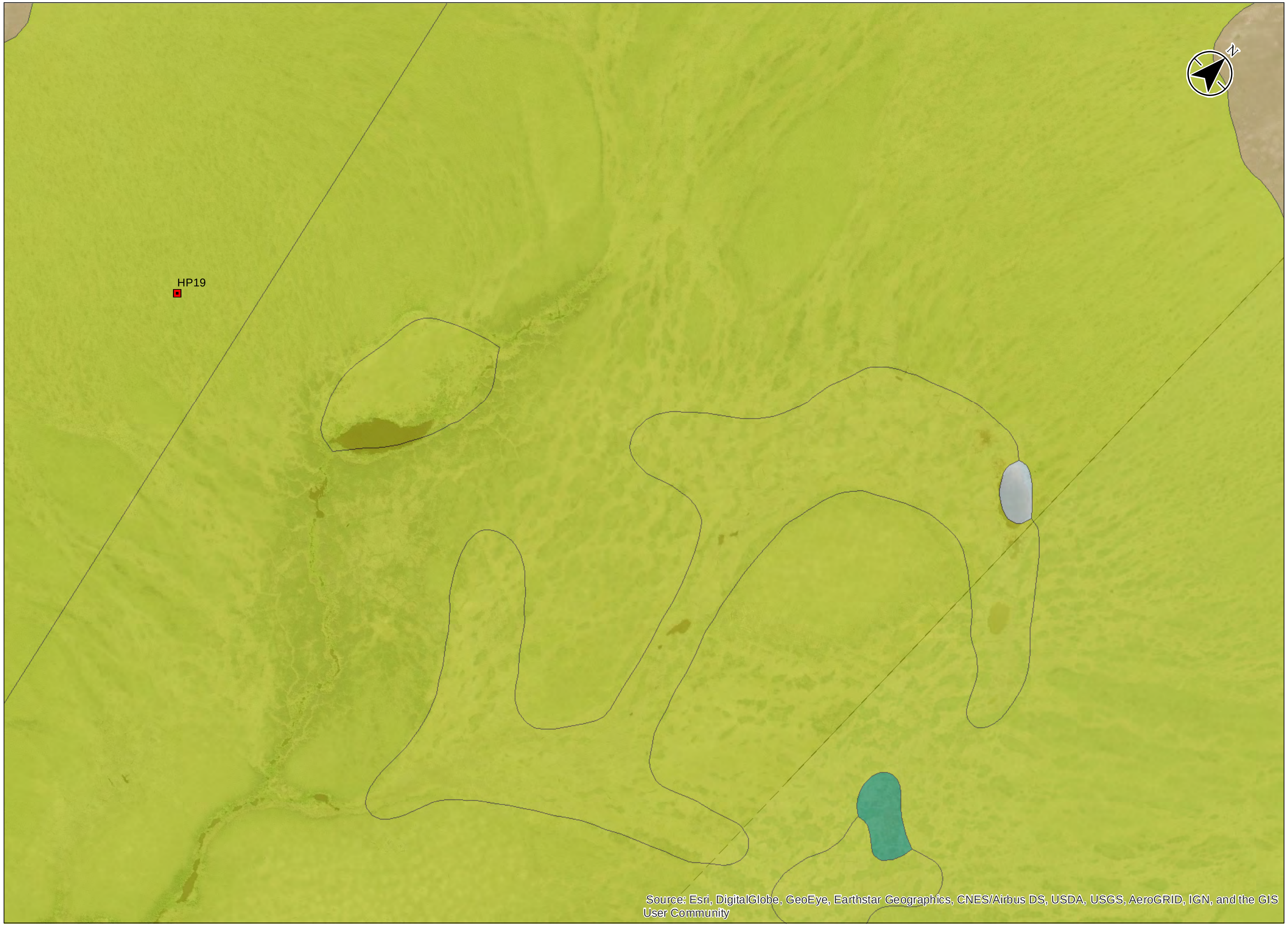

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
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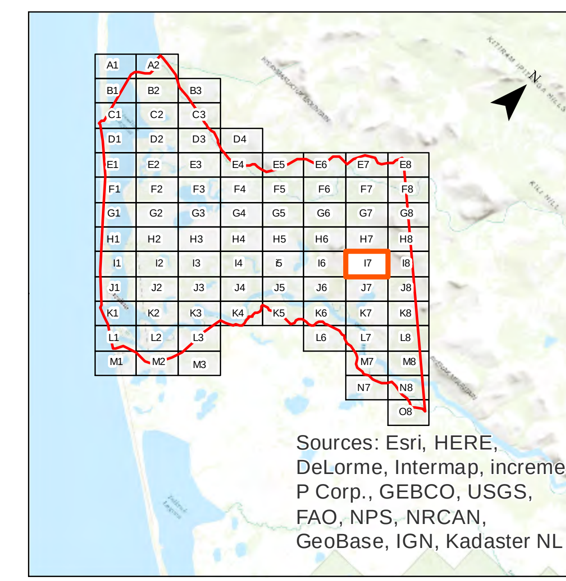

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - I7

Title
Kivalina Evacuation and School Site Access Road - Wetlands

Page 53 of 87

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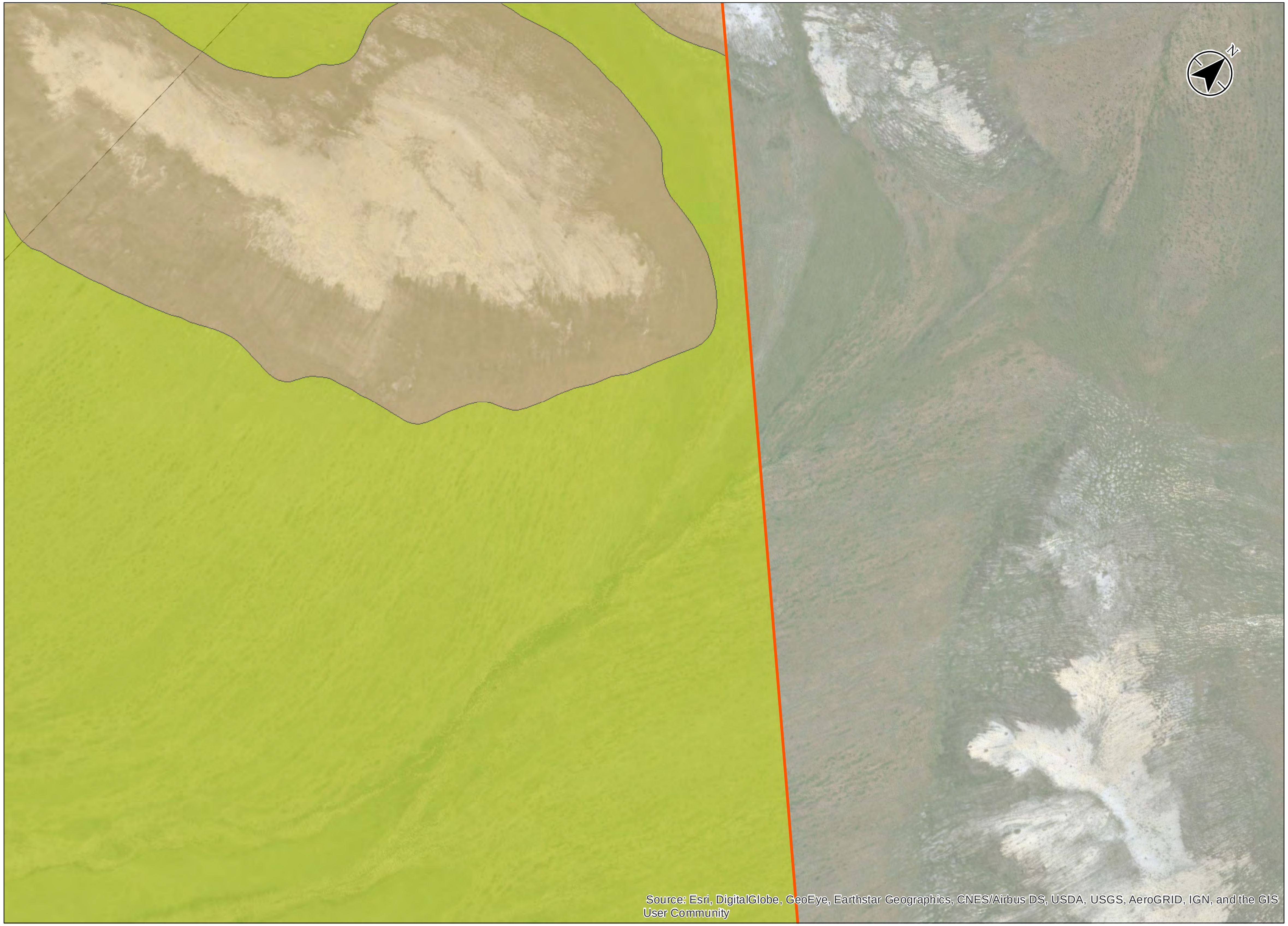

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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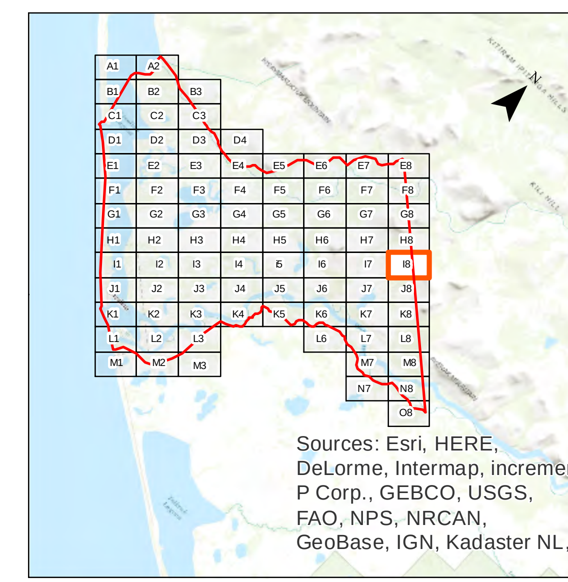

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - I8

Title
Kivalina Evacuation and School Site Access Road - Wetlands

0 250 500 1,000 1,500 2,000
Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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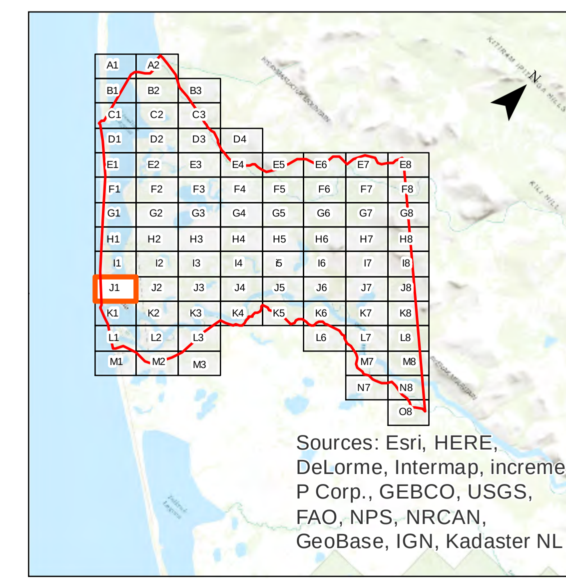


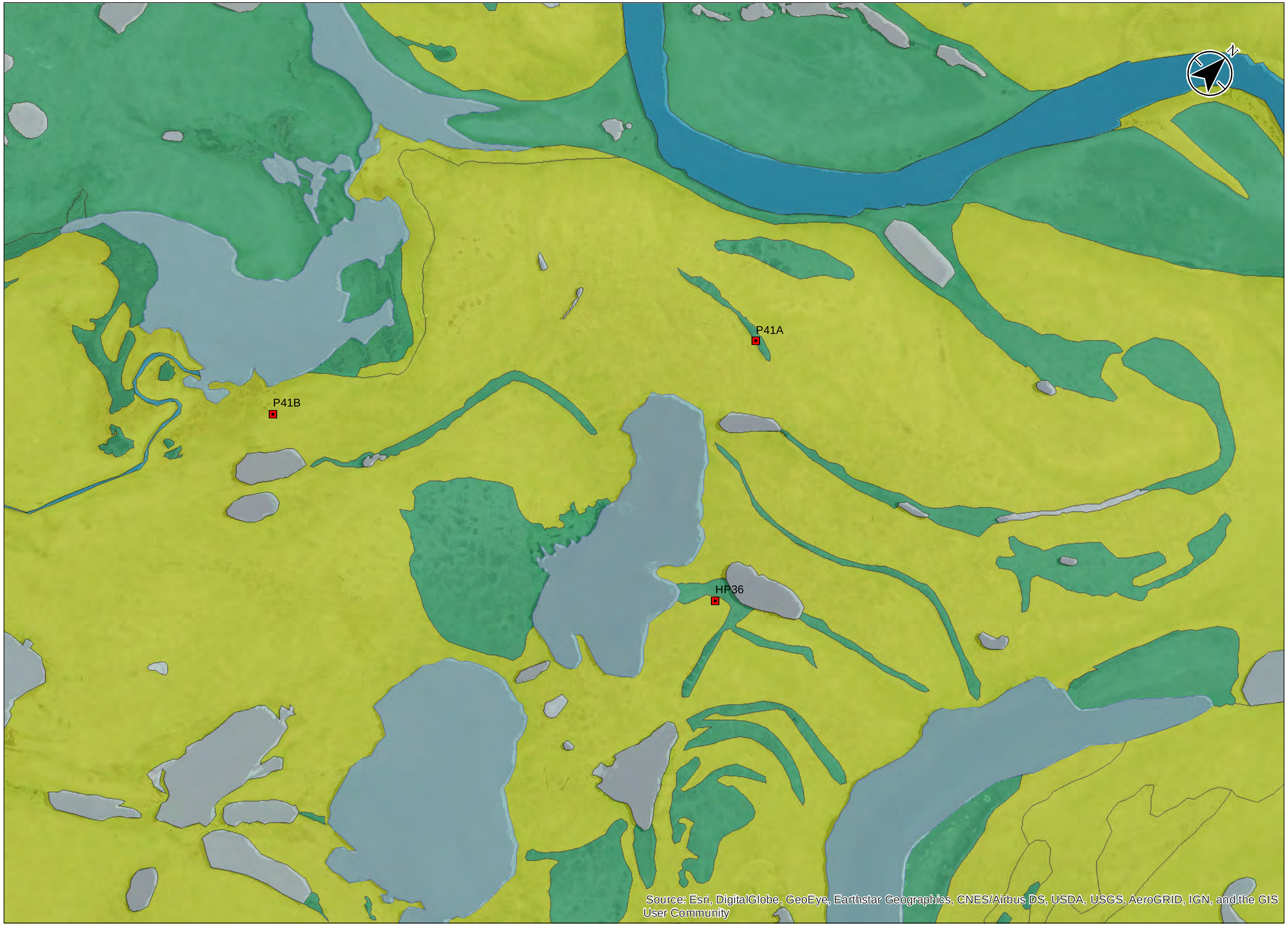
Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - J1

Title
Kivalina Evacuation and School Site Access Road - Wetlands



0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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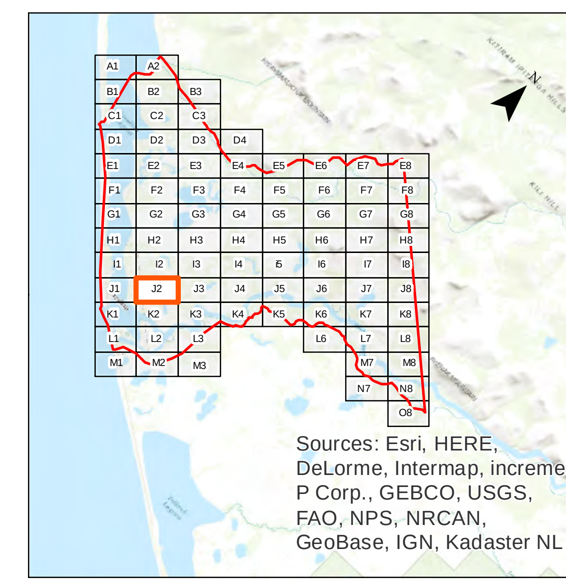

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - J2

Title
Kivalina Evacuation and School Site Access Road - Wetlands

U:\204705102\GIS\mxd\Wetland Report Figs\Fig_2-1 2-XXX Cowardin draft.mxd Revised: 2017-09-14 By: cpannone

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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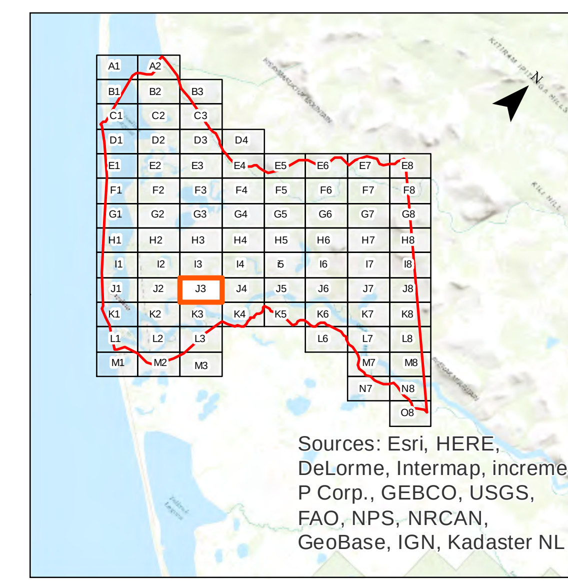

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - J3

Title
Kivalina Evacuation and School Site Access Road - Wetlands

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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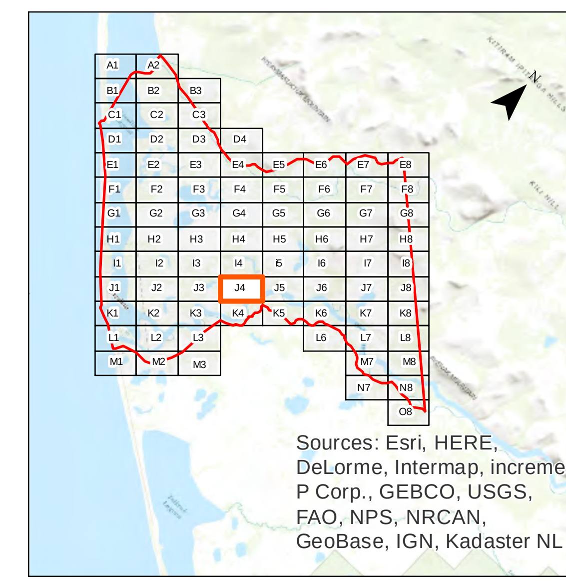

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - J4

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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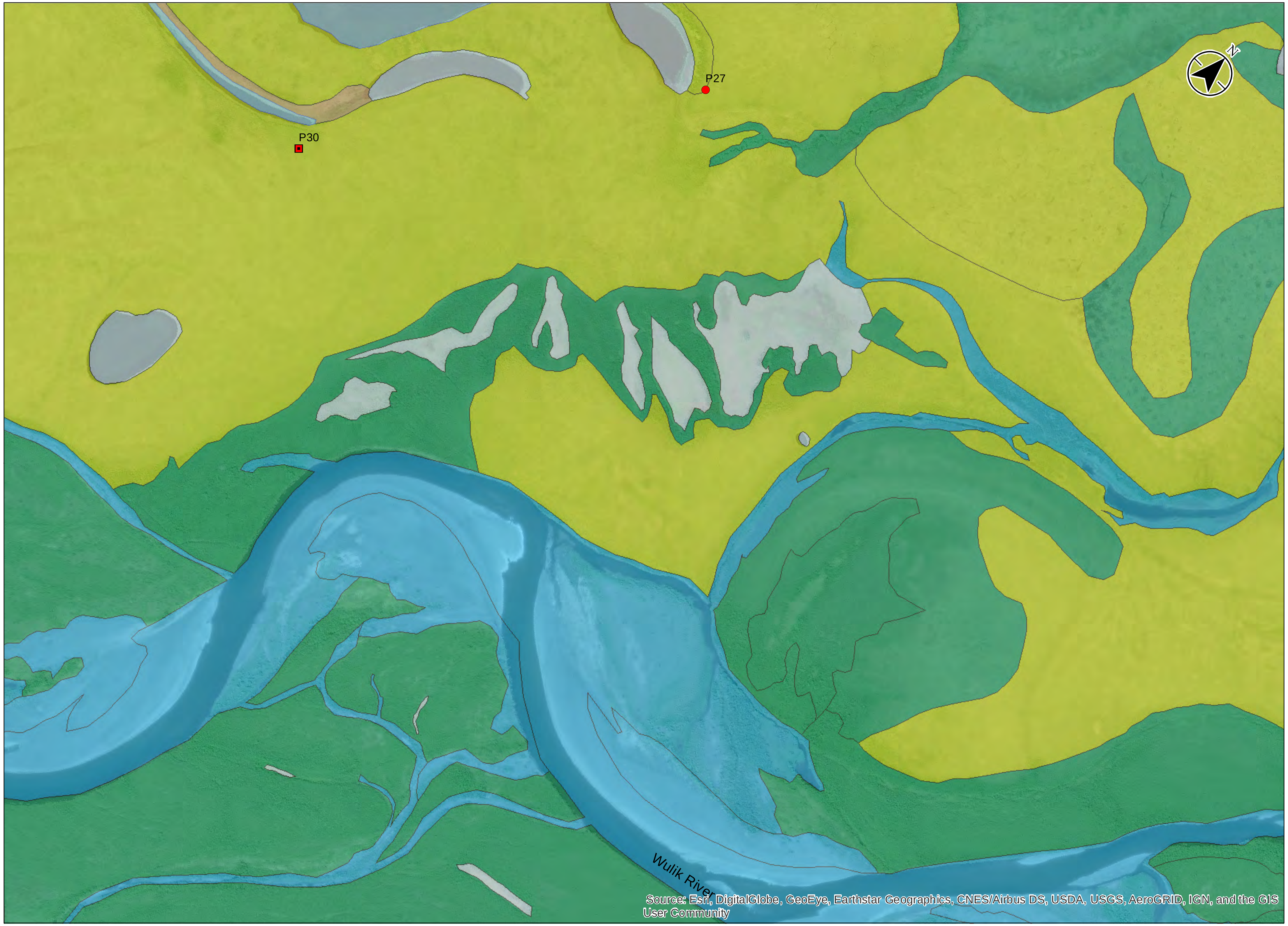

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
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Notes

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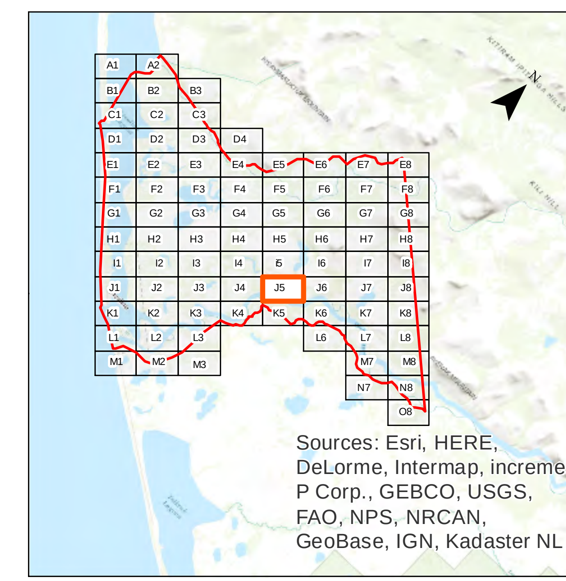

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - J5

Title
Kivalina Evacuation and School Site Access Road - Wetlands

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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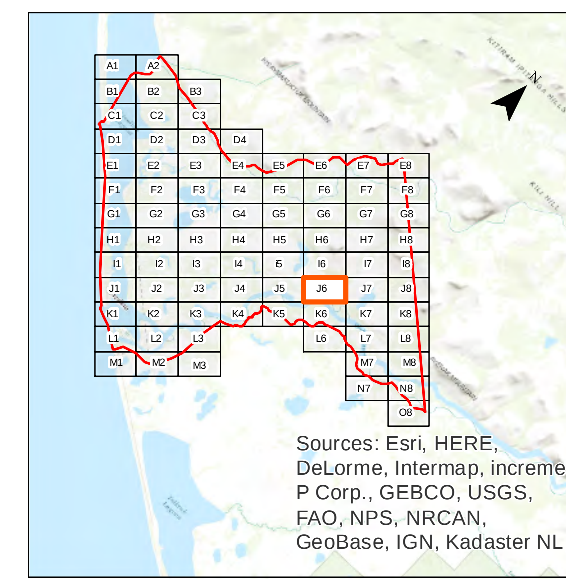

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - J6

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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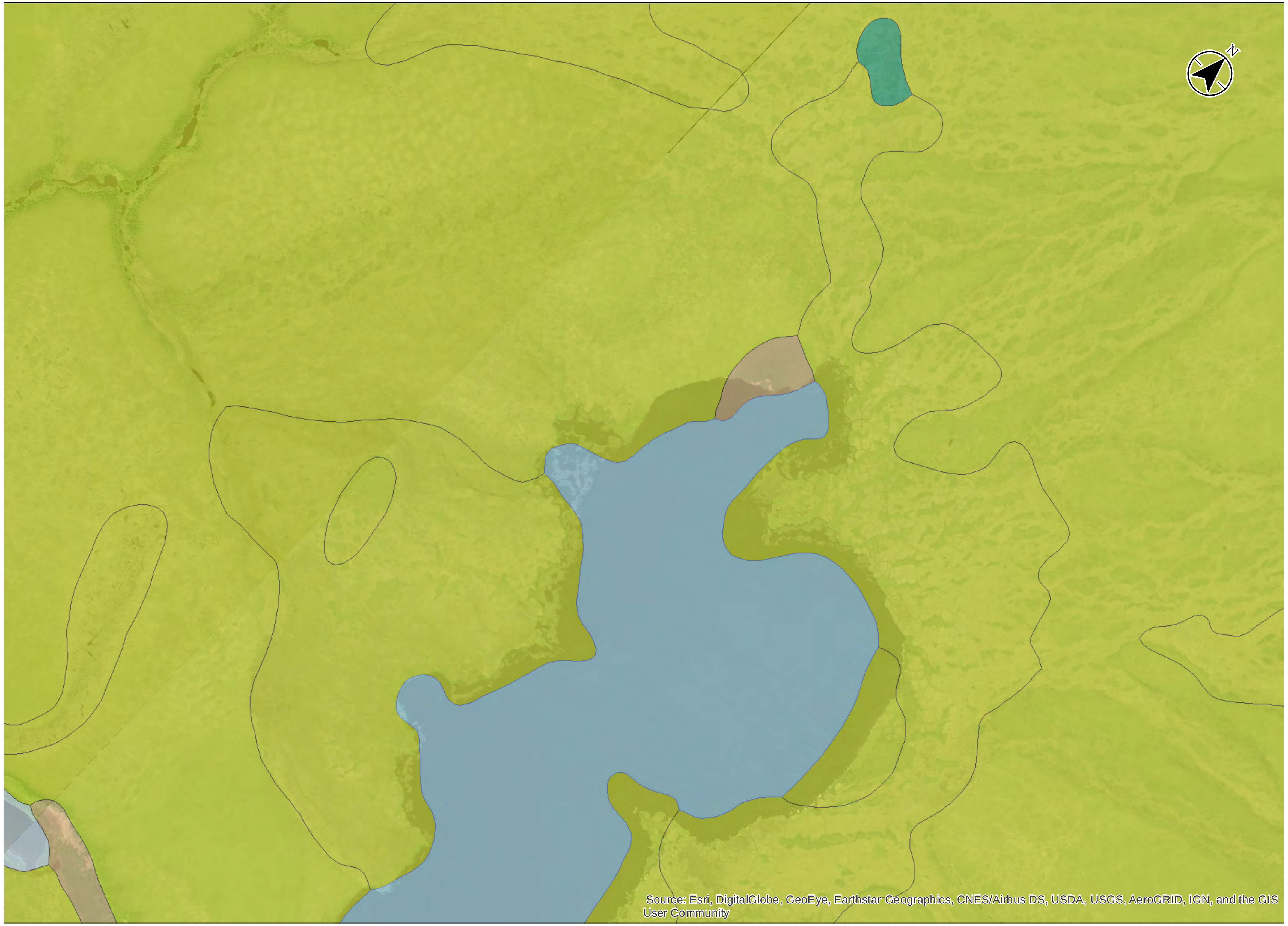

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
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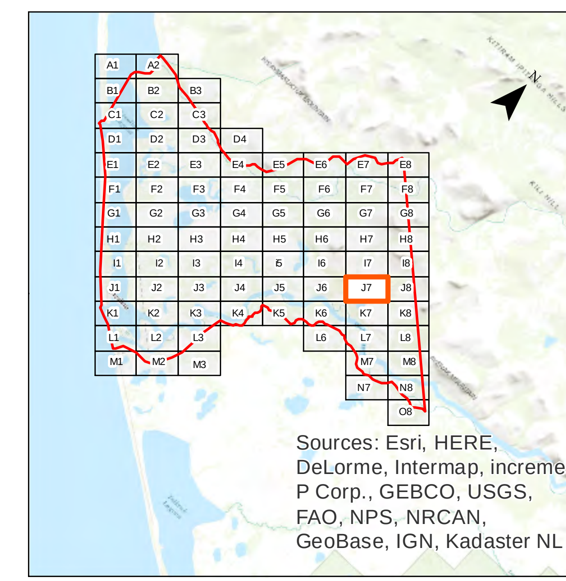

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
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Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - J7

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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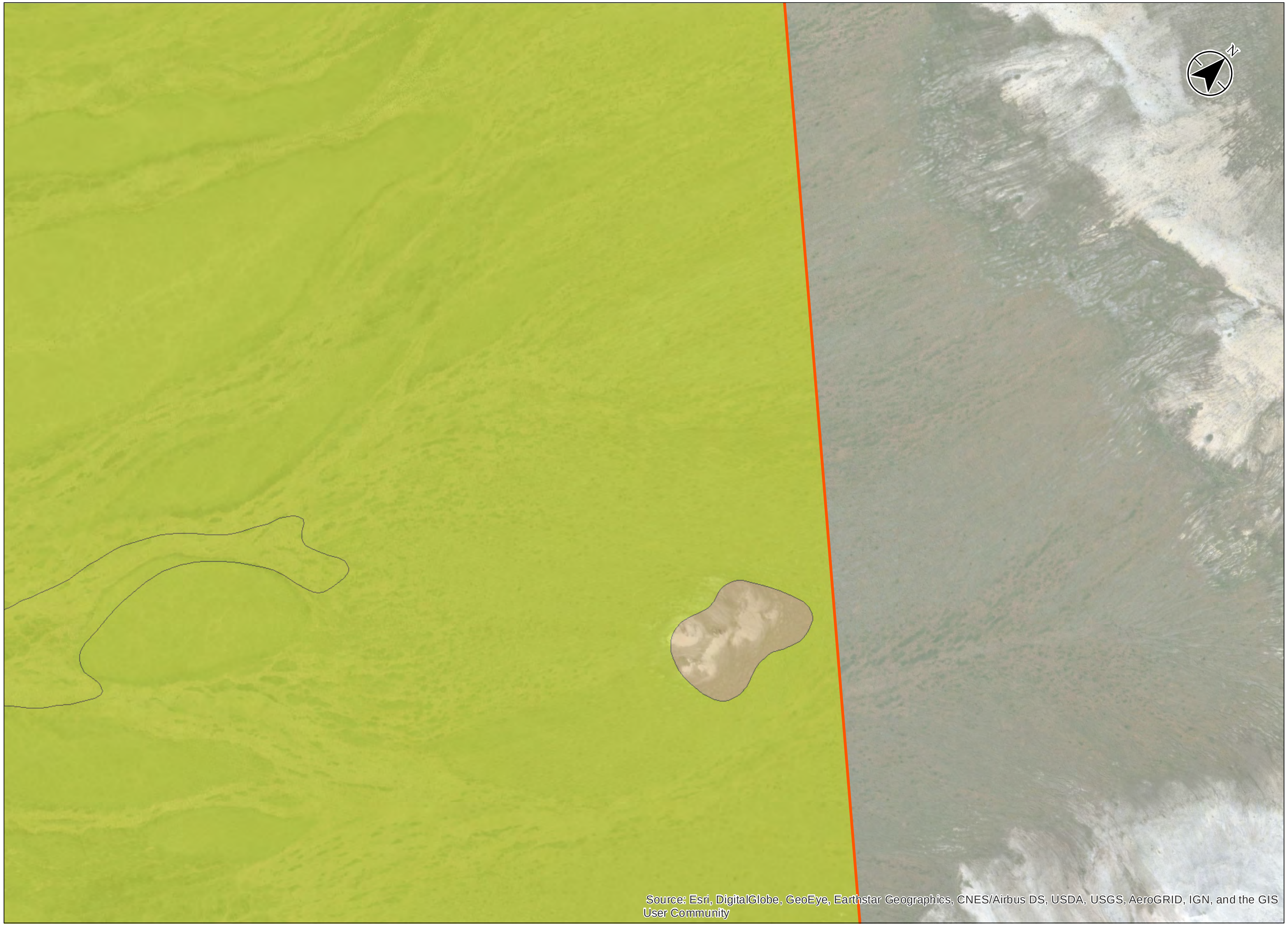

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Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
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- Upland
- Study Area

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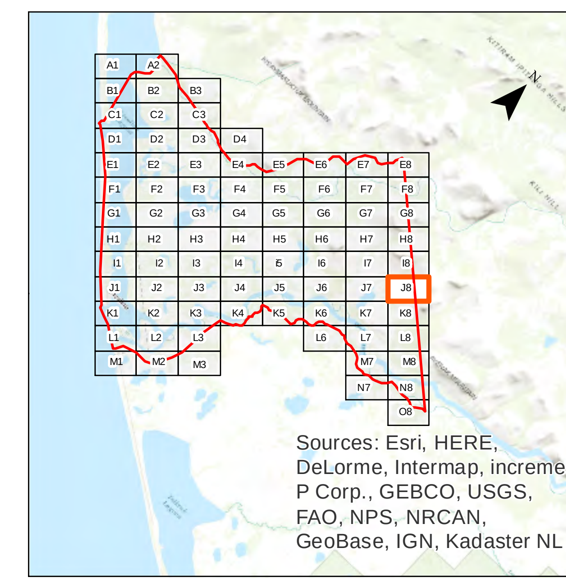

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
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Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - J8

Title
Kivalina Evacuation and School Site Access Road - Wetlands

U:\2047055102\GIS\mxd\Wetland Report Figs\Fig 2-1 2-XXX Cowardin draft.mxd Revised: 2017-09-14 By: cpannone

0 250 500 1,000 1,500 2,000
Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
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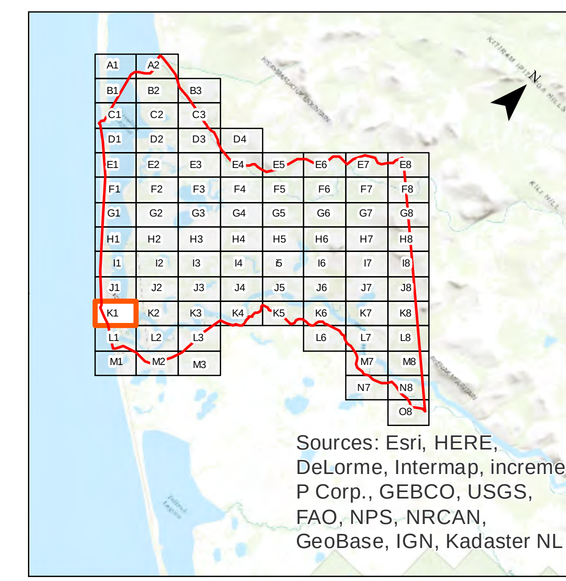


Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

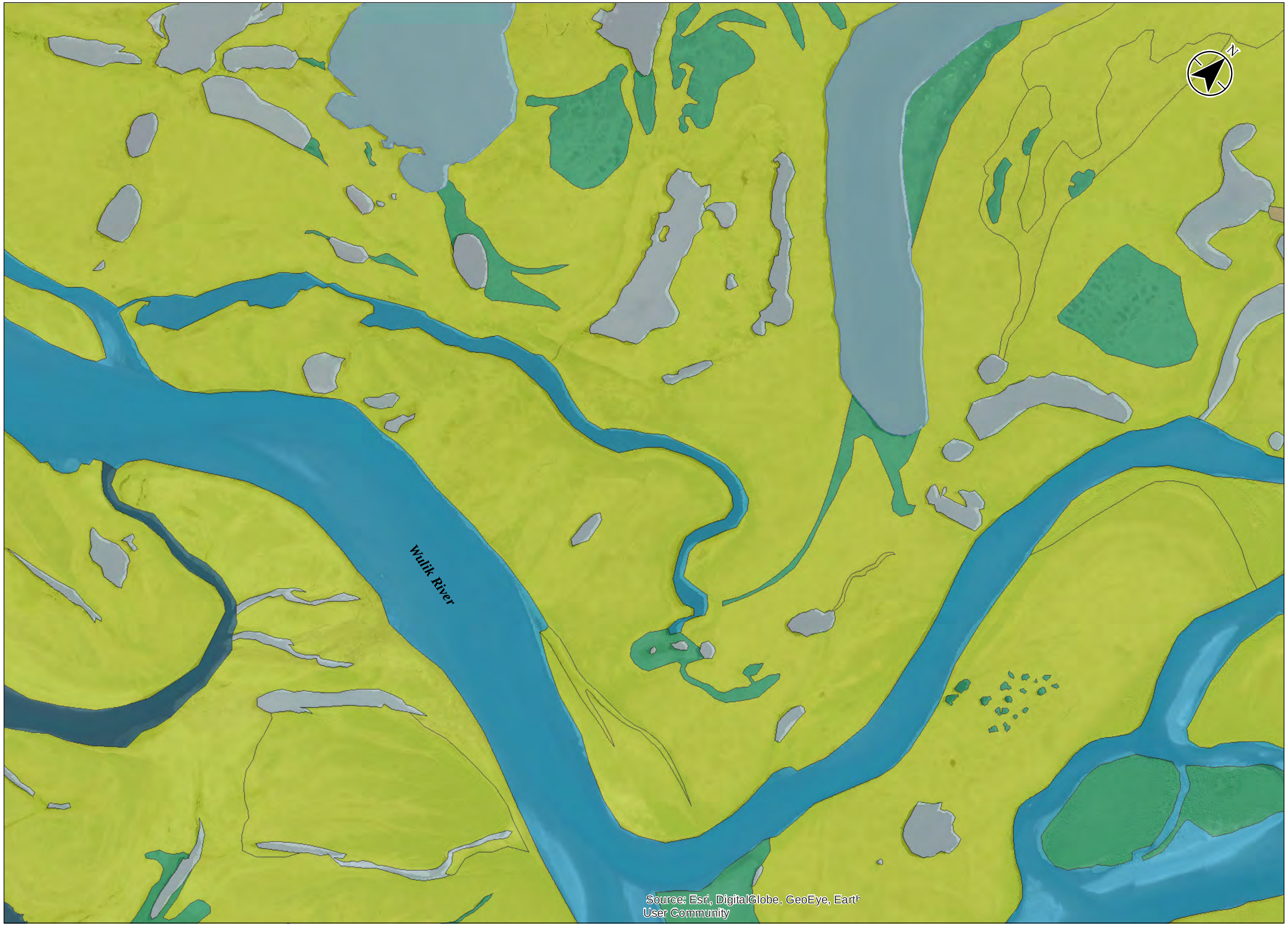
002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - K1

Title
Kivalina Evacuation and School Site Access Road - Wetlands

U:\204765102\GIS\mxd\Wetland Report Figs\Fig. 2-1 2-XXX Cowardin draft.mxd Revised: 2017-09-14 By: cpannone



1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
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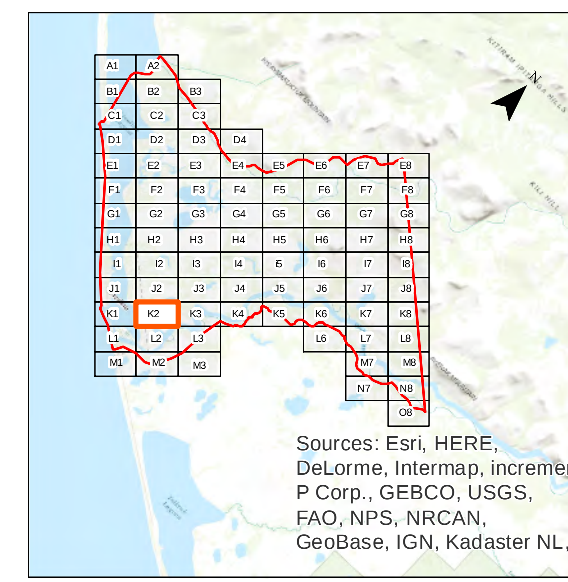


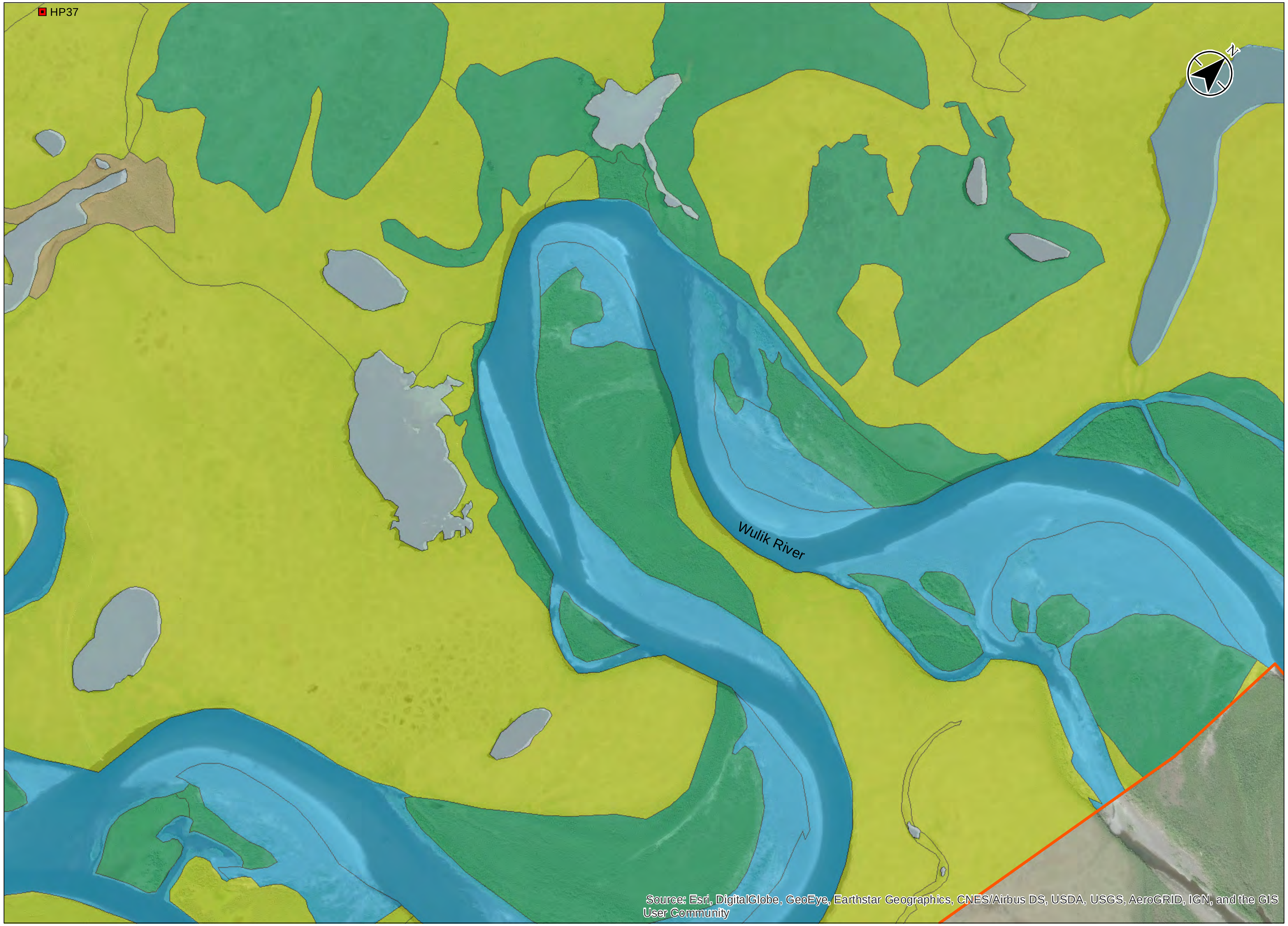
Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - K2

Title
Kivalina Evacuation and School Site Access Road - Wetlands



0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
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- Study Area

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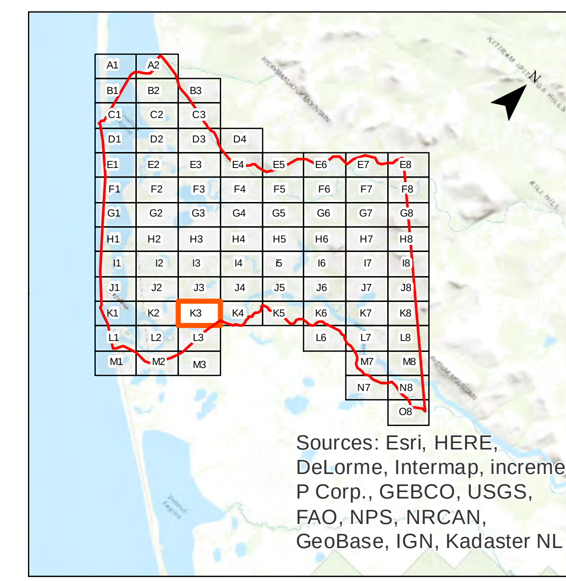
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

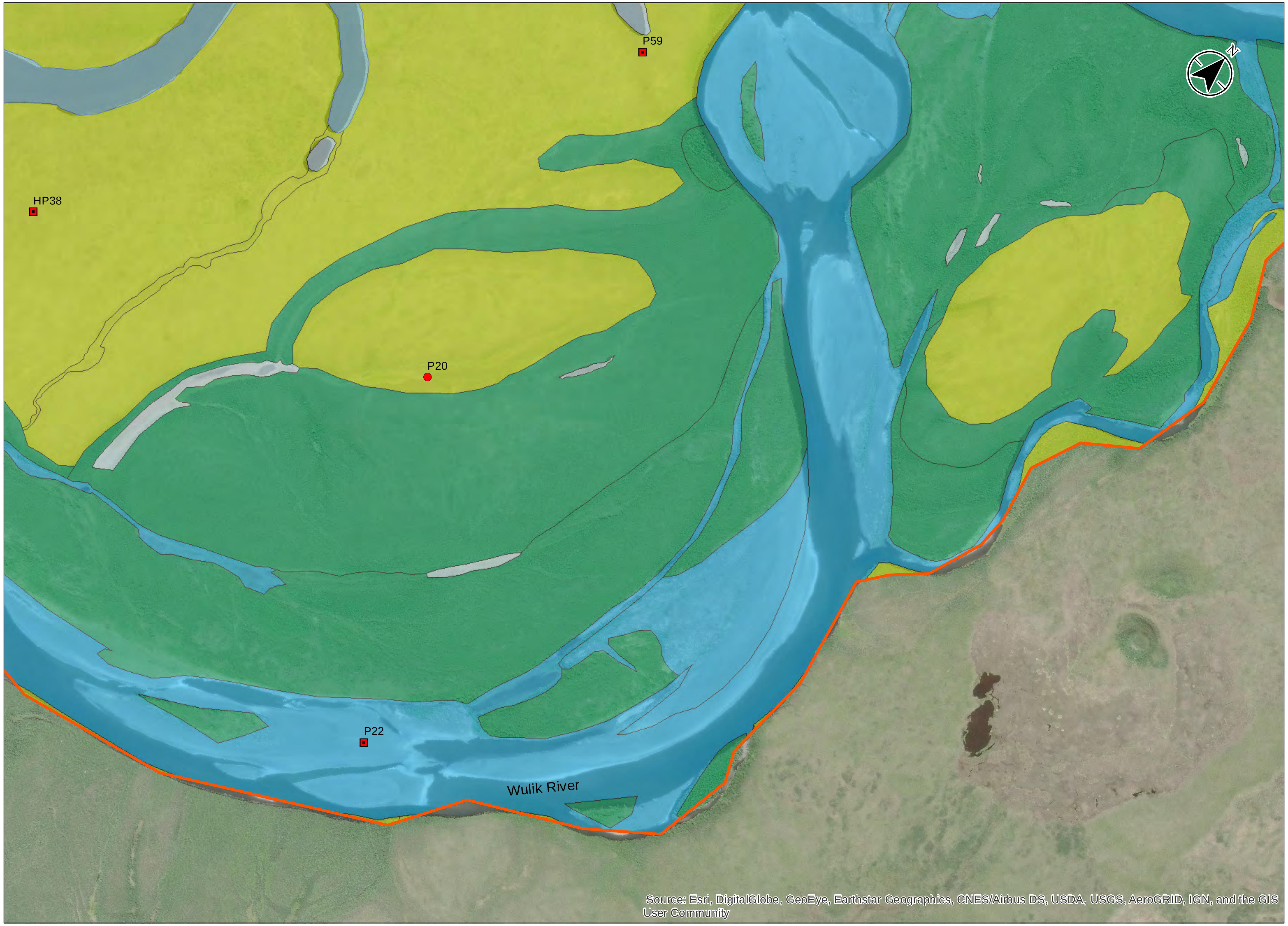
002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - K3

Title
Kivalina Evacuation and School Site Access Road - Wetlands

U:\204765502\GIS\mxd\Wetland Report Figs\Fig_2-1_2-XX_Cowardin_draft.mxd Revised: 2017-09-14 By: cpannone



0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

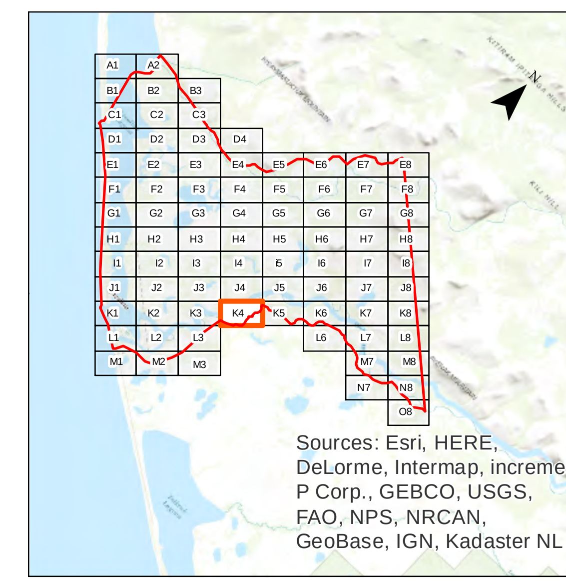
- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



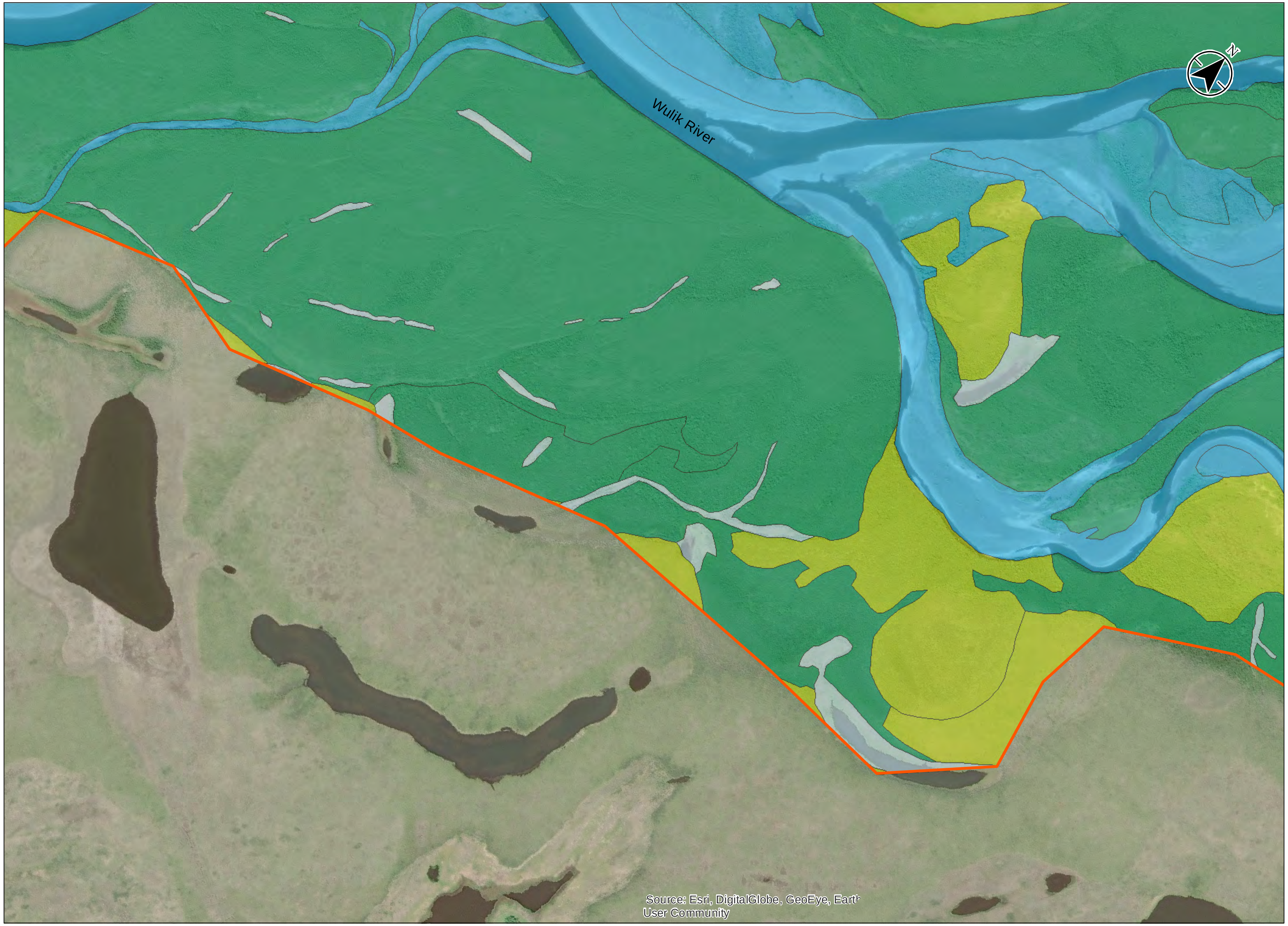
Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - K4

Title
Kivalina Evacuation and School Site Access Road - Wetlands



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Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

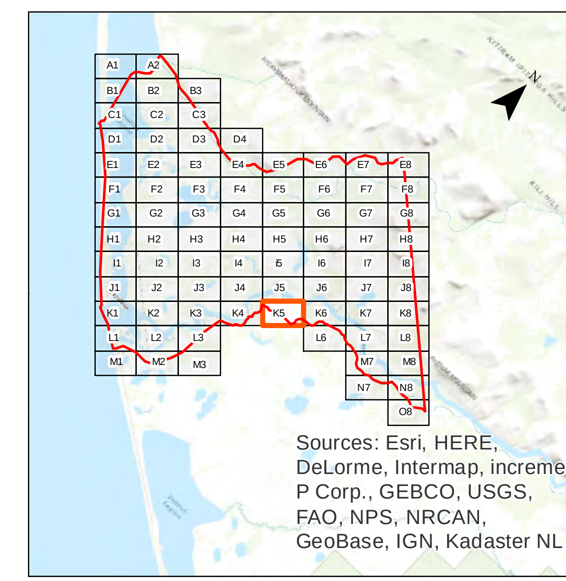
- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

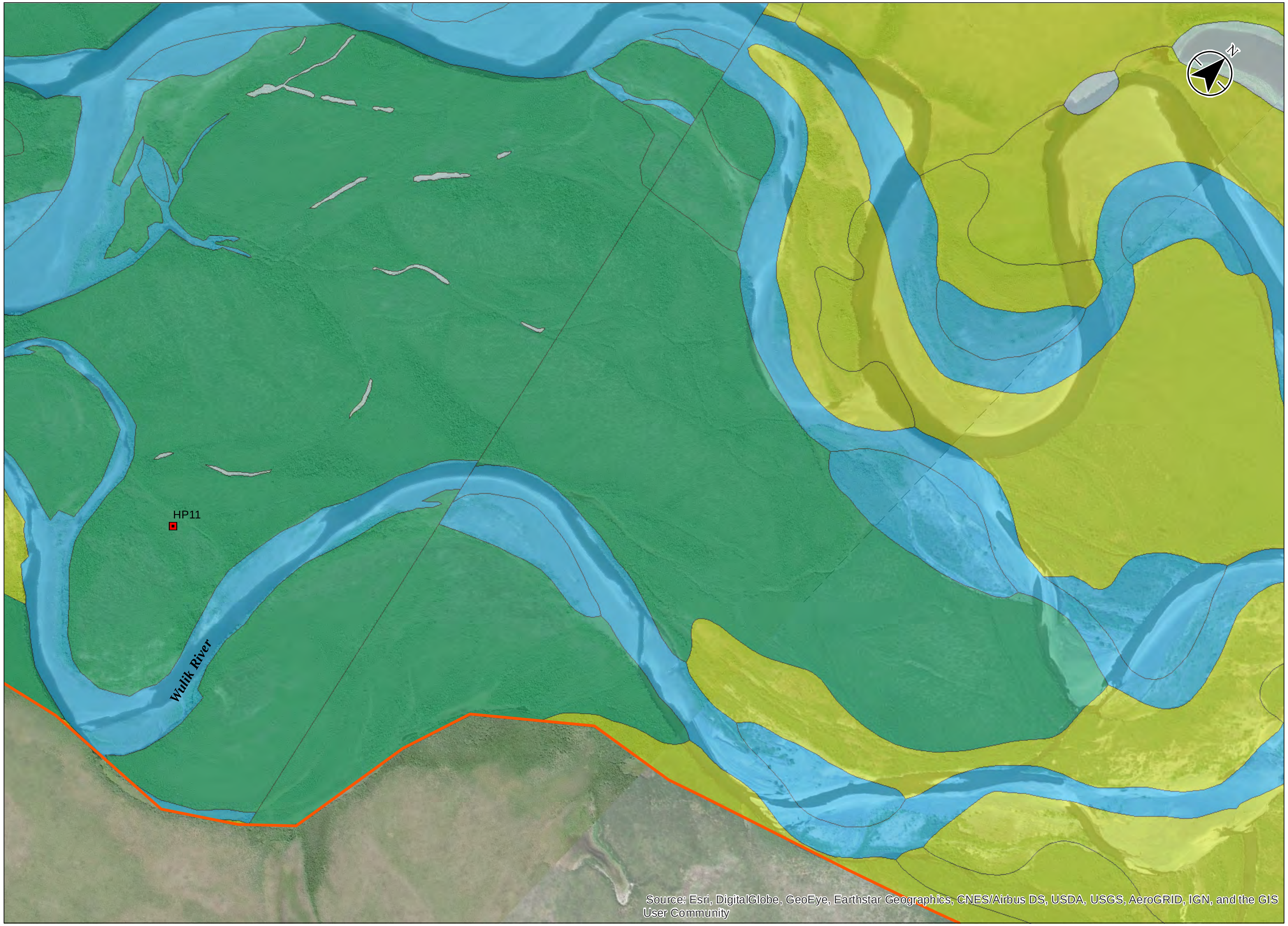
002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - K5

Title
Kivalina Evacuation and School Site Access Road - Wetlands

U:\204705102\GIS\mxd\Wetland Report Figs\Fig 2-1 2-XXX Cowardin draft.mxd Revised: 2017-09-14 By: cpannone



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1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

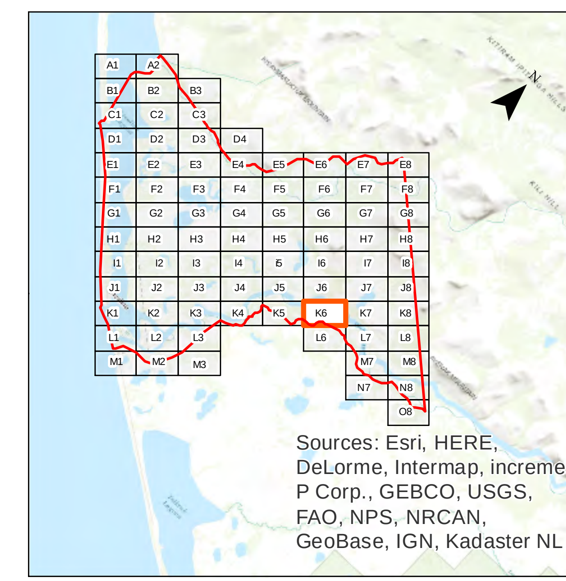
- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

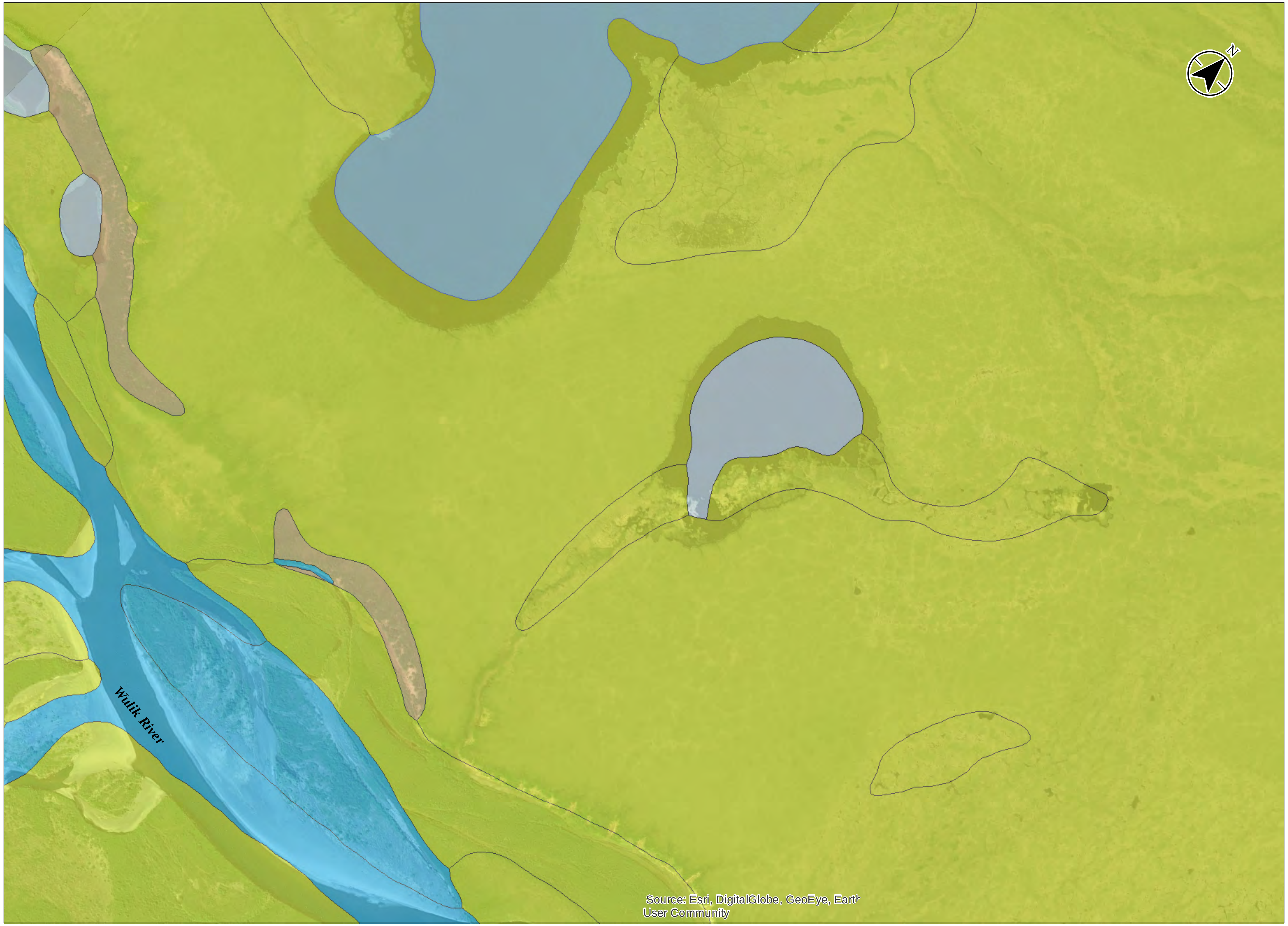
002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - K6

Title
Kivalina Evacuation and School Site Access Road - Wetlands

U:\120470651\02\GIS\mxd\Wetland Report Figs\Fig 2-1 2-XXX Cowardin draft.mxd Revised: 2017-09-14 By: cpannone



Stantec

Legend

Data Points (2016)

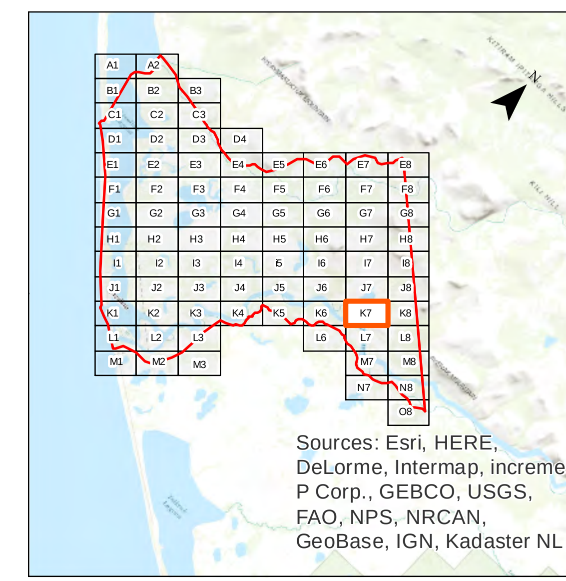
- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



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Project Location	002(384)/NFHWYP00162 REVA
Project Origin: Kivalina, Alaska	Prepared by CDP on 2017-06-23
Section 21, Township 27N, Range 26W	Technical Review by ABC on 2017-0X-XX
Kateel River Meridian	Independent Review by ABC on 2017-0X-XX

Client/Project

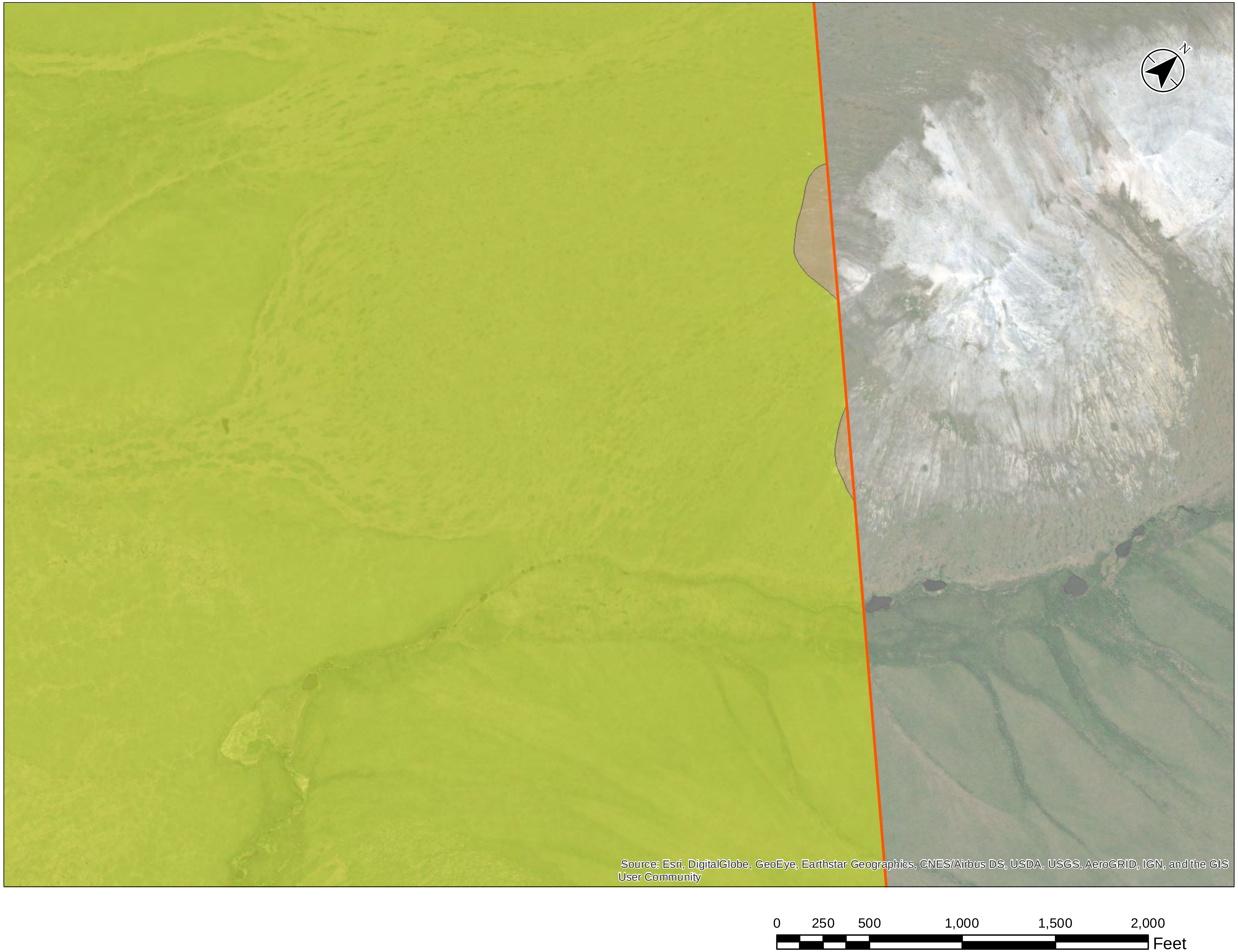
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.

2 - K7

Title

Kivalina Evacuation and School Site Access Road - Wetlands



1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

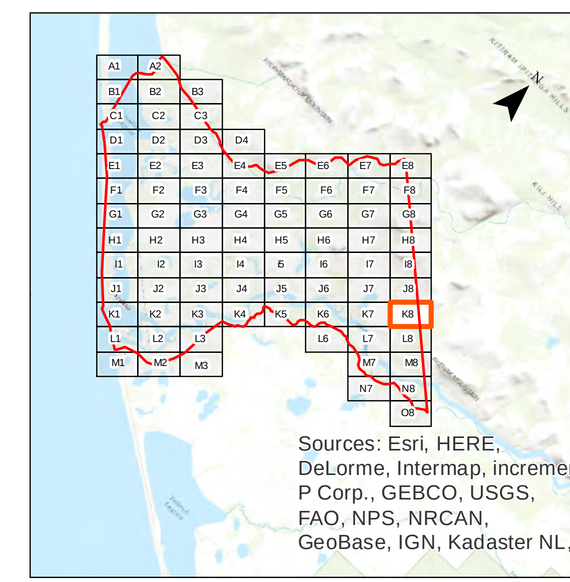
- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - K8

Title
Kivalina Evacuation and School Site Access Road - Wetlands

U:\2047055102\GIS\mxd\Wetland Report Figs\Fig_2-1_2-XXX_Cowardin_draft.mxd Revised: 2017-09-14 By: cpannone

0 250 500 1,000 1,500 2,000
Feet
1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

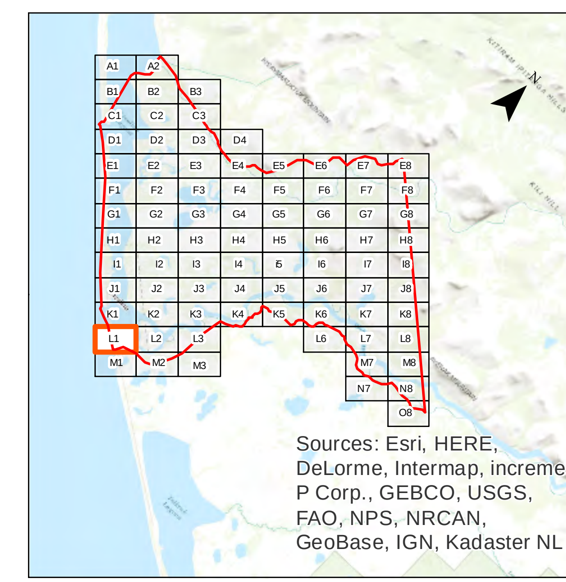
- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

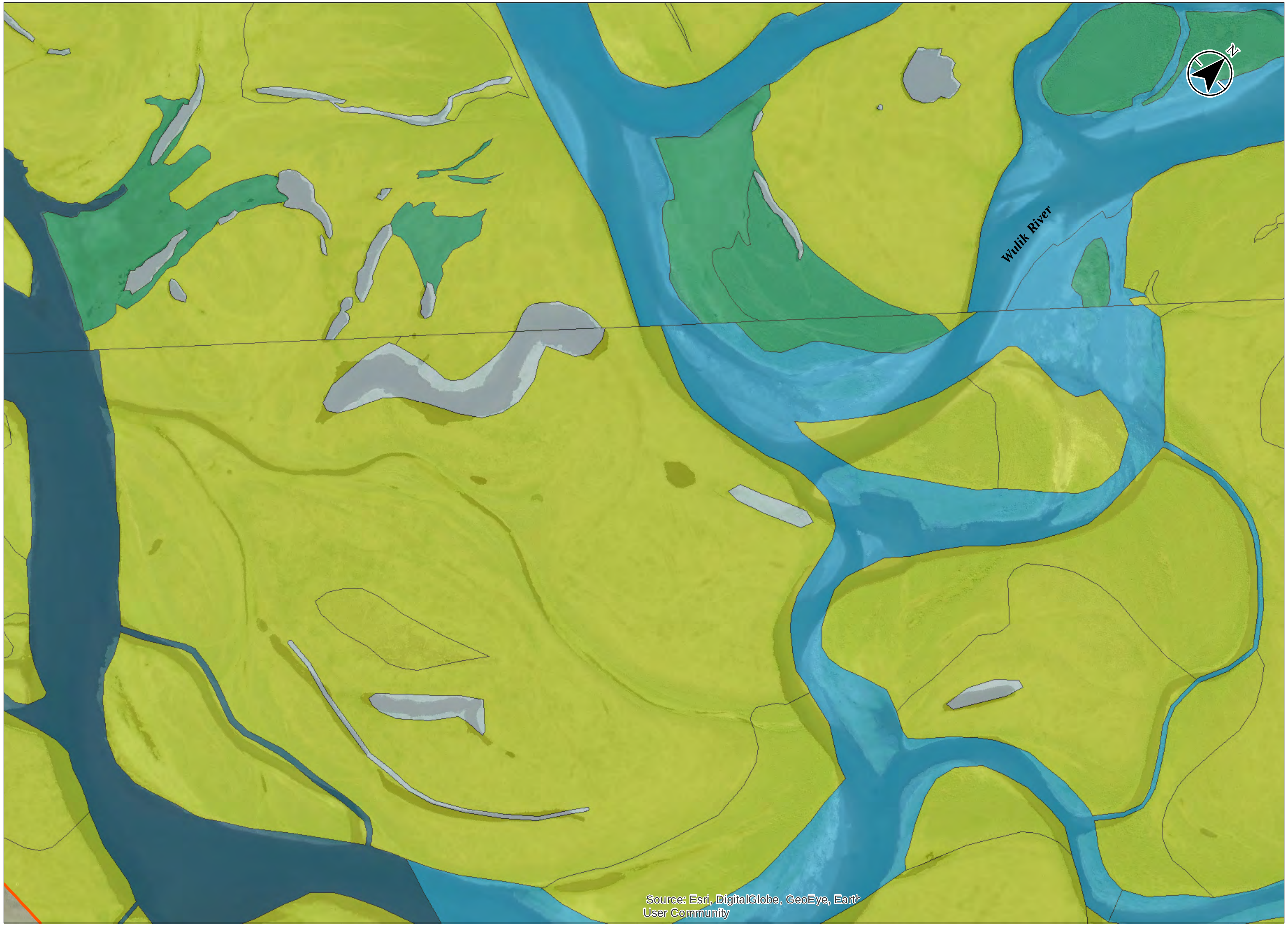
002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - L1

Title
Kivalina Evacuation and School Site Access Road - Wetlands

U:\204705102\GIS\mxd\Wetland Report Figs\Fig_2-1_2-XXX_Cowardin_draft.mxd Revised: 2017-09-14 By: cpannone



0 250 500 1,000 1,500 2,000
Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
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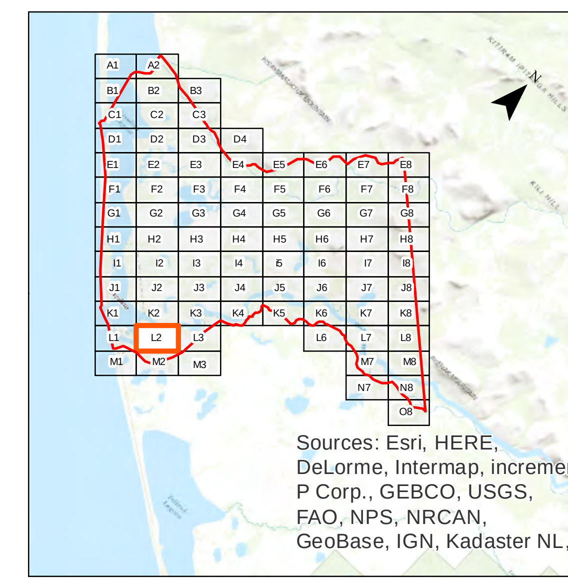


Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 -L2

Title
Kivalina Evacuation and School Site Access Road - Wetlands

U:\204705102\GIS\mxd\Wetland Report Figs\Fig 2-1 2-XXX Cowardin draft.mxd Revised: 2017-09-14 By: cpannone

0 250 500 1,000 1,500 2,000
Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

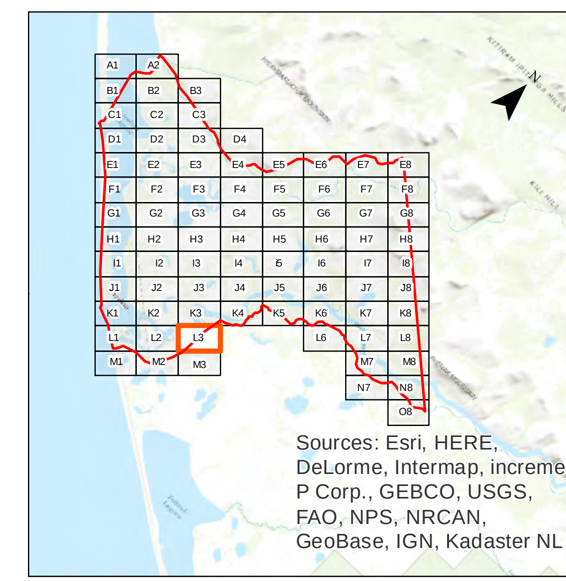
- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - L3

Title
Kivalina Evacuation and School Site Access Road - Wetlands

U:\204765102\GIS\mxd\Wetland Report Figs\Fig_2-1 2-XX Cowardin draft.mxd Revised: 2017-09-14 By: cpannone

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

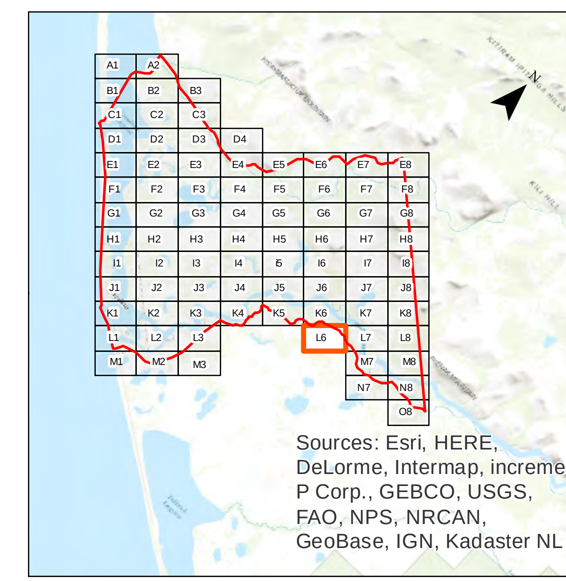
- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - L6

Title
Kivalina Evacuation and School Site Access Road - Wetlands

U:\2047055102\GIS\mxd\Wetland Report Figs\Fig 2-1 2-XXX Cowardin draft.mxd Revised: 2017-09-14 By: cpannone

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

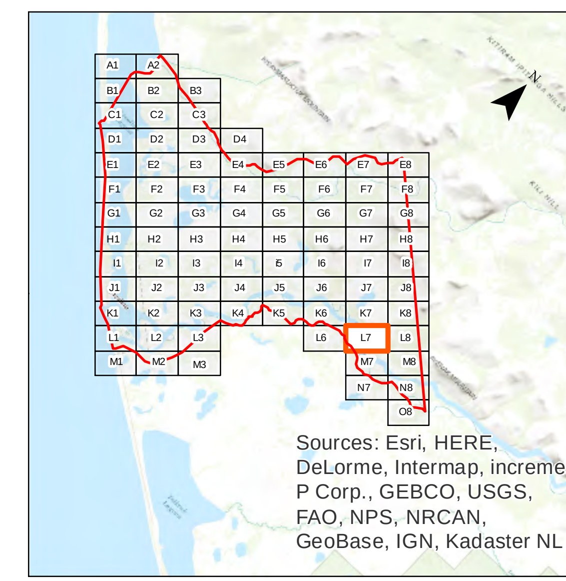
- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - L7

Title
Kivalina Evacuation and School Site Access Road - Wetlands

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

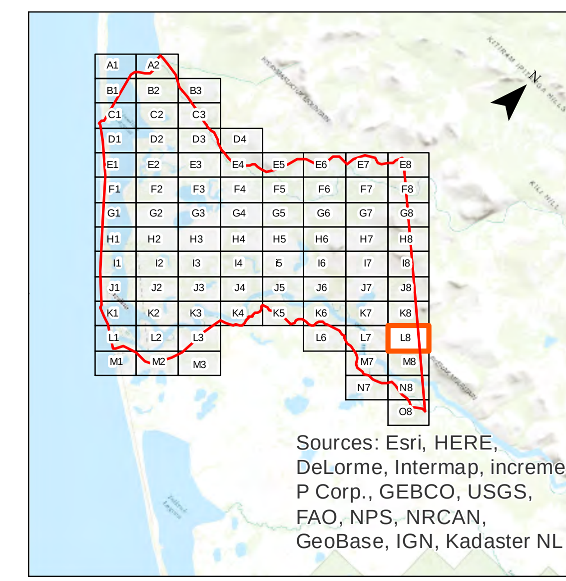
- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - L8

Title
Kivalina Evacuation and School Site Access Road - Wetlands

U:\204705102\GIS\mxd\Wetland Report Figs\Fig_2-1 2-XXX Cowardin draft.mxd Revised: 2017-09-14 By: cpannone

0 250 500 1,000 1,500 2,000
Feet

1:6,500 (At original document size of 11x17)

Legend

Data Points (2016)

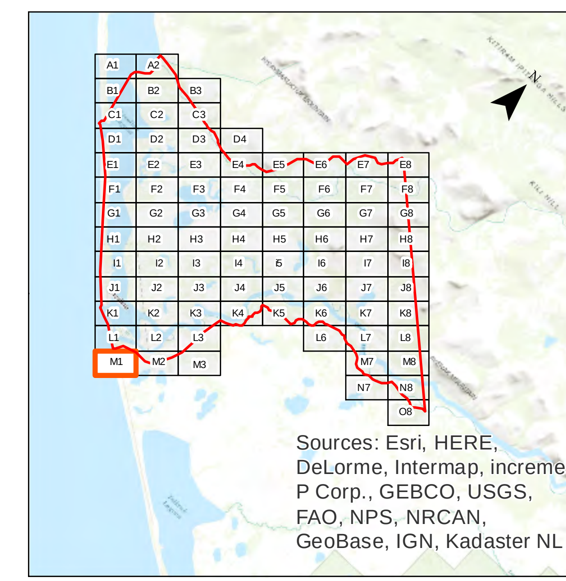
- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

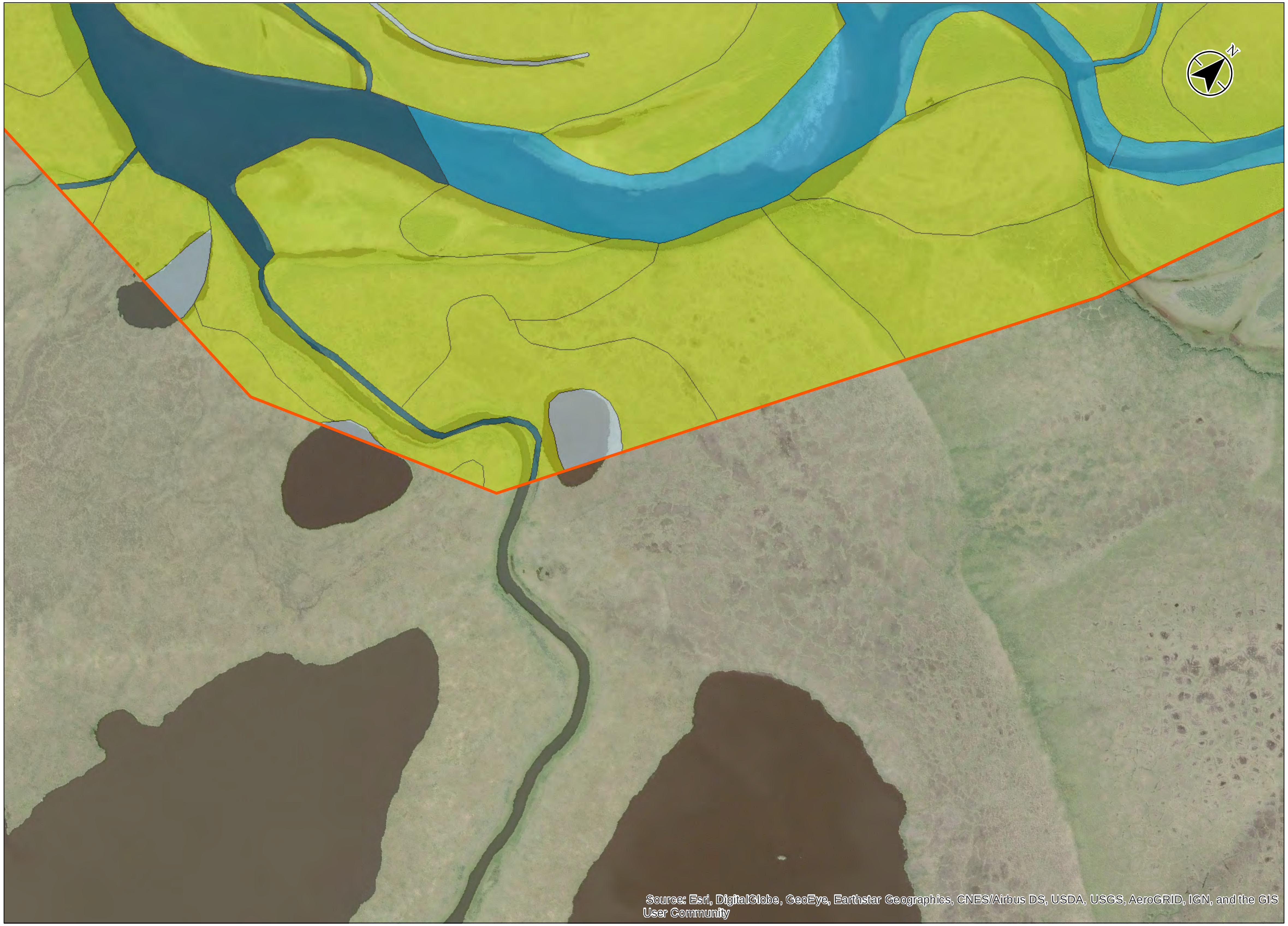
002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - M1

Title
Kivalina Evacuation and School Site Access Road - Wetlands

U:\204765102\GIS\mxd\Wetland Report Figs\Fig_2-1_2-XXX_Cowardin_draft.mxd Revised: 2017-09-14 By: cpannone



1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

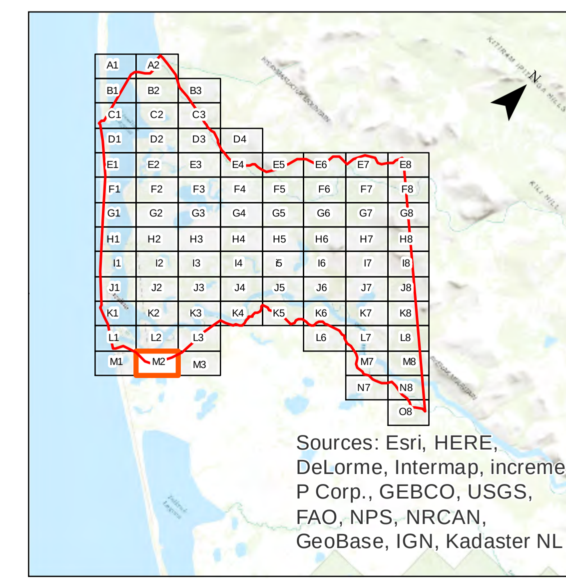
- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - M2

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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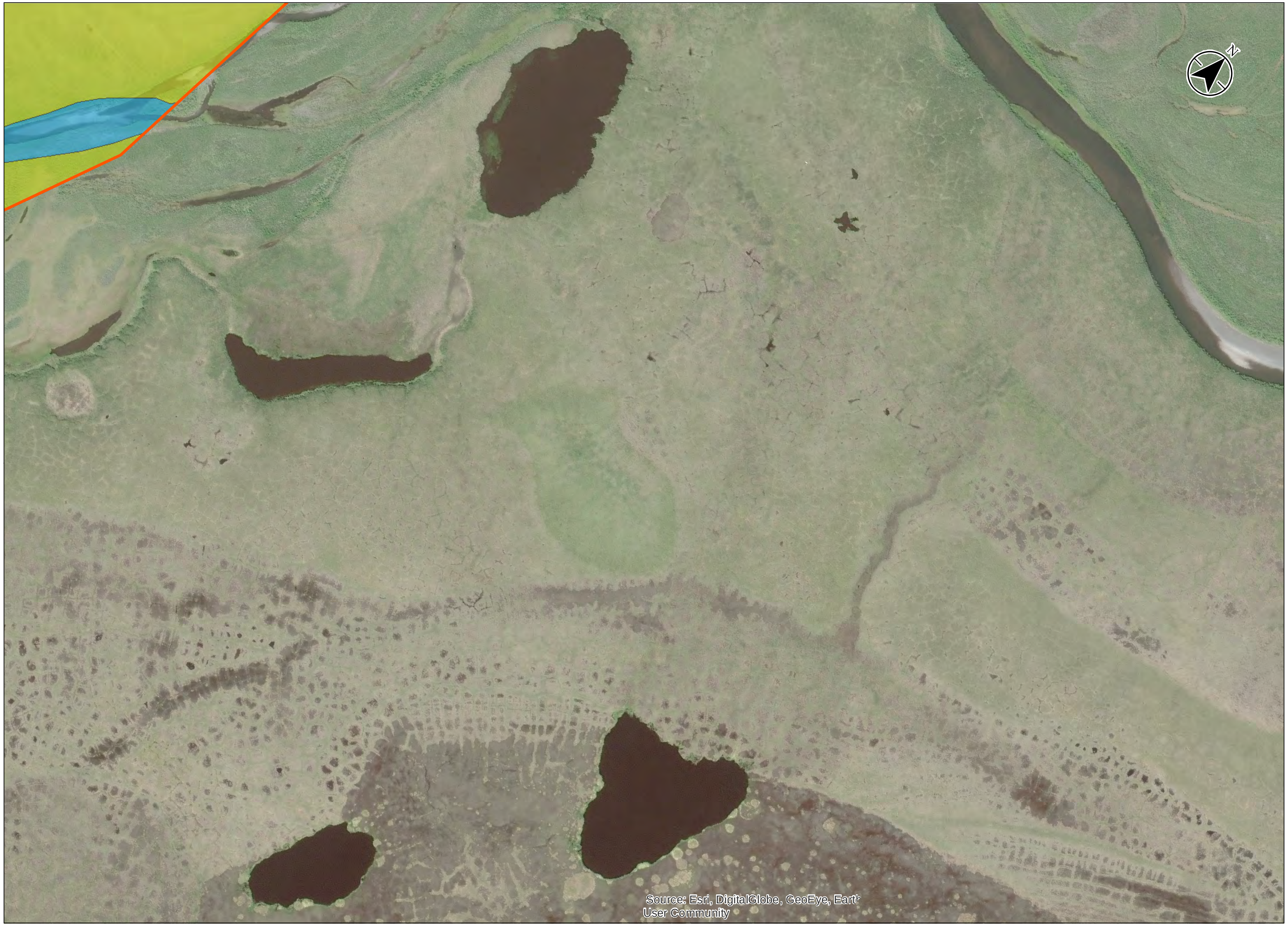

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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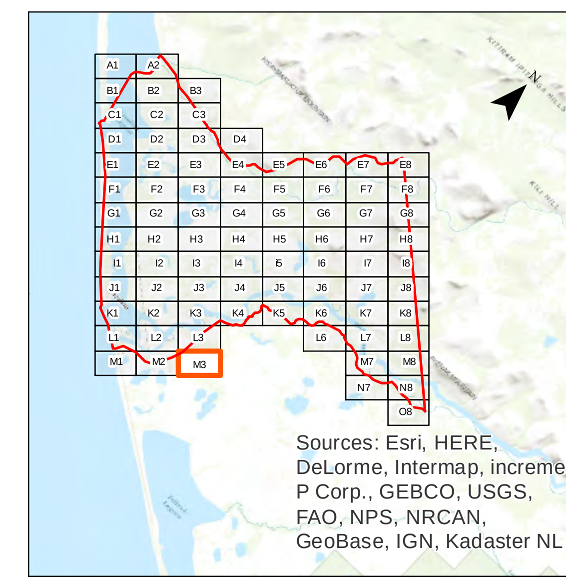

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

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Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - M3

Title
Kivalina Evacuation and School Site Access Road - Wetlands

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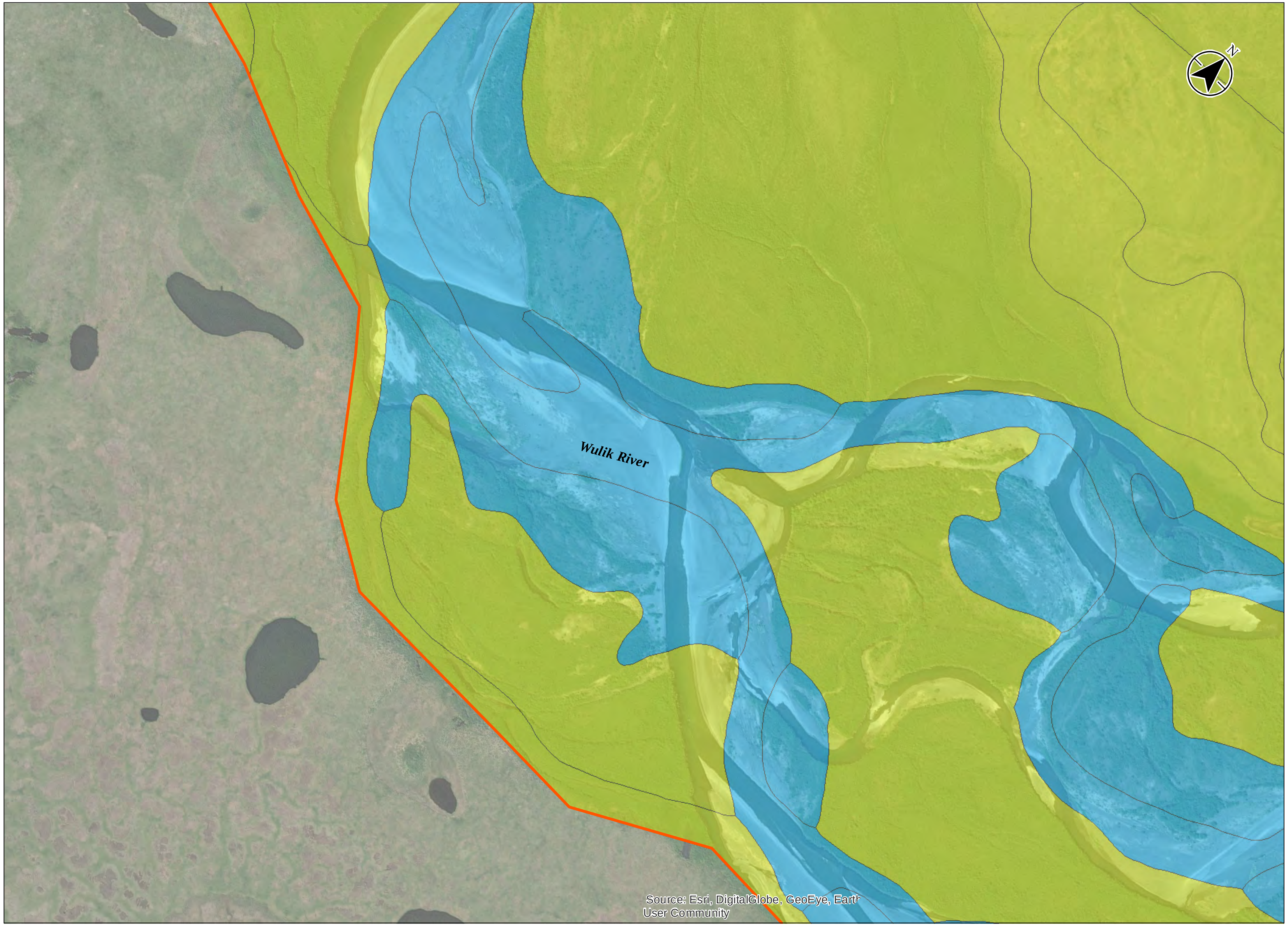

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
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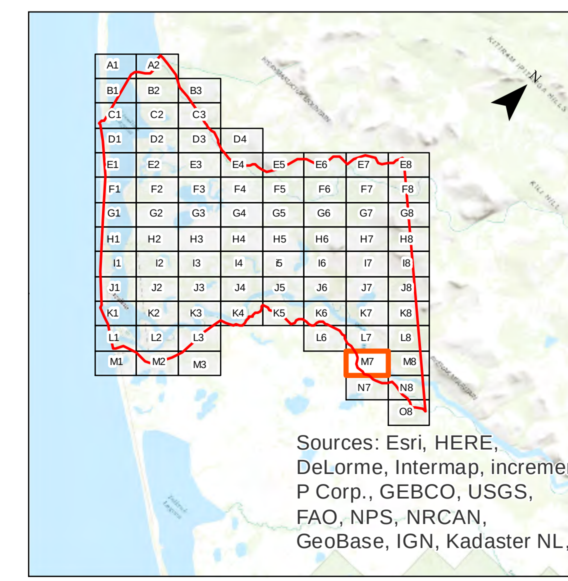

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
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Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

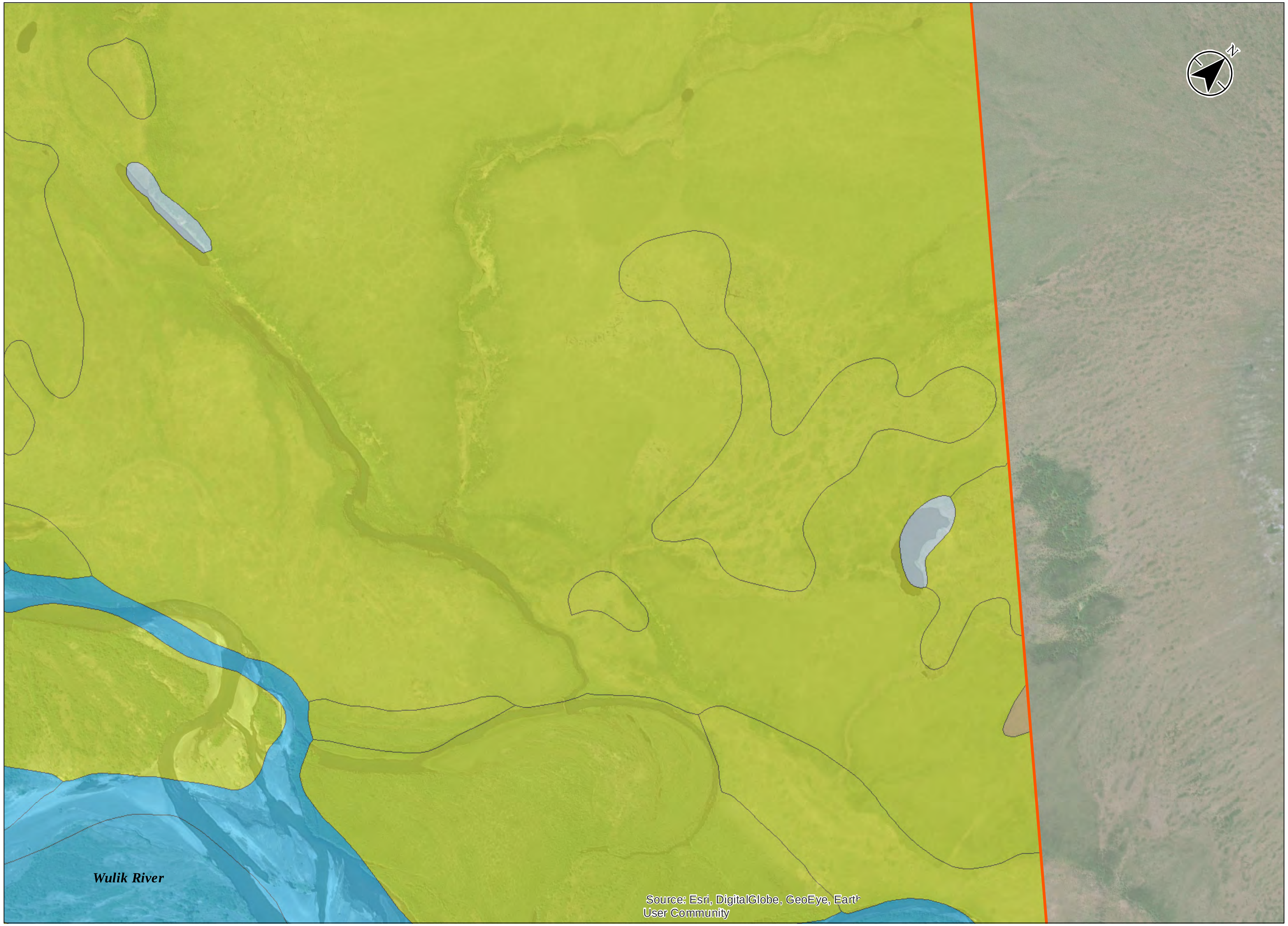
Figure No.
2 - M7

Title
Kivalina Evacuation and School Site Access Road - Wetlands

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

U:\2047055102\GIS\mxd\Wetland Report Figs\Fig 2-1 2-XXX Cowardin draft.mxd Revised: 2017-09-14 By: cpannone



Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
- Upland
- Study Area

Notes

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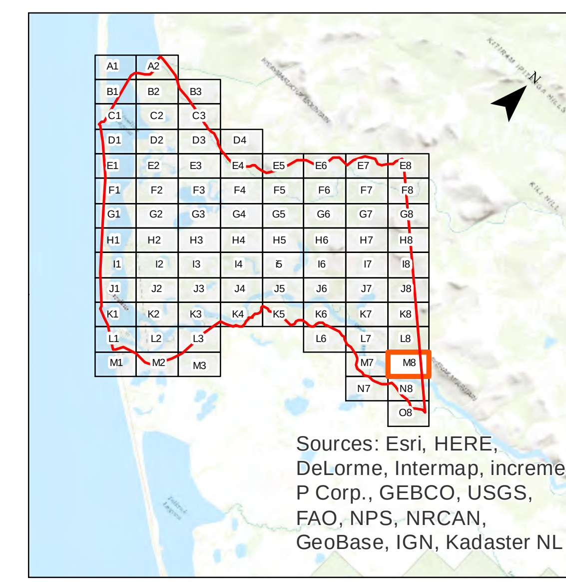


Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

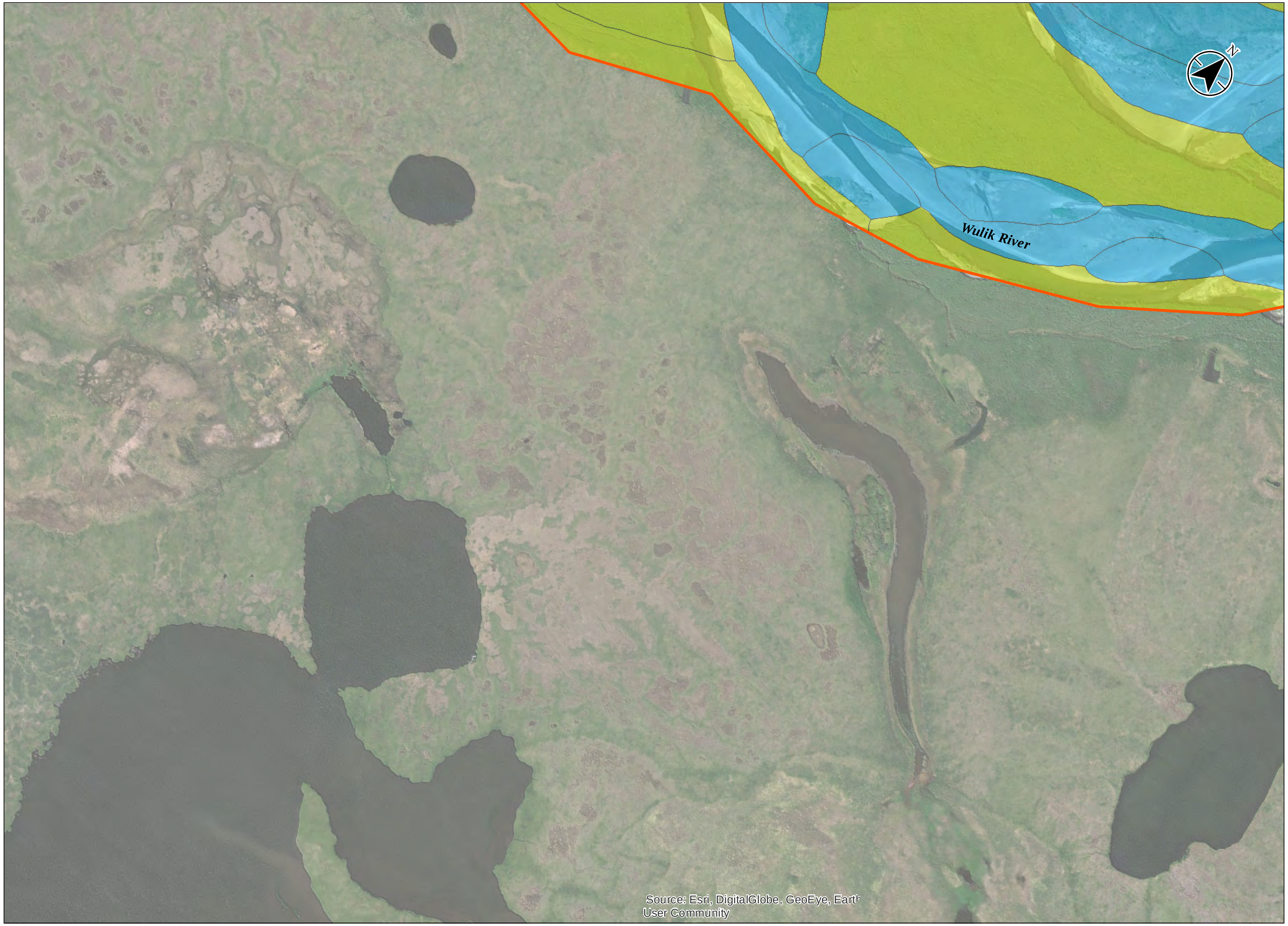
Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - M8

Title
Kivalina Evacuation and School Site Access Road - Wetlands

0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)



0 250 500 1,000 1,500 2,000
Feet

1:6,500 (At original document size of 11x17)

Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
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- Riverine
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- Study Area

Notes

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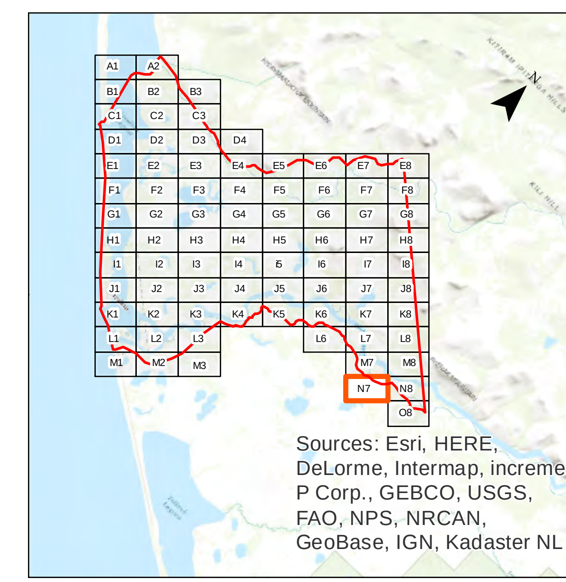

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
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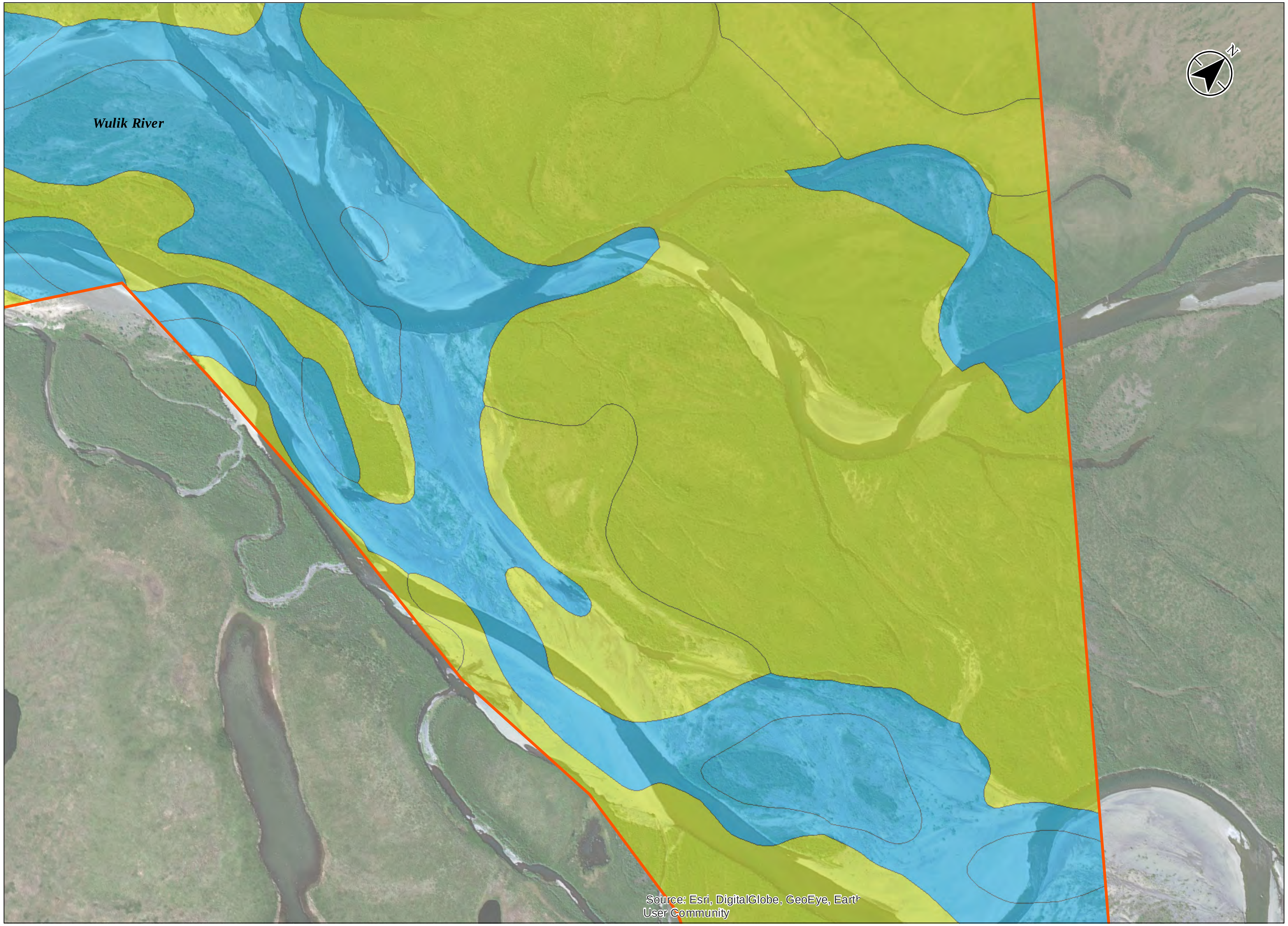
Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - N7

Title
Kivalina Evacuation and School Site Access Road - Wetlands

U:\2047055102\GIS\mxd\Wetland Report Figs\Fig 2-1 2-XXX Cowardin draft.mxd Revised: 2017-09-14 By: cpannone



Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
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- Riverine
- Upland
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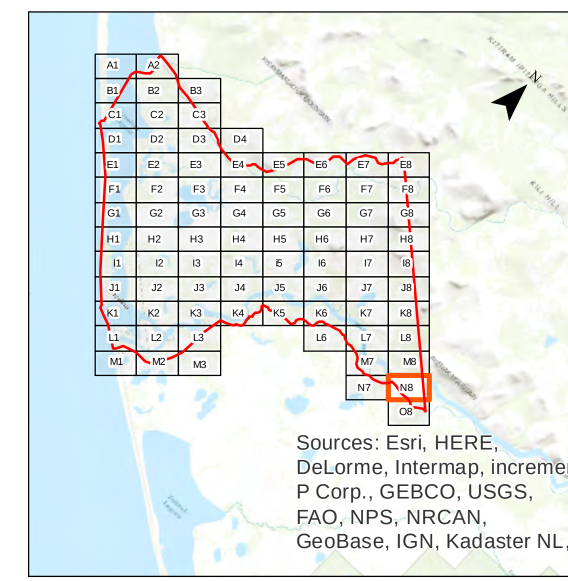

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
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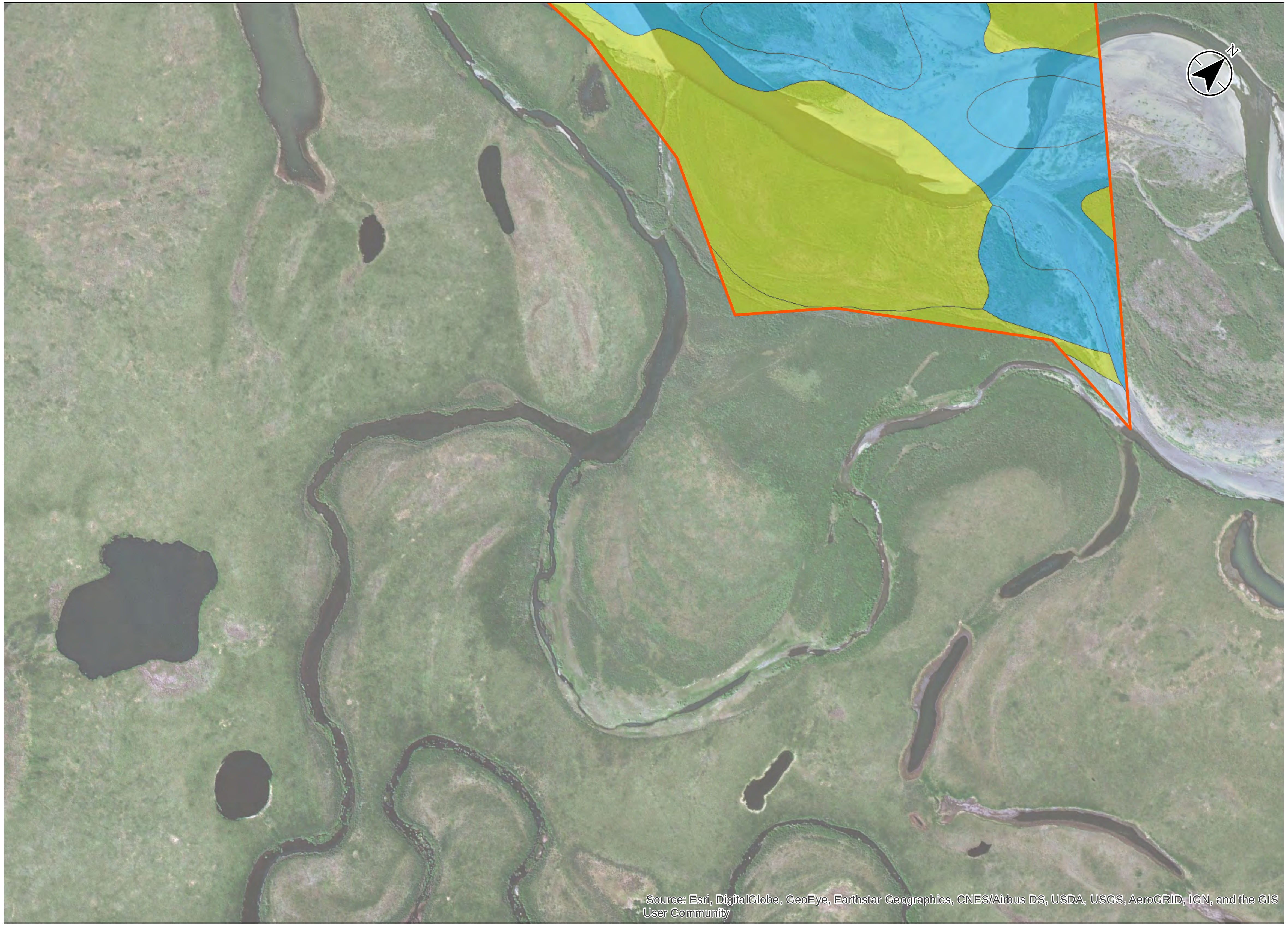
Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - N8

Title
Kivalina Evacuation and School Site Access Road - Wetlands



Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

- Estuarine
- Lacustrine
- Marine
- Palustrine_Flooded
- Palustrine_Saturated
- Pond
- Riverine
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- Study Area

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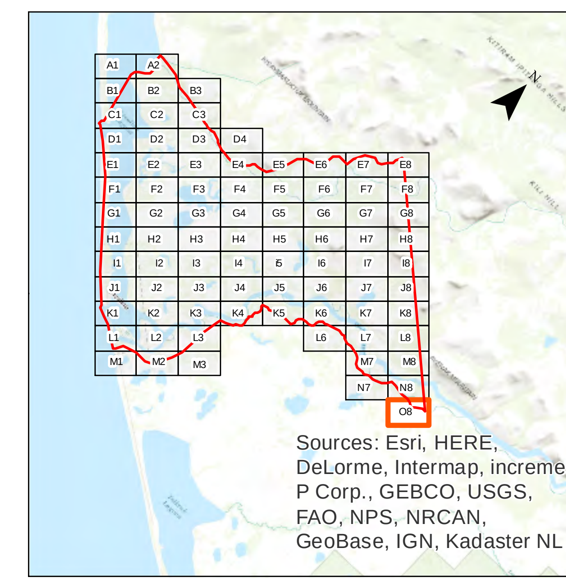


0 250 500 1,000 1,500 2,000 Feet

1:6,500 (At original document size of 11x17)

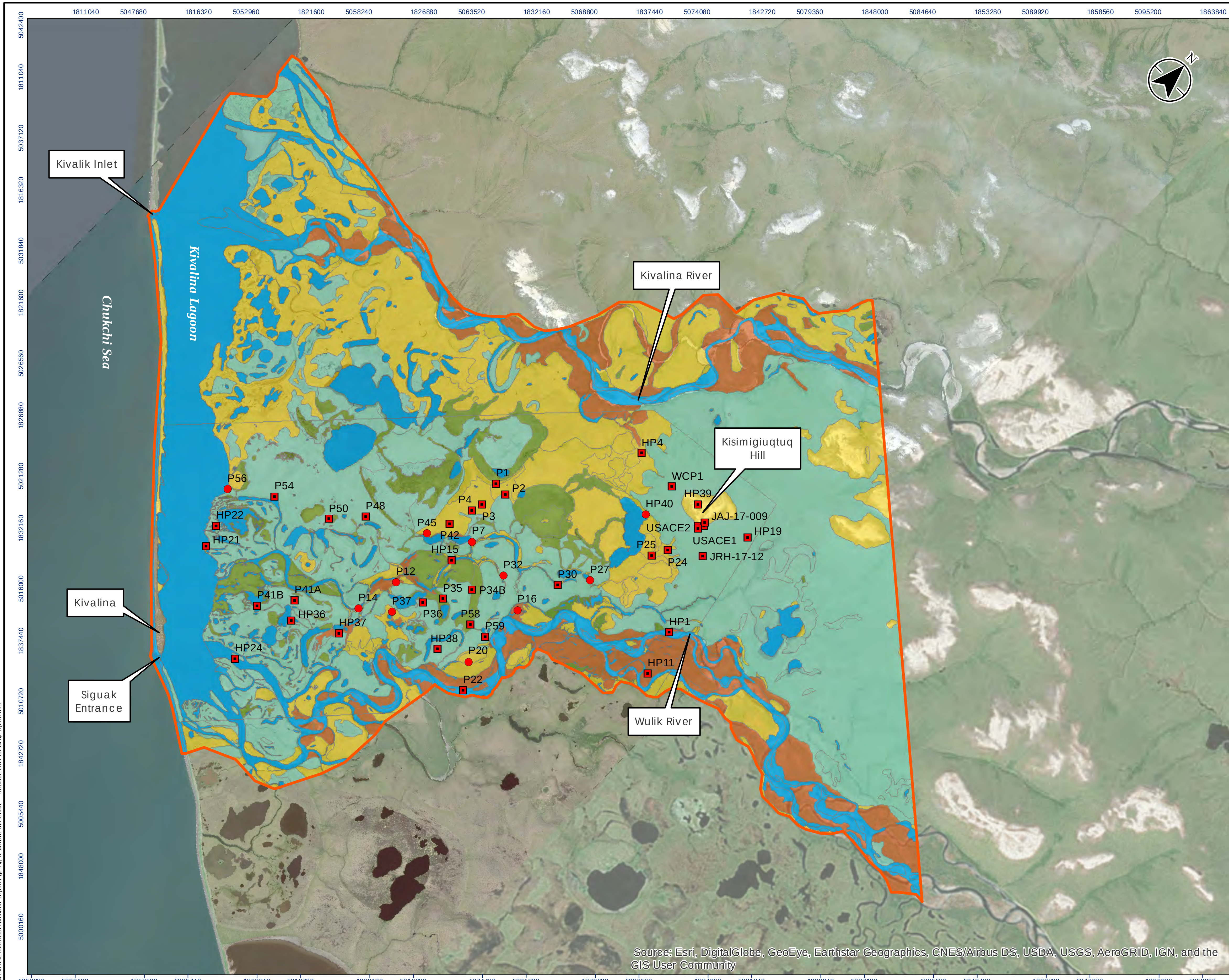
Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

002(384)/NFHWYP00162 REVA
Prepared by CDP on 2017-06-23
Technical Review by ABC on 2017-0X-XX
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
2 - O8

Title
Kivalina Evacuation and School Site Access Road - Wetlands



Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Viereck

- Developed
- II.C.1: Closed Low Scrub*
- II.D.2: Willow Dwarf Shrub
- III.A.2: Mesic Graminoid Herbaceous
- III.A.3: Mesic Graminoid Herbaceous
- W: Water
- Study Area

* Closed Low Scrub is considered important bird habitat.

0 1 2 Miles

1:80,000 (At original document size of 11x17)

Notes

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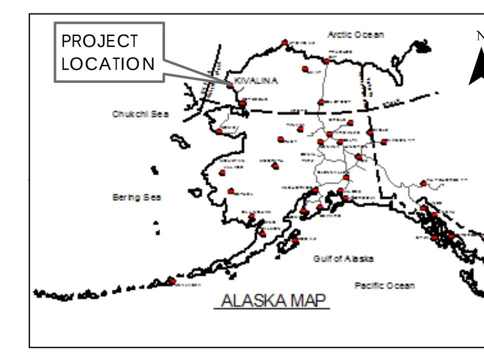

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

NFHWYP00162-002(384) REVA
Prepared by CDP on 2017-06-23
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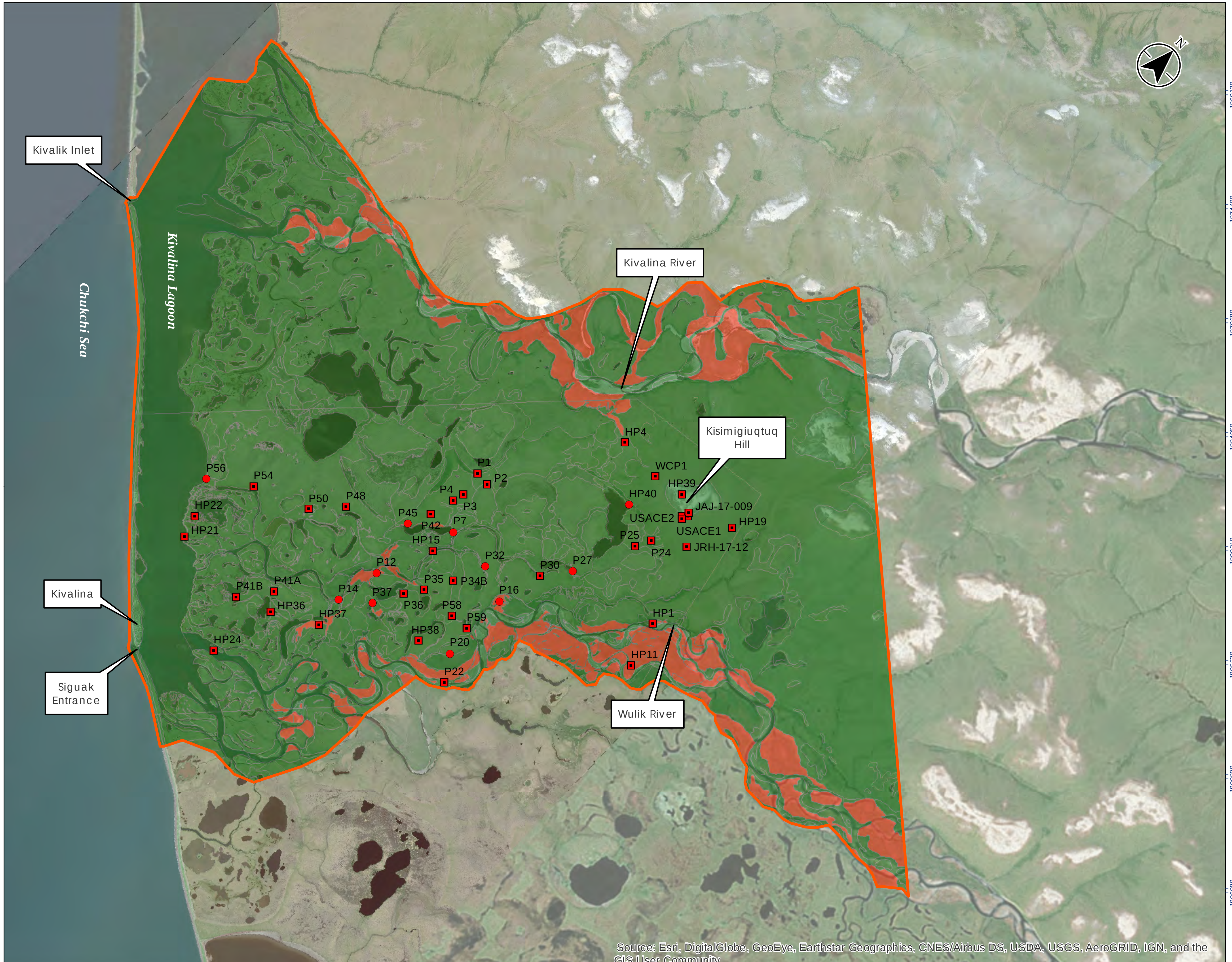
Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
3

Title
Kivalina Evacuation and School Site Access Road - Wildlife Overview



Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Bird

- No
- Yes
- Study Area

0 1 2 Miles

1:80,000 (At original document size of 11x17)

Notes

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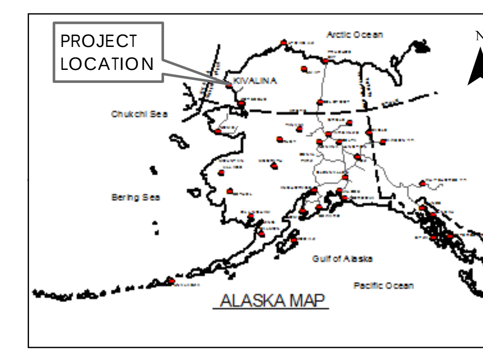

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

NFHWYP00162-002(384) REVA
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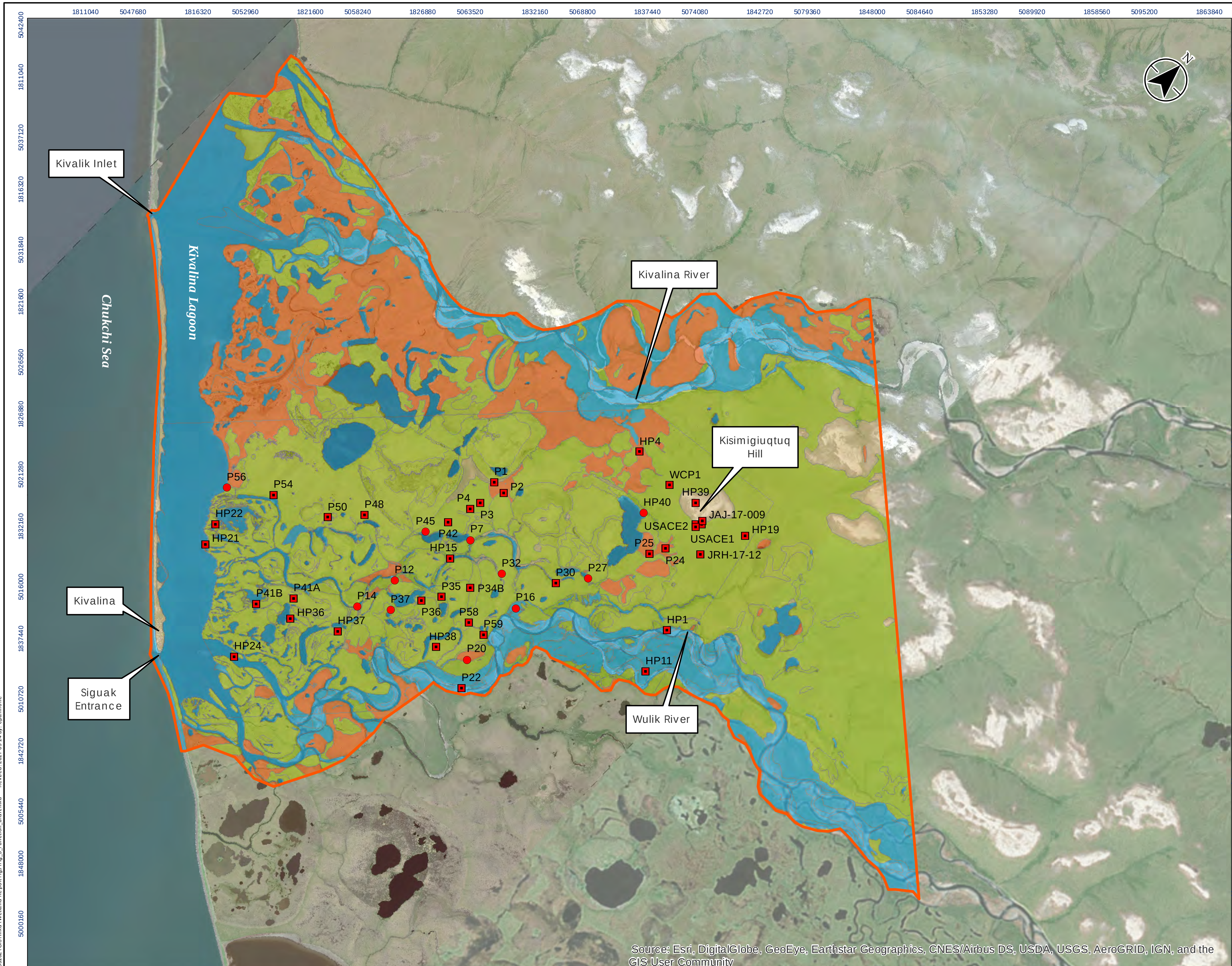
Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
4

Title
Kivalina Evacuation and School Site Access Road - Bird Overview



Stantec

Legend

Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Function

- I+
- I
- II
- Upland
- Study Area

0 1 2 Miles

1:80,000 (At original document size of 11x17)

Notes

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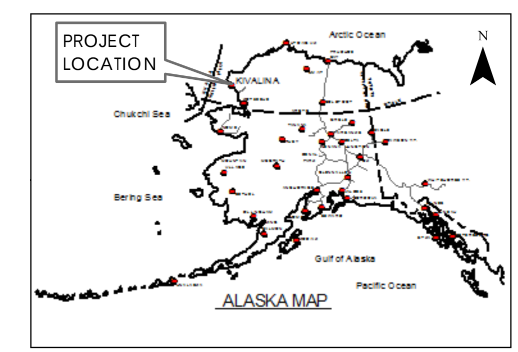

Project Location
Project Origin: Kivalina, Alaska
Section 21, Township 27N, Range 26W
Kateel River Meridian

NFHWYP00162-002(384) REVA
Prepared by CDP on 2017-06-23
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Independent Review by ABC on 2017-0X-XX

Client/Project
State of Alaska, DOT & PF Northern Region
Wetlands Verification Report
Kivalina Evacuation and School Site Access Road

Figure No.
5

Title
Kivalina Evacuation and School Site Access Road - Function Overview

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Appendix B STANDARD WETLAND DELINEATION DATA SHEETS

WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: Kivalina Borough/City: NW Arctic Sampling Date: Sept/Oct 2016
Applicant/Owner: DOT&PF Sampling Point HP40
Investigator(s): Stantec Landform (hillside, terrace, hummocks, etc Slight terrace
Local relief (concave, convex, none): convex Slope (%): 0
Subregion: Western Brooks Range Mts Foothills Lat: 67.803448 Long: -164.409217 Datum: NAD83
Soil Map Unit Name: Not Available NWI classification: PSS1/EM1E
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? ___ Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? ___ (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x No ___	Is the Sampled Area within a Wetland? Yes x No ___
Hydric Soil Present?	Yes x No ___	
Wetland Hydrology Present?	Yes x No ___	

Remarks Larger willows along northeast side of large lake at base of K-hill west. Drainage apparant along paths between willows. This point combines the soil information (from an Oct 2016 cultural investigation) with the site photos of vegetation during a Sept 2016 site visit, conducted by Stantec. We have determined that there was enough information from these investigations to inform the status of the site.

VEGETATION – Use scientific names of plants. List all species in the plot. MUST LIST COVER IN DESECENDING ORDER

3/3 Abbrev.	Species Name	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum				
1				
2				
3				
4				
	Total Cover:	0		
	50% of total cover: 0		20% of total cover:	0
Sapling/Shrub Stratum				
1	Salix, Unidentified	80	YES	FAC
2 vaculi	Vaccinium uliginosum	10	NO	FAC
3				
4				
5				
6				
	Total Cover:	90		
	50% of total cover: 45		20% of total cover:	18
Herb Stratum				
1	Unidentified Grass	100	YES	FAC
2				
3				
4				
5				
6				
7				
8				
9				
10				
	Total Cover:	100		
	50% of total cover: 50		20% of total cover:	20

Plot size (radius, or length x width) ___ % Bare Ground ___
% Cover of Wetland Bryophytes ___ Total Cover of Bryophytes ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	190	x 3 =	570
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	190 (A)		570 (B)

Prevalence Index = B/A = 3

Hydrophytic Vegetation Indicators:

Yes Dominance Test is >50%
Yes Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** x **No** ___

Remarks:

SOIL Sampling Point HP40

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6							Sod	DME-16-008
6-26							Brown silty clay loam	no roots; DME-16-008
								DME-16-008 is the Stantec Cultural Point

[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:

- ___ Histosol or Histel (A1)
- x Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: Permafrost

Depth (inches): 72

Hydric Soil Present? **Yes** x **No** ___

Remarks Oct 2016 Stantec Cultural Point DME-16-008 was used for soils. While Munsell colors were not identified, we interpreted 0-6 inches as being organics, 6-26 inches as being a layer of organic/mineral soil mix meeting the definition of a Histic Epipedon ('brown' being chroma 2 or less, 'dense...roots' as organics). Saturation was noted at below 5 inches. As the site was sampled in October, we expect the organics to be saturated during June – August.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- x Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- x Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		x	
Water Table Present?	x		8
Saturation Present? (includes capillary fringe)	x		6

Wetland Hydrology Present? **Yes** x **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: The Oct 2016 Stantec Cultural Point DME-16-008 found 50-75% water saturation at 6 inches. There is no note of a water table, as this information is not typically recorded in a cultural investigation. In our experience in the region, saturation of this degree probably means the water table is near the 8 inch mark during June - August. It is also important to review the secondary characteristics of this site.

Project/Site:	Kivalina	Site No.:	HP40
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/14/2017	Cowardin:	PSS1/EM1E

Notes: Larger willows along northeast side of large lake at base of K-hill west

Overview of Lake looking south

Overview of Lake looking south

WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: Kivalina Borough/City: NW Arctic Sampling Date: Sept/Oct 2016
Applicant/Owner: DOT&PF Sampling Point P7
Investigator(s): Stantec Landform (hillside, terrace, hummocks, etc Old Terrace
Local relief (concave, convex, none): None Slope (%): 0
Subregion: Western Brooks Range Mts Foothills Lat: 67.778212 Long: -164.460604 Datum: NAD83
Soil Map Unit Name: Not Available NWI classification: PEM1/SS1C
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? ___ Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? ___ (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x No ___	Is the Sampled Area within a Wetland? Yes x No ___
Hydric Soil Present?	Yes x No ___	
Wetland Hydrology Present?	Yes x No ___	

Remarks: Old channel and gravel bars with standing water adjacent to south. This point combines the soil information from an Oct 2016 cultural investigation with the site photos of vegetation during a Sept 2016 site visit, both conducted by Stantec. While wetlands data was not taken specifically, at this location we have determined that there was enough information from these investigations to inform the status of the site.

VEGETATION – Use scientific names of plants. List all species in the plot. MUST LIST COVER IN DESECENDING ORDER

	3/3 Abbrev.	Species Name	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum					
1					
2					
3					
4					
		Total Cover:	0		
		50% of total cover: 0	20% of total cover: 0		
Sapling/Shrub Stratum					
1	vacvit	Vaccinium vitis-idaea	50	YES	FAC
2	rhotom	Rhododendron tomentosum	50	YES	FACW
3	betnan	Betula nana	10	NO	FAC
4					
5					
6					
		Total Cover:	110		
		50% of total cover: 55	20% of total cover: 22		
Herb Stratum					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
		Total Cover:	0		
		50% of total cover: 0	20% of total cover: 0		

Plot size (radius, or length x width) ___ % Bare Ground ___
% Cover of Wetland Bryophytes ___ Total Cover of Bryophytes ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	50	x 2 =	100
FAC species	60	x 3 =	180
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	110 (A)		280 (B)

Prevalence Index = B/A = 2.5455

Hydrophytic Vegetation Indicators:

Yes Dominance Test is >50%
Yes Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: Shrubs were present on the microtopographic 'highs'. Also un-identified grasses and sedges are present. VacVit and RhoTom were identified in cultural investigation notes. BetNan appears present in the background of the closeup photo.

SOIL Sampling Point P7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2							Moss	JAJ-16-048
2-4							Brown silty clay loam	dense fine to medium roots; JAJ-16-048
4-10							Gray clay no gravels	No roots; JAJ-16-048
								JAJ-16-048 is the Stantec Cultural Point

[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:

___ Histosol or Histel (A1)
x Histic Epipedon (A2)
___ Hydrogen Sulfide (A4)
___ Thick Dark Surface (A12)
___ Alaska Gleyed (A13)
___ Alaska Redox (A14)
___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

___ Alaska Color Change (TA4)[4]
___ Alaska Alpine Swales (TA5)
___ Alaska Redox With 2.5Y Hue
___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: None

Depth (inches):

Hydric Soil Present? **Yes** x **No** ___

Remarks Soils information is taken from a Oct 2016 cultural resources investigation. 25-50% saturation was noted at 5-11". While Munsell colors were not identified, we interpreted a 2" layer of moss, at 2-4" a layer of saturated organics (primarily due to the 'dense roots') meeting the definition of a Histic Epipedon, and at 4-10" a layer of mineral soil meeting the definition of a Histic Epipedon ('gray' being chroma 2 or less). This interpretation has been boosted by the site photographs and our regional experience.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
x High Water Table (A2)
x Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Marl Deposits (B15)
___ Hydrogen Sulfide Odor (C1)
___ Dry-Season Water Table (C2)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-stained Leaves (B9)
___ Drainage Patterns (B10)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Salt Deposits (C5)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
x Microtopographic Relief (D4)
___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		x	
Water Table Present?	x		~5
Saturation Present? (includes capillary fringe)	x		5

Wetland Hydrology Present? **Yes** x **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

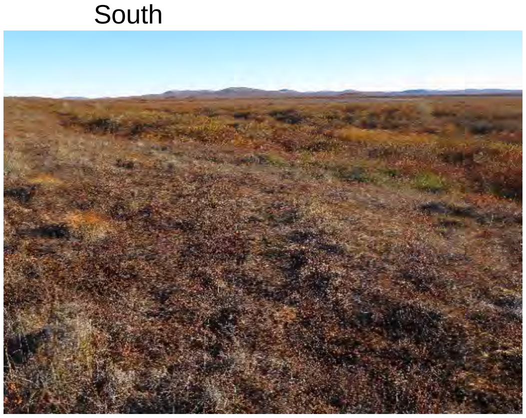
Remarks: The Oct 2016 cultural investigation notes 25-50% water saturation at 5-11 inches. There is no note of a water table, as this information is not typically recorded in a cultural investigation. In our experience in the region, saturation of this degree probably means the water table is near the 5 inch mark.

Project/Site:	Kivalina	Site No.:	P7
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/15/2016	Cowardin:	PEM1/SS1C

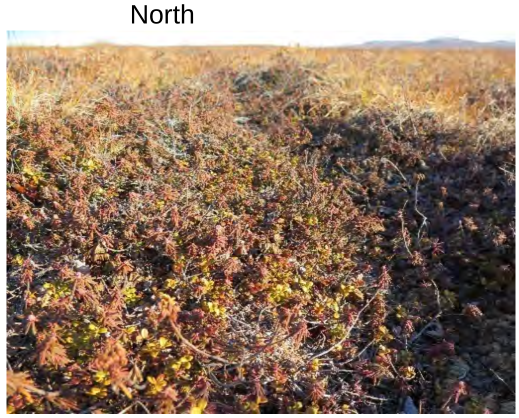
Notes: Old channel and gravel bars with standing water adjacent to south. P7 site vegetation (Low bush cranberry, Labrador tea)

South

North



East



Plant Closeup

Hovering Over P7 (in field notes as HP14)

WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: Kivalina Borough/City: NW Arctic Sampling Date: Sept/Oct 2016
Applicant/Owner: DOT&PF Sampling Point P12
Investigator(s): Stantec Landform (hillside, terrace, hummocks, etc Flat transition of habitat
Local relief (concave, convex, none): Flat Slope (%): 0
Subregion: Western Brooks Range Mts Foothills Lat: 67.76341 Long: -164.473383 Datum: NAD83
Soil Map Unit Name: Not Available NWI classification: PSS1/EM1B
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? ___ Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? ___ (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x No ___	
Hydric Soil Present?	Yes x No ___	Is the Sampled Area within a Wetland? Yes x No ___
Wetland Hydrology Present?	Yes x No ___	

Remarks Edge of geomorphic change. Up raised on south side to less vegetated plateau, shrubs diminishing to the south grading to tussock/grassy. Point combines soil information from an Oct 2016 cultural investigation (point JAJ-16-009) with site photos of vegetation during a Sept 2016 site visit (P12), both conducted by Stantec. While wetlands data was not taken specifically, at this location we have determined that there was enough information from these investigations to inform the status of the site.

VEGETATION – Use scientific names of plants. List all species in the plot. MUST LIST COVER IN DESECENDING ORDER

3/3 Abbrev.	Species Name	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum				
1				
2				
3				
4				
	Total Cover:	0		
	50% of total cover: 0	20% of total cover: 0		
Sapling/Shrub Stratum				
1 salsp	Salix sp (unknown)	80	YES	FAC
2 betnan	Betula nana	25	NO	FAC
3 vaculi	Vaccinium uliginosum	25	NO	FAC
4 rhotom	Rhododendron tomentosum	25	NO	FACW
5				
6				
	Total Cover:	155		
	50% of total cover: 77.5	20% of total cover: 31		
Herb Stratum				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
	Total Cover:	0		
	50% of total cover: 0	20% of total cover: 0		

Plot size (radius, or length x width) ___ % Bare Ground ___
% Cover of Wetland Bryophytes ___ Total Cover of Bryophytes ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	25	x 2 =	50
FAC species	130	x 3 =	390
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	155 (A)		440 (B)

Prevalence Index = B/A = 2.8387

Hydrophytic Vegetation Indicators:

Yes Dominance Test is >50%
Yes Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: High shrubs are assumed to be willow species. Detailed photo examination also show BetNan, VacUli, and Labrador Tea. Herbs are present, but are too distant to identify, and do not appear to be FACU or UPL species.

SOIL Sampling Point P12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2							Sod	JAJ-16-009
2-16							Brown silty clay loam	dense fine to medium roots; JAJ-16-009
								JAJ-16-009 is the Stantec Cultural Point

[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:

- ___ Histosol or Histel (A1)
- x Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: Permafrost

Depth (inches): 53

Hydric Soil Present? **Yes** x **No** ___

Remarks Soils information is taken from a Oct 2016 cultural resources investigation. 50-75% saturation was noted at 2 to 16 inches in Oct. While Munsell colors were not identified, we interpreted there to be a 2 inch layer of organics, which is probably saturated during the growing season. At 5-40 inches a mixture of organics (due to the 'dense roots') and mineral loam. We assume this meets the definition of a Histic Epipedon, ('brown' being chroma 2 or less). This interpretation has been boosted by the site photographs.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- x Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- x Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		x	
Water Table Present?	x		5
Saturation Present? (includes capillary fringe)	x		2

Wetland Hydrology Present? **Yes** x **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

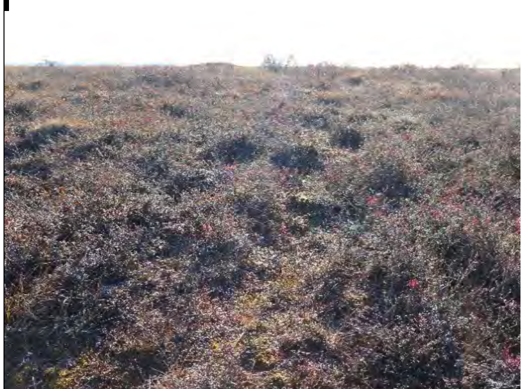
Remarks: The Oct 2016 cultural investigation notes 50-75% water saturation at 2-16 inches. There is no note of a water table, as this information is not typically recorded in a cultural investigation. In our experience in the region, saturation of this degree probably means the water table is near the 5 inch mark. We also note microtopo relief and drainage patterns in the "South" site photos.

Project/Site:	Kivalina	Site No.:	P12
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/15/2016	Cowardin:	PSS1/EM1B

Notes: Edge of geomorphic change. Up raised on south side to less vegetated plateau, shrubs diminishing to the south grading to tussock/grassy.

Looking North

Looking East



Looking South

Looking West

WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: Kivalina Borough/City: NW Arctic Sampling Date: Sept/Oct 2016
Applicant/Owner: DOT&PF Sampling Point P14
Investigator(s): Stantec Landform (hillside, terrace, hummocks, etc Terrace above wetter area
Local relief (concave, convex, none): Convex Slope (%): 0
Subregion: Western Brooks Range Mts Foothills Lat: 67.755301 Long: -164.477827 Datum: NAD83
Soil Map Unit Name: Not Available NWI classification: PSS1/EM1E
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? ___ Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? ___ (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x No ___	Is the Sampled Area within a Wetland? Yes x No ___
Hydric Soil Present?	Yes x No ___	
Wetland Hydrology Present?	Yes x No ___	

Remarks: Edge of second side channel to east. Standing ponds chain. Flat elevated tundra between two side channels. Point combines soil information (from an Oct 2016 cultural investigation and a March/April 2015 Golder geotechnical investigation) with site photos of vegetation during a Sept 2016 site visit, conducted by Stantec. While wetlands data was not taken specifically, at this location we have determined that there was enough information from these investigations to inform the status of the site.

VEGETATION – Use scientific names of plants. List all species in the plot. MUST LIST COVER IN DESECENDING ORDER

3/3 Abbrev.	Species Name	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum				
1				
2				
3				
4				
	Total Cover:	0		
	50% of total cover: 0		20% of total cover: 0	
Sapling/Shrub Stratum				
1 rhotom	Rhododendron tomentosum	75	YES	FACW
2 vacvit	Vaccinium vitis-idaea	75	YES	FAC
3 salsp	Salix sp (unknown species)	50	YES	FAC
4 betnan	Betula nana	10	NO	FAC
5				
6				
	Total Cover:	210		
	50% of total cover: 105		20% of total cover: 42	
Herb Stratum				
1 erivag	Eriophorum vaginatum	2	YES	FACW
2				
3				
4				
5				
6				
7				
8				
9				
10				
	Total Cover:	2		
	50% of total cover: 1		20% of total cover: 0.4	

Plot size (radius, or length x width) ___ % Bare Ground ___
% Cover of Wetland Bryophytes ___ Total Cover of Bryophytes ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	77	x 2 =	154
FAC species	135	x 3 =	405
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	212	(A)	559 (B)

Prevalence Index = B/A = 2.6368

Hydrophytic Vegetation Indicators:

Yes Dominance Test is >50%
Yes Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: Shrubs are present throughout the site photos. Small numbers of EriVag seed heads are visible. There is apparent dense shrub cover, which appears to be RhoTom/VacVit or similar.

SOIL Sampling Point P14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4							Organics	DME-16-023
4-25	Brown						Silty Sand no gravel	DME-16-023
								DME-16-023 is the Stantec Cultural Point
0-35	Frozen, brown						ORGANIC SILT	10-20% visible ice; Golder K15-13

[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:

- ___ Histosol or Histel (A1)
- x Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: Permafrost
Depth (inches): 25

Hydric Soil Present? Yes x No ___

Remarks Oct 2016 Stantec Cultural Point DME-16-023 and a March/April 2015 Golder geotechnical investigation was used for soils (point K15-13). While Munsell colors were not identified, we interpreted 0-4 inches as being organics, 4-25 inches as being a layer of mineral soil meeting the definition of a Histic Epipedon ('brown' being chroma 2 or less). Saturation was noted at 4 inches and below. As the site was sampled in October, we expect the organics to be saturated during June - August

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- x Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		x	
Water Table Present?	x		4
Saturation Present? (includes capillary fringe)	x		4

Wetland Hydrology Present? Yes x No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: The Oct 2016 Stantec Cultural Point DME-16-023 found 75-100% water saturation at 4 inches. There is no note of a water table, as this information is not typically recorded in a cultural investigation. In our experience in the region, saturation of this degree probably means the water table is near the 4 inch mark during June - August.

Project/Site: Kivalina

Applicant/Owner: DOT&PF

Date: 9/15/2016

Site No.: P14

Investigator(s): Stantec

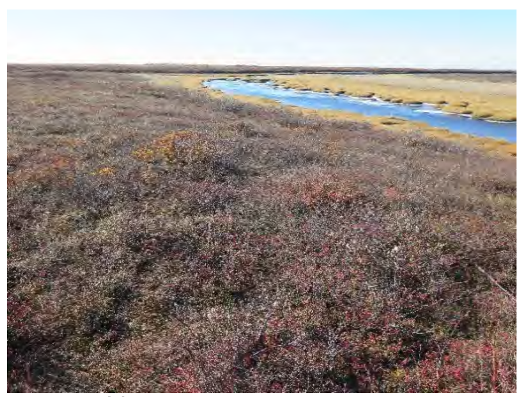
Cowardin: PSS1/EM1E

Notes: Edge of second side channel to east. Standing ponds chain. Flat elevated tundra between two side channels perpendicular to curved lake forming North end.

Looking North

Looking East

Looking South



Looking West

WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: Kivalina Borough/City: NW Arctic Sampling Date: Sept/Oct 2016
Applicant/Owner: DOT&PF Sampling Point P16
Investigator(s): Stantec Landform (hillside, terrace, hummocks, etc Flat
Local relief (concave, convex, none): Concave Slope (%): 0
Subregion: Western Brooks Range Mts Foothills Lat: 67.774894 Long: -164.422309 Datum: NAD83
Soil Map Unit Name: Not Available NWI classification: PSS1J
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? ___ Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? ___ (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x No ___	Is the Sampled Area within a Wetland? Yes x No ___
Hydric Soil Present?	Yes ___ No ___	
Wetland Hydrology Present?	Yes x No ___	

Remarks This point combines the soil information (from an Oct 2016 cultural investigation) with the site photos of vegetation during a Sept 2016 site visit, conducted by Stantec. We have determined that there was enough information from these investigations to inform the status of the site. Our hypothesis is that these riverine wetlands experience regular flooding during spring highwater. This would provide the wetland hydrology, and the scouring force to prevent a dense herb layer.

VEGETATION – Use scientific names of plants. List all species in the plot. MUST LIST COVER IN DESECENDING ORDER

	3/3 Abbrev.	Species Name	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum					
1					
2					
3					
4					
		Total Cover:	0		
		50% of total cover: 0		20% of total cover: 0	
Sapling/Shrub Stratum					
1	salsp	Salix sp (unknown species)	75	YES	FAC
2					
3					
4					
5					
6					
		Total Cover:	75		
		50% of total cover: 37.5		20% of total cover: 15	
Herb Stratum					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
		Total Cover:	0		
		50% of total cover: 0		20% of total cover: 0	

Plot size (radius, or length x width) ___ % Bare Ground ___
% Cover of Wetland Bryophytes ___ Total Cover of Bryophytes ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	75	x 3 =	225
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	75 (A)		225 (B)

Prevalence Index = B/A = 3

Hydrophytic Vegetation Indicators:

Yes Dominance Test is >50%
Yes Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: The vegetation consists of tall unidentified willow species. Some unidentified grasses are present in the herb layer. Our hypothesis is that these riverine wetlands experience regular flooding during spring highwater. This would provide the wetland hydrology, and the scouring force to prevent a dense herb layer.

SOIL Sampling Point P16

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2							Moss/Sod	JAJ-16-013
2-16							Brown silty clay loam	dense fine to medium roots; JAJ-16-013
16-17							Clay	No roots; JAJ-16-013
								JAJ-16-013 is the Stantec Cultural Point

[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:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: None

Depth (inches):

Hydric Soil Present? **Yes** ___ **No** ___

Remarks Oct 2016 Stantec Cultural Point JAJ-16-013 was used for soils. While Munsell colors were not identified, we interpreted 0-2 inches as being organics, 2-16 inches as being a layer of organic/mineral soil mix meeting the definition of a Histic Epipedon ('brown' being chroma 2 or less).We interpreted 'dense...roots' as being evidence of organics. Saturation was noted at below 2 inches. As the site was sampled in October, we expect the organics to be saturated during June - August.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- x Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- x Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		x	
Water Table Present?	x		8
Saturation Present? (includes capillary fringe)	x		2

Wetland Hydrology Present? **Yes** x **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Oct 2016 Stantec Cultural Point DME-16-013 found 25-50% water saturation at 2". No note of a water table, this information is not typically recorded in a cultural investigation. In our experience in the region, saturation of this degree probably means the water table is near the 8" mark during June-Aug. It is also important to review the secondary characteristics of this site. We find that this site likely experiences seasonal flooding during spring highwater (note lack of dense herb layer, indicating scouring).

Project/Site:	Kivalina	Site No.:	P16
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/15/2016	Cowardin:	PSS1J

Notes: Ground vegetation at P16 (sedge and moss). Water slough from Wulik River. Tapers off 500 ft. to east

Looking North

Looking East

Looking South

Looking West

WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: Kivalina Borough/City: NW Arctic Sampling Date: Sept/Oct 2016
Applicant/Owner: DOT&PF Sampling Point P20
Investigator(s): Stantec Landform (hillside, terrace, hummocks, etc Tundra
Local relief (concave, convex, none): Concave Slope (%): 0
Subregion: Western Brooks Range Mts Foothills Lat: 67.762042 Long: -164.422233 Datum: NAD83
Soil Map Unit Name: Not Available NWI classification: PSS1/EM1B
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? ___ Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? ___ (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x No ___	Is the Sampled Area within a Wetland? Yes x No ___
Hydric Soil Present?	Yes x No ___	
Wetland Hydrology Present?	Yes x No ___	

Remarks: Largest gravel material site along Wulik River. Little bit higher ground - no standing water. Soil probe sample saturated. Low areas saturated at surface, sedges, moss covered surface, 20% grass, 30% moss. This point combines the soil information (from an Oct 2016 cultural investigation) with the site photos of vegetation during a Sept 2016 site visit, conducted by Stantec. We have determined that there was enough information from these investigations to inform the status of the site.

VEGETATION – Use scientific names of plants. List all species in the plot. MUST LIST COVER IN DESECENDING ORDER

	3/3 Abbrev.	Species Name	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum					
1					
2					
3					
4					
		Total Cover:	0		
		50% of total cover: 0	20% of total cover: 0		
Sapling/Shrub Stratum					
1	salsp	Salix, Unidentified	50	YES	FAC
2	vacvit	Vaccinium vitis-idaea	5	NO	FAC
3					
4					
5					
6					
		Total Cover:	55		
		50% of total cover: 27.5	20% of total cover: 11		
Herb Stratum					
1		Grass, Unidentified	20	YES	FAC
2		Sedge, Unidentified	20	YES	FAC
3					
4					
5					
6					
7					
8					
9					
10					
		Total Cover:	40		
		50% of total cover: 20	20% of total cover: 8		

Plot size (radius, or length x width) ___ % Bare Ground 0
% Cover of Wetland Bryophytes ___ Total Cover of Bryophytes 30

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	95	x 3 =	285
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	95 (A)		285 (B)

Prevalence Index = B/A = 3

Hydrophytic Vegetation Indicators:

Yes Dominance Test is >50%
Yes Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks:

SOIL Sampling Point P20

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2							Moss	JAJ-16-46
2-3							Brown/gray clay silt	dense fine to small roots; JAJ-16-46
3-10							Grey clay	No roots, JAJ-16-46
								JAJ-16-46 is the Stantec Cultural Point

[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:

- ___ Histosol or Histel (A1)
- x Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed

[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: Permafrost
Depth (inches): 10

Hydric Soil Present? Yes x No ___

Remarks Oct 2016 Stantec Cultural Point JAJ-16-466. While Munsell colors were not identified, we interpreted 0-2" as moss/organics, 2-3" as organic/mineral soil mix meeting the definition of a Histic Epipedon ('brown' being interpreted as chroma 2 or less).We interpreted 'dense...roots' as being evidence of organics. 3-10" as clay without organics. 50-75% saturation was noted at 2". As the site was sampled in Oct. we expect saturated organics during June–Aug.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- x Shallow Aquitard (D3)
- x Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No x Depth (inches): ___
Water Table Present? Yes x No ___ Depth (inches): 8
Saturation Present? Yes x No ___ Depth (inches): 2
(includes capillary fringe)

Wetland Hydrology Present? Yes x No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: The Oct 2016 Stantec Cultural Point JAJ-16-466 found 50-75% water saturation at 2 inches. The Stantec 9/15/17 field visit notes saturation at the surface.In our experience in the region, saturation of this degree probably means the water table is above or near the 8 inch mark. Micro relief is evident, and we belive the permafrost is present above 24" during the growing season, and able to perch water to within 12 inches.

Project/Site:	Kivalina	Site No.:	P20
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/15/2017	Cowardin:	PSS1/EM1B

Notes: Largest gravel material site along Wulik River. Little bit higher ground - no standing water. Soil probe sample saturated. Low areas saturated at surface, sedges, moss covered surface, 20% grass, 30% moss

Looking North

Looking East

Looking South

Looking West

WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: Kivalina Borough/City: NW Arctic Sampling Date: Sept/Oct 2016
Applicant/Owner: DOT&PF Sampling Point P27
Investigator(s): Stantec Landform (hillside, terrace, hummocks, etc Terrace
Local relief (concave, convex, none): Convex Slope (%):
Subregion: Western Brooks Range Mts Foothills Lat: 67.78784 Long: -164.406934 Datum: NAD83
Soil Map Unit Name: Not Available NWI classification: PSS1/EM1B
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? ___ Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? ___ (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x No ___	Is the Sampled Area within a Wetland? Yes x No ___
Hydric Soil Present?	Yes x No ___	
Wetland Hydrology Present?	Yes x No ___	

Remarks Just south of cluster of 3 ponds. Elevated to north of ponds, on edge of elevated ridge that wraps to the east of the ponds. This point combines the soil information (from an Oct 2016 cultural investigation) with the site photos of vegetation during a Sept 2016 site visit, conducted by Stantec. We have determined that there was enough information from these investigations to inform the status of the site.

VEGETATION – Use scientific names of plants. List all species in the plot. MUST LIST COVER IN DESECENDING ORDER

3/3 Abbrev.	Species Name	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum				
1				
2				
3				
4				
	Total Cover:	0		
	50% of total cover: 0		20% of total cover: 0	
Sapling/Shrub Stratum				
1 rhotom	Rhododendron tomentosum	50	YES	FACW
2 Vaculi	Vaccinium uliginosum	10	NO	FAC
3	Salix Unidentified	5	NO	FAC
4 arcrub	Arctous ruber	5	NO	FAC
5				
6				
	Total Cover:	70		
	50% of total cover: 35		20% of total cover: 14	
Herb Stratum				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
	Total Cover:	0		
	50% of total cover: 0		20% of total cover: 0	

Plot size (radius, or length x width)____ % Bare Ground____
% Cover of Wetland Bryophytes____ Total Cover of Bryophytes____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	50	x 2 =	100
FAC species	20	x 3 =	60
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	70 (A)		160 (B)

Prevalence Index = B/A = 2.2857

Hydrophytic Vegetation Indicators:

Yes Dominance Test is >50%
Yes Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: The point is taken on a slight convex rise. It primarily consists of grass/sedge (unid) and low shrubs, with a few scattered moderate height willow. Grass tussocks are evident in regular patterns.

SOIL Sampling Point P27

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2							Sod	JAJ-16-020
2-12							Org and Brown loam	few fine to small roots; JAJ-16-020
								JAJ-16-020 is the Stantec Cultural Point

[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:

- ___ Histosol or Histel (A1)
- x Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: None

Depth (inches):

Hydric Soil Present? Yes x No ___

Remarks Oct 2016 Stantec Cultural Point JAJ-16-020 was used for soils. While Munsell colors were not identified, we interpreted 0-2" as organics, 2-12" as a layer of mineral with organics intermixed ('brown' being chroma 2 or less).We interpreted 'few...roots' as organics evidence. Saturation was noted below 2". As the site was sampled in Oct., organics will be saturated during June – August. While the organic is slightly less than typical of a wetland, we interpret this as histic epipedon.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- x Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		x	
Water Table Present?	x		8
Saturation Present? (includes capillary fringe)	x		2

Wetland Hydrology Present? Yes x No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: The Oct 2016 Stantec Cultural Point JAJ-16-020 25-50% water saturation at 2 inches. There is no note of a water table, as this information is not typically recorded in a cultural investigation. In our experience in the region, saturation of this degree probably means the water table is near the 8 inch mark during June - August. It is also important to review the secondary characteristics of this site.

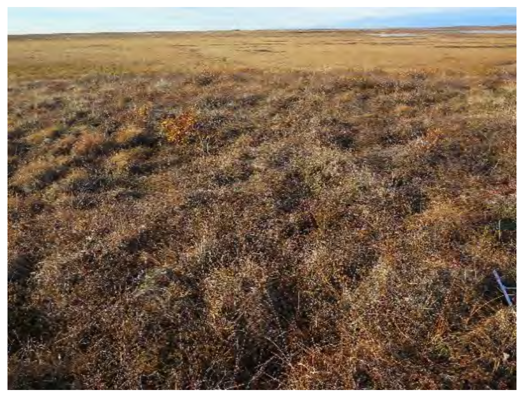
Project/Site:	Kivalina	Site No.:	P27
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/16/2017	Cowardin:	PSS1/EM1B

Notes: Just south of cluster of 3 ponds. Elevated to north of ponds, on edge of elevated ridge that wraps to the east of the ponds

Looking North

Looking East

Looking South



Looking West

WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: Kivalina Borough/City: NW Arctic Sampling Date: Sept/Oct 2016
Applicant/Owner: DOT&PF Sampling Point P32
Investigator(s): Stantec Landform (hillside, terrace, hummocks, etc Flat
Local relief (concave, convex, none): Flat Slope (%): 0
Subregion: Western Brooks Range Mts Foothills Lat: 67.777731 Long: -164.438397 Datum: NAD83
Soil Map Unit Name: Not Available NWI classification: PEM1/SS1C
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? ___ Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? ___ (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x No ___	Is the Sampled Area within a Wetland? Yes x No ___
Hydric Soil Present?	Yes x No ___	
Wetland Hydrology Present?	Yes x No ___	

Remarks Standing water at surface in current location. Sporadic shrubs, seeding grasses/sedges. This point combines the soil information (from an Oct 2016 cultural investigation and a March/April 2015 Golder geotechnical investigation) with the site photos of vegetation during a Sept 2016 site visit, conducted by Stantec. We have determined that there was enough information from these investigations to inform the status of the site.

VEGETATION – Use scientific names of plants. List all species in the plot. MUST LIST COVER IN DESECENDING ORDER

3/3 Abbrev.	Species Name	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum				
1				
2				
3				
4				
	Total Cover:	0		
	50% of total cover: 0		20% of total cover: 0	
Sapling/Shrub Stratum				
1	Salix Unidentified	50	YES	FAC
2				
3				
4				
5				
6				
	Total Cover:	50		
	50% of total cover: 25		20% of total cover: 10	
Herb Stratum				
1	Carex sp (unidentified)	100	YES	FAC
2 erivag	Eriophorum vaginatum	5	NO	FACW
3				
4				
5				
6				
7				
8				
9				
10				
	Total Cover:	105		
	50% of total cover: 52.5		20% of total cover: 21	

Plot size (radius, or length x width)___ % Bare Ground___
% Cover of Wetland Bryophytes___ Total Cover of Bryophytes ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	5	x 2 =	10
FAC species	150	x 3 =	450
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	155 (A)		460 (B)

Prevalence Index = B/A = 2.9677

Hydrophytic Vegetation Indicators:

Yes Dominance Test is >50%
Yes Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** x **No** ___

Remarks: The vegetation consists primarily of sedges and grasses, with some interspersed willows. Cottongrass is evident, and standing water was reported. While identifying specific species is difficult, indicators are likely to be FAC or wetter.

SOIL Sampling Point P32

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2							Moss	JAJ-16-30
2-12							Brown silty clay loam	dense fine to medium roots; JAJ-16-30
								JAJ-16-30 is the Stantec Cultural Point
0-240	Frozen, brown to black						ORGANIC SILT	10-30% Ice; Golder K15-21

[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:

- ___ Histosol or Histel (A1)
- x Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: None

Depth (inches):

Hydric Soil Present? Yes x No ___

Remarks Oct 2016 Stantec Cultural Point JAJ-16-30 and March/April 2015 Golder geotechnical investigation was used for soils (point K15-21). While Munsell colors were not identified, we interpreted 0-2" as organics, 2-12" as a layer of organic/mineral soil mix meeting the definition of a Histic Epipedon ('brown' being chroma 2 or less, 'dense...roots' as being organics). Saturation was noted at below 2 inches. As the site was sampled in October, we expect the organics to be saturated during June – August.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- x Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- x Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes x	No ___	Depth (inches): 0
Water Table Present?	Yes x	No ___	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes x	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes x No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: The Sept site visit notes standing water. The Oct 2016 Stantec Cultural Point JAJ-16-30 found 75-100% water saturation at 2 inches. There is no note of a water table, as this information is not typically recorded in a cultural investigation. In our experience in the region, saturation of this degree probably means the water table is near the 8 inch mark during June - August. It is also important to review the secondary characteristics of this site.

Project/Site: Kivalina

Applicant/Owner: DOT&PF

Date: 9/16/2016

Site No.: P32

Investigator(s): Stantec

Cowardin: PEM1/SS1C

Notes: Dry surface conditions from upper edge of last feature to current location. Short pond ~500 ft to south. Standing water at surface in current location. Sporadic shrubs, seeding grasses/sedges.

Looking North

Looking East

Looking South

Looking West

WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: Kivalina Borough/City: NW Arctic Sampling Date: Sept/Oct 2016
Applicant/Owner: DOT&PF Sampling Point P37
Investigator(s): Stantec Landform (hillside, terrace, hummocks, etc Meadow
Local relief (concave, convex, none): Flat Slope (%): 0
Subregion: Western Brooks Range Mts Foothills Lat: 67.759108 Long: -164.46516 Datum: NAD83
Soil Map Unit Name: Not Available NWI classification: PSS1/EM1E
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? ___ Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? ___ (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x No ___	Is the Sampled Area within a Wetland? Yes x No ___
Hydric Soil Present?	Yes x No ___	
Wetland Hydrology Present?	Yes x No ___	

Remarks: Standing water with small open water areas. Base of medium sized elongated rise. Hydrologically connected to pond, near by sedges and taller grasses. This point combines the soil information (from an Oct 2016 cultural investigation and a March/April 2015 Golder geotechnical investigation) with the site photos of vegetation during a Sept 2016 site visit, conducted by Stantec. We have determined that there was enough information from these investigations to inform the status of the site.

VEGETATION – Use scientific names of plants. List all species in the plot. MUST LIST COVER IN DESECENDING ORDER

	3/3 Abbrev.	Species Name	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum					
1					
2					
3					
4					
		Total Cover:	0		
		50% of total cover: 0		20% of total cover: 0	
Sapling/Shrub Stratum					
1					
2					
3					
4					
5					
6					
		Total Cover:	0		
		50% of total cover: 0		20% of total cover: 0	
Herb Stratum					
1	Carsp	Carex sp (unidentified)	100	YES	FACW
2					
3					
4					
5					
6					
7					
8					
9					
10					
		Total Cover:	100		
		50% of total cover: 50		20% of total cover: 20	

Plot size (radius, or length x width) ___ % Bare Ground ___
% Cover of Wetland Bryophytes ___ Total Cover of Bryophytes ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		200 (B)

Prevalence Index = B/A = 2

Hydrophytic Vegetation Indicators:

Yes Dominance Test is >50%
Yes Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: The site has standing water and sedge monoculture. While the specific species is not evident, it is likely to be FACW or OBL.

SOIL Sampling Point P37

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2							Sod	JAJ-16-006
2-21	Brown, no gravels						Silty clay loam	Fine to small roots
								JAJ-16-006 is the Stantec Cultural Point
0-18							Frozen peat	Organics; Golder K15-15
18-84	Frozen, dark grayish brown						ORGANIC SILT	40-50% Ice; Golder K15-15

[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:

- ___ Histosol or Histel (A1)
- x Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: None

Depth (inches):

Hydric Soil Present? **Yes** x **No** ___

Remarks Golder found peat/organics from 0-18". Oct 2016 Stantec Cultural Point JAJ-16-006 and March/April 2015 Golder geotechnical investigation was used for soils (point K-15-15). While Munsell colors were not identified, we interpreted 0-2" as organics, 2-21" as organics (roots) and a layer of mineral soil meeting the definition of a Histic Epipedon ('brown' being chroma 2 or less). Saturation was noted at below 2".

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- x Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes x	No ___	Depth (inches):	0
Water Table Present?	Yes x	No ___	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes x	No ___	Depth (inches):	0

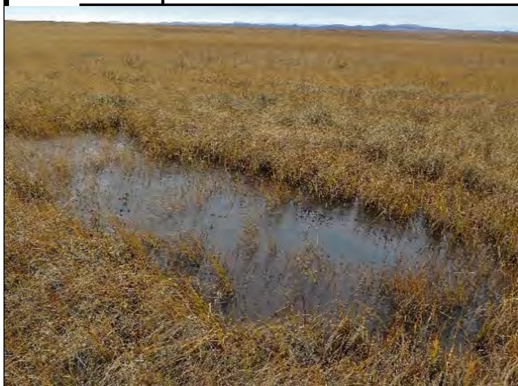
Wetland Hydrology Present? **Yes** x **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: The Oct 2016 Stantec Cultural Point JAJ-16-006 found 25-50% saturation at 2 inches. There is no note of a water table, as this information is not typically recorded in a cultural investigation. In our experience in the region, saturation of this degree probably means the water table is near the 8 inch mark during June - August. The Sept site visit found standing water.

Project/Site:	Kivalina	Site No.:	P37
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/16/2016	Cowardin:	PSS1/EM1E

Notes: Standing water with small open water areas. Base of medium sized elongated rise. Hydrologically connected to pond, near by sedges and taller grasses.



Looking North

Looking East

Looking South

Looking West

WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: Kivalina Borough/City: NW Arctic Sampling Date: Sept/Oct 2016
Applicant/Owner: DOT&PF Sampling Point P45
Investigator(s): Stantec Landform (hillside, terrace, hummocks, etc Hillside
Local relief (concave, convex, none): Slope Slope (%): 5
Subregion: Western Brooks Range Mts Foothills Lat: 67.773729 Long: -164.478786 Datum: NAD83
Soil Map Unit Name: Not Available NWI classification: PSS1/EM1C
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? ___ Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? ___ (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x No ___	Is the Sampled Area within a Wetland? Yes x No ___
Hydric Soil Present?	Yes x No ___	
Wetland Hydrology Present?	Yes x No ___	

Remarks
Drainage feature towards lake. This point combines the soil information (from an Oct 2016 cultural investigation) with the site photos of vegetation during a Sept 2016 site visit, conducted by Stantec. We have determined that there was enough information from these investigations to inform the status of the site.

VEGETATION – Use scientific names of plants. List all species in the plot. MUST LIST COVER IN DESECENDING ORDER

	3/3 Abbrev.	Species Name	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum					
1					
2					
3					
4					
		Total Cover:	0		
		50% of total cover: 0		20% of total cover:	0
Sapling/Shrub Stratum					
1	vaculi	Vaccinium uliginosum	75	YES	FAC
2	salsp	Salix sp (unidentified)	50	YES	FAC
3	vacvit	Vaccinium vitis-idaea	40	YES	FAC
4	rhotom	Rhododendron tomentosum	10	NO	FACW
5					
6					
		Total Cover:	175		
		50% of total cover: 87.5		20% of total cover:	35
Herb Stratum					
1		Unidentified Grass	5	YES	FAC
2					
3					
4					
5					
6					
7					
8					
9					
10					
		Total Cover:	5		
		50% of total cover: 2.5		20% of total cover:	1

Plot size (radius, or length x width) ___ % Bare Ground ___
% Cover of Wetland Bryophytes ___ Total Cover of Bryophytes ___

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 4 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	10	x 2 =	20
FAC species	170	x 3 =	510
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	180 (A)		530 (B)

Prevalence Index = B/A = 2.9444

Hydrophytic Vegetation Indicators:
Yes Dominance Test is >50%
Yes Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: A shrub sloping hillside, with dense layers of VacVit and VacUli, and a covering chest high layer of willows.

SOIL Sampling Point P45

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2							Sod	JAJ-16-016
2-16							Brown/gray clay silty	few fine to small roots; JAJ-16-016
								JAJ-16-016 is the Stantec Cultural Point

[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:

- ___ Histosol or Histel (A1)
- x Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: None

Depth (inches):

Hydric Soil Present? Yes x No ___

Remarks Oct 2016 Stantec Cultural Point JAJ-16-016 was used for soils. While Munsell colors were not identified, we interpreted 0-2" as organics, 2-16" as a layer of organic/mineral soil mix meeting the definition of a Histic Epipedon ('brown' being chroma 2 or less, 'few...roots' as organics). Saturation was noted at below 2". As the site was sampled in October, we expect the organics to be saturated during June – August. Shallow organic layers for histic epipedons are common in Arctic Regions.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- x Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		x	
Water Table Present?	x		8
Saturation Present? (includes capillary fringe)	x		2

Wetland Hydrology Present? Yes x No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: The Oct 2016 Stantec Cultural Point JAJ-16-016 found 25-50% water saturation at 2 inches. There is no note of a water table, as this information is not typically recorded in a cultural investigation. In our experience in the region, saturation of this degree probably means the water table is near the 8 inch mark during June - August. It is also important to review the secondary characteristics of this site.

Project/Site:	Kivalina	Site No.:	P45
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/17/2016	Cowardin:	PSS1/EM1C

Notes: Drainage feature towards lake. Mid chest high shrub, with a mixture of low shrub and emergent vegetation. Slight microtopographic relief evident.


Looking North


Looking East


Looking South


Looking West

WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: Kivalina Borough/City: NW Arctic Sampling Date: Sept/Oct 2016
Applicant/Owner: DOT&PF Sampling Point P56
Investigator(s): Stantec Landform (hillside, terrace, hummocks, etc Terrace
Local relief (concave, convex, none): Concave Slope (%): 0
Subregion: Upper Kobuk, Koyukuk Hills and Val Lat: 67.754557 Long: -164.562484 Datum: NAD83
Soil Map Unit Name: Not Available NWI classification: PSS1/EM1B
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? ___ Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? ___ (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x No	Is the Sampled Area within a Wetland? Yes x No
Hydric Soil Present?	Yes x No	
Wetland Hydrology Present?	Yes x No	

Remarks: Slight rise near shoreline. Location where north/central proposed route would cross lagoon. Small section is slightly drier than surrounding, but is still a wetland. This point combines the soil information (from an Oct 2016 cultural investigation) with the site photos of vegetation during a Sept 2016 site visit, conducted by Stantec. We have determined that there was enough information from these investigations to inform the status of the site.

VEGETATION – Use scientific names of plants. List all species in the plot. MUST LIST COVER IN DESECENDING ORDER

	3/3 Abbrev.	Species Name	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum					
1					
2					
3					
4					
		Total Cover:	0		
		50% of total cover: 0		20% of total cover: 0	
Sapling/Shrub Stratum					
1	vaculi	Vaccinium uliginosum	80	YES	FAC
2	rhotom	Rhododendron tomentosum	75	YES	FACW
3		Salix sp (Unidentified)	10	NO	FAC
4					
5					
6					
		Total Cover:	165		
		50% of total cover: 82.5		20% of total cover: 33	
Herb Stratum					
1		Grass, Unidentified	5	YES	FAC
2					
3					
4					
5					
6					
7					
8					
9					
10					
		Total Cover:	5		
		50% of total cover: 2.5		20% of total cover: 1	

Plot size (radius, or length x width) ___ % Bare Ground ___
% Cover of Wetland Bryophytes ___ Total Cover of Bryophytes ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	75	x 2 =	150
FAC species	95	x 3 =	285
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	170 (A)		435 (B)

Prevalence Index = B/A = 2.5588

Hydrophytic Vegetation Indicators:

Yes Dominance Test is >50%
Yes Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: Slight terrace along ocean shoreline, rising above surrounding wetter wetlands.

SOIL Sampling Point P56

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4							Peat Moss	DEM-16-17
4-20							Brown/gray clay silty	Some roots; DEM-16-17
								DEM-16-17 is the Stantec Cultural Point

[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:

- ___ Histosol or Histel (A1)
- x Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: Permafrost

Depth (inches): 20

Hydric Soil Present? **Yes** x **No** ___

Remarks Oct 2016 Stantec Cultural Point DME-16-017 was used for soils. While Munsell colors were not identified, we interpreted 0-4" as organics, 4-20" as a layer of organic/mineral soil mix meeting the definition of a Histic Epipedon ('brown' being chroma 2 or less, 'few...roots' as being evidence of organics). Saturation was noted at below 4". As the site was sampled in October, we expect the organics to be saturated during June – August. Shallow organic for epipedon are common in the Arctic.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- x Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		x	
Water Table Present?	x		8
Saturation Present? (includes capillary fringe)	x		4

Wetland Hydrology Present? **Yes** x **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: The Oct 2016 Stantec Cultural Point DME-16-017 found 25-50% water saturation at 4 inches. There is no note of a water table, as this information is not typically recorded in a cultural investigation. In our experience in the region, saturation of this degree probably means the water table is near the 8 inch mark during June - August. It is also important to review the secondary characteristics of this site.

Project/Site: Kivalina

Applicant/Owner: DOT&PF

Date: 9/17/2016

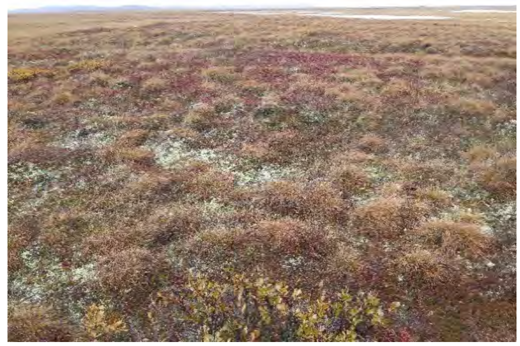
Site No.: P56

Investigator(s): Stantec

Cowardin: PSS1/EM1B

Notes: Location where north/central proposed route would cross lagoon. Slight terrace evident along shoreline, with flatter wetlands evident in the distance.

Looking North



Looking East

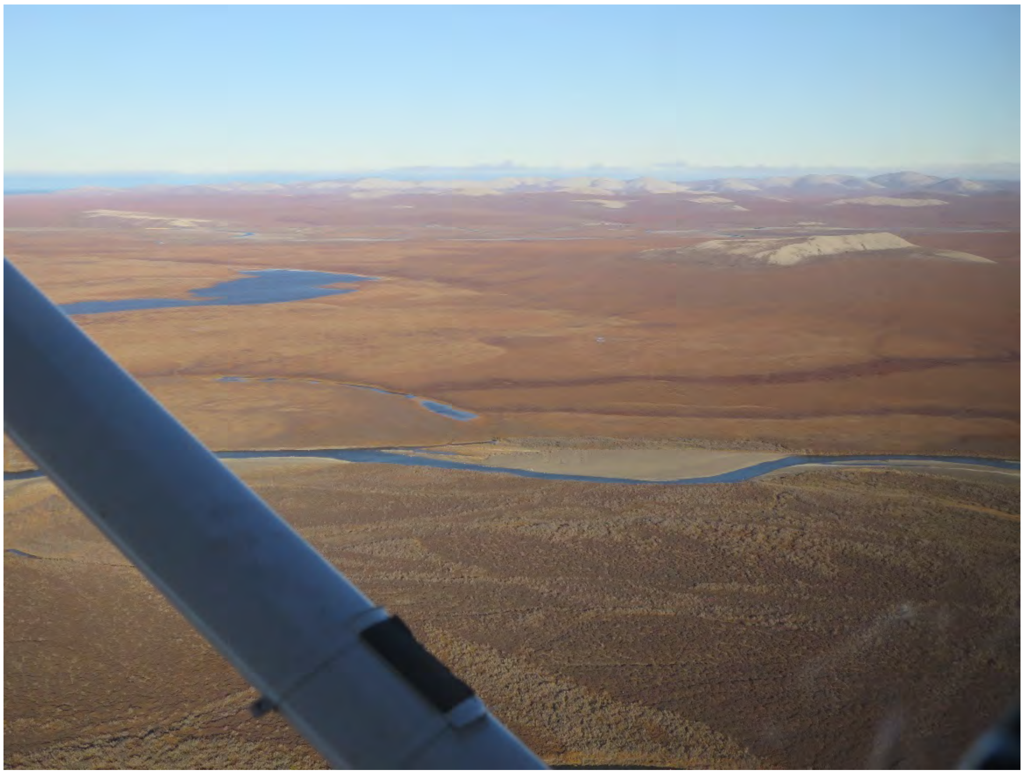
Looking South

Looking West

Appendix C PHOTO POINTS

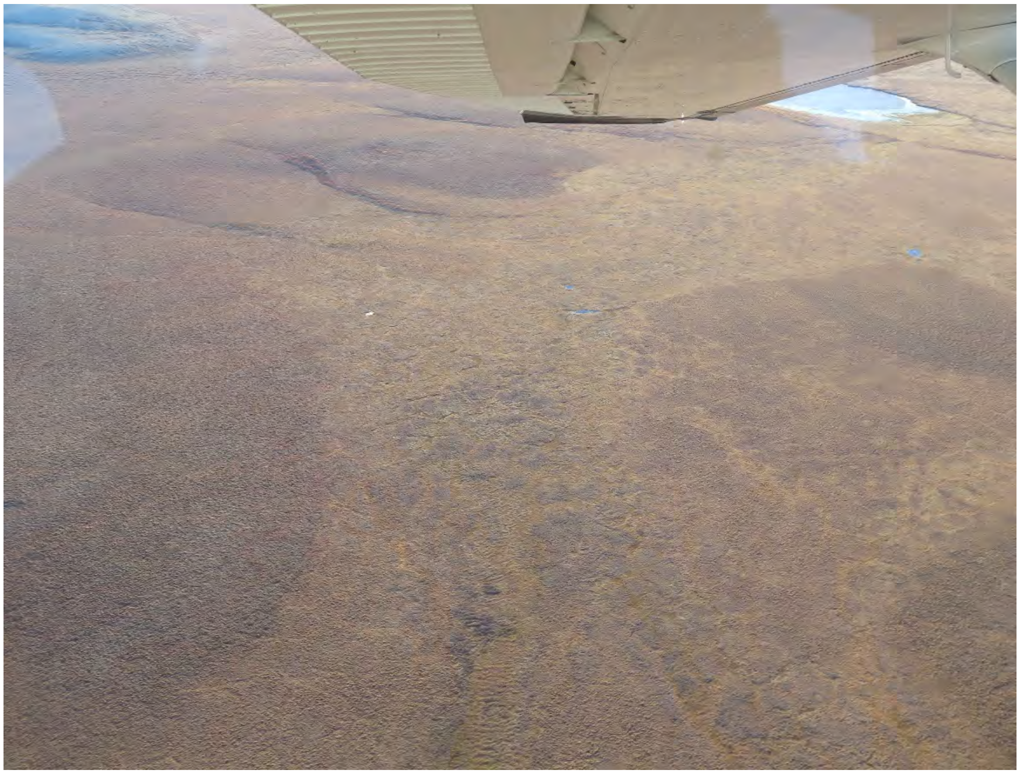
Project/Site:	Kivalina	Site No.:	HP1
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/14/2017	Cowardin:	R2US

Notes: Aerial photo during Stantec visit (HP1). K-Hill and study area looking north. Small riverine system is evident in the mid-ground, with shrub dominated wetlands in the foregound.



Project/Site:	Kivalina	Site No.:	HP4
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/14/2017	Cowardin:	PSS1/EM1B

Notes: Ice wedge polygon features. Saturated and seasonally flooded wetland are evident.



Project/Site:	Kivalina	Site No.:	HP11
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/14/2017	Cowardin:	PSS1/EM1E

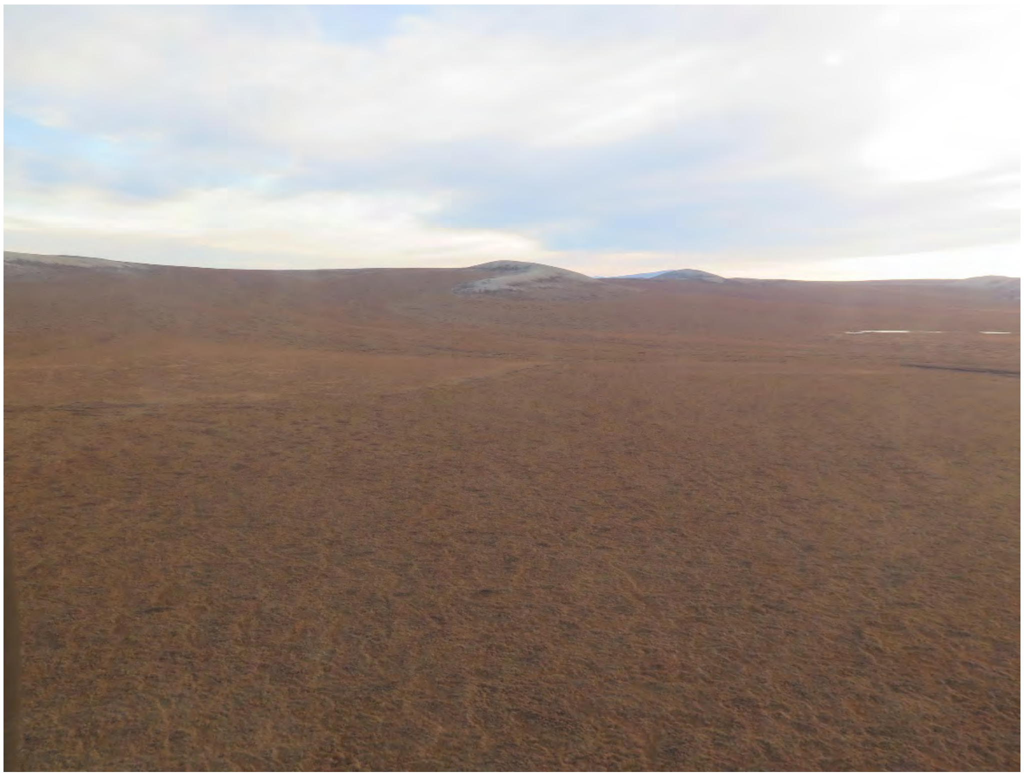
Notes: Wulik River braids. Shrub habitat is evident, along with emergent wetlands in the distance. The shrubs around the river braids appear to be seasonally flooded, as evident from the gravel desposits.

Project/Site:	Kivalina	Site No.:	HP15
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/15/2017	Cowardin:	L1UB

Notes: Helicopter overview looking west. Shrub habitat is evident near the shoreline, along with emergent wetland habitat and ponds in the distance.

Project/Site:	Kivalina	Site No.:	HP19
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/16/2017	Cowardin:	PSS1/EM1C

Notes: View of sloping wetlands back up to K-Hill.

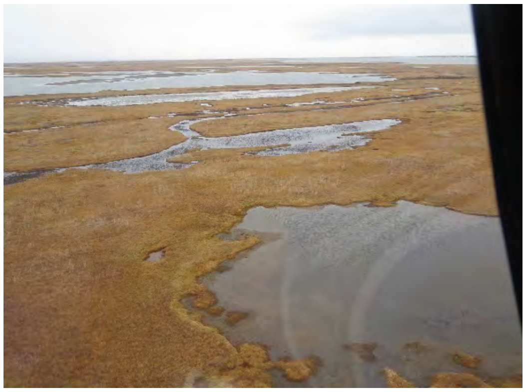


Project/Site:	Kivalina	Site No.:	HP21
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/16/2017	Cowardin:	PEM1/SS1C

Notes: Photo taken during Stantec Site visit. Shoreline of ocean. Demonstrates a small terrace above the shoreline, with a flat wetland to the background.

Project/Site:	Kivalina	Site No.:	HP22
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/17/2017	Cowardin:	PEM1/SS1C

Notes: Helicopter overview of potential gravel source near lagoon. Primarily emergent wetland, with a few small shrubs present. Ponds are evident, as is the ocean in the background.



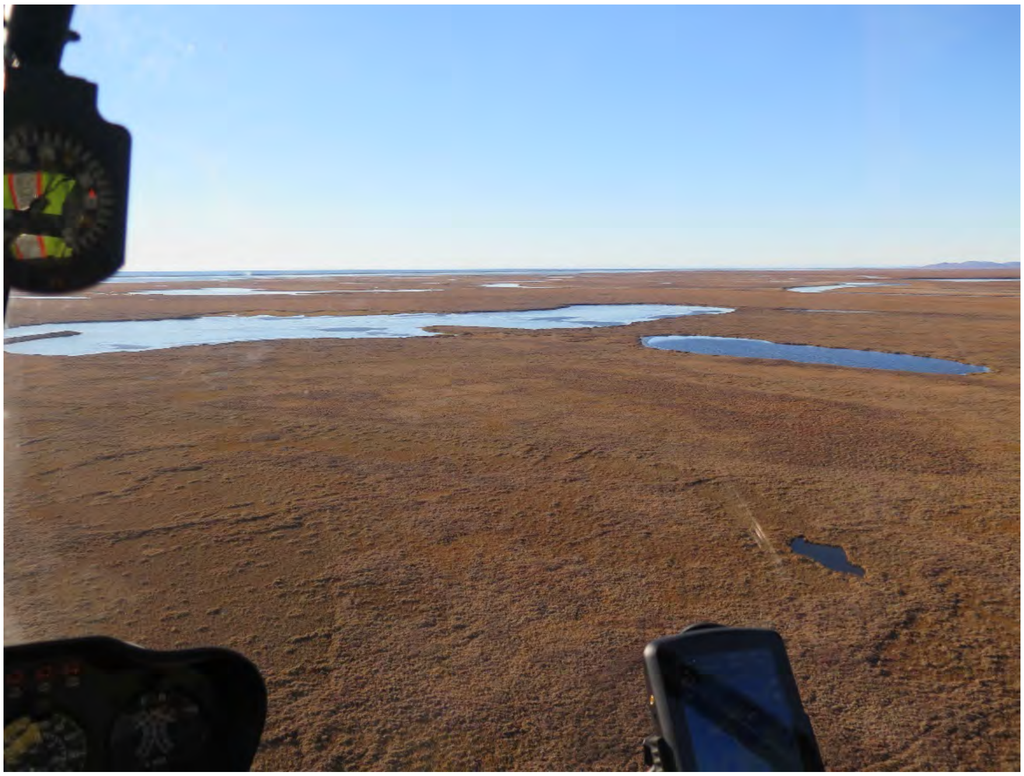
Project/Site:	Kivalina	Site No.:	HP24
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/14/2017	Cowardin:	R2UB

Notes: Kivalina and south entrance to Kivalina Lagoon/mouth of Wulik River. Pictures give a good understanding of the meandering riverine system and wetland complexes reaching to the ocean. Lakes and ponds are evident in the distance. Along the river banks one can note high shrubs, which may provide important bird habitat.

Project/Site: Kivalina
Applicant/Owner: DOT&PF
Date: 9/15/2017

Site No.: HP36
Investigator(s): Stantec
Cowardin: PEM1/SS1C

Notes: Photo taken during Stantec Site visit (HP36). Flat wetland, primarily emergent vegetation with some shrubs present. At least seasonal flooding is evident from vegetation patterns. Lakes and ponds in the background.



Project/Site: Kivalina

Applicant/Owner: DOT&PF

Date: 9/15/2017

Site No.: HP37

Investigator(s): Stantec

Cowardin: PEM1/SS1C

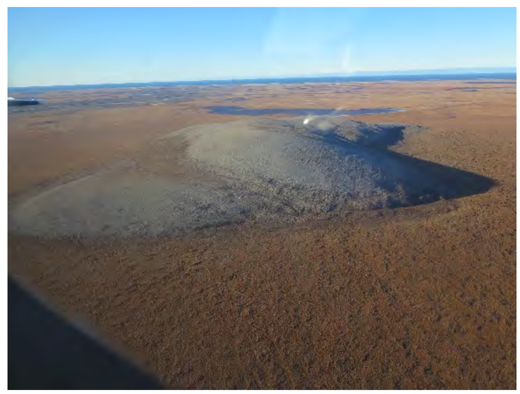
Notes: Photo taken during Stantec Site visit (HP37). Scrub Shrub wetland evident, with evidence of prime bird habitat. Lakes and ponds are present in the distance.

Project/Site:	Kivalina	Site No.:	HP38
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/15/2017	Cowardin:	PEM1/SS1C

Notes: Aerial Photo taken during Stantec Site Visit (HP38). Flat emergent wetland evident, with some shrubs present.

Project/Site:	Kivalina	Site No.:	HP39
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/14/2016	Cowardin:	U

Notes: Aerial photos of K-Hill taken by Stantec (HP39). Upland



Project/Site:	Kivalina	Site No.:	P1
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/15/2016	Cowardin:	U

Notes: Topography change next to lake - start of higher/drier plateau, blueberries, low shrubs, small hummocks, no standing water. P1 site vegetation, Polar grass, blueberry, Labrador tea

North

East

East

Project/Site:	Kivalina	Site No.:	P2
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/15/2016	Cowardin:	PSS1/EM1B

Notes: Boundary between vegetation and geomorphic change. North -higher/drier, hummocky, some taller grasses. South - flatter, smaller hummocks. Boundary curves around to the east and then south.

Northeast

Southeast

West

North

Project/Site:	Kivalina	Site No.:	P3
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/15/2017	Cowardin:	PSS1/EM1C

Notes: Vegetation and landscape change, standing water between tussocks on south/flatter side. P3 site vegetation (sedges, cottongrass, Labrador tea)

North

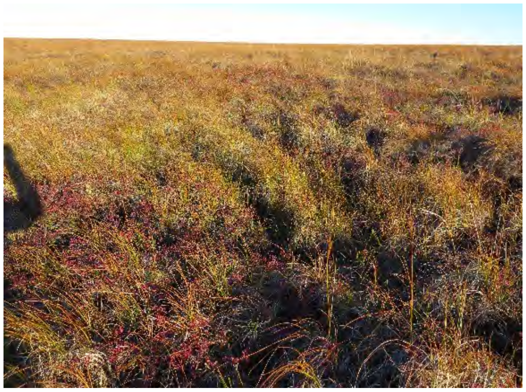
East

South

West

Project/Site:	Kivalina	Site No.:	P4
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/15/2016	Cowardin:	PSS1/EM1C

Notes: Lower lying finger of grassy/less shrub vegetation extending up the hilll. Slight geomorphic change from areas to west and east



North

East

South

West

Project/Site:	Kivalina	Site No.:	P22
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/15/2017	Cowardin:	R2UB

Notes: Photo taken during Stantec Site visit. Wulik River gravel bar

North

East

South

West

Project/Site:	Kivalina	Site No.:	P24
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/16/2016	Cowardin:	PSS1/EM1B

Notes: Slope break from sloping area at base of K-Hill to more flat ground extending westward. Transition to more grass/sedge. Smaller tussocks. Walking west, standing water occurs between tussocks. Undulating between low and elevated spots with more shrub or elevated - 0.5 - 1 ft. Undulating bands run North-South for the most part. Not particular drainage paths distinctly. Frozen/frost conditions.

North

East

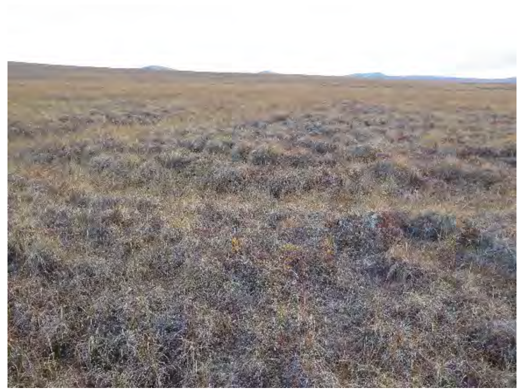
South

West

Project/Site:	Kivalina	Site No.:	P25
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/16/2016	Cowardin:	PSS1/EM1E

Notes: Standing water, frozen ground, example of wet ground boundary. Cottongrass present in this area

North



East

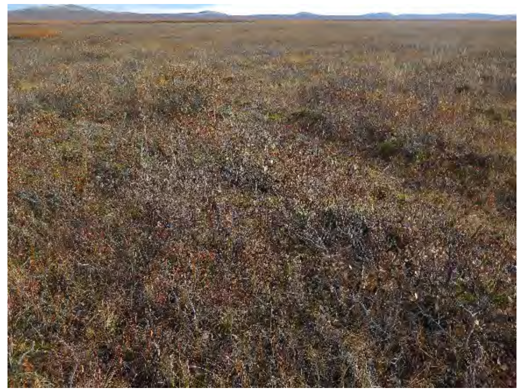
South

West

Project/Site:	Kivalina	Site No.:	P30
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/16/2016	Cowardin:	PEM1/SS1C

Notes: Increasing dryness, increasing shrubs - 20 - 30% cover. Grasses and moss ground cover, increasing elevation to west slightly

North



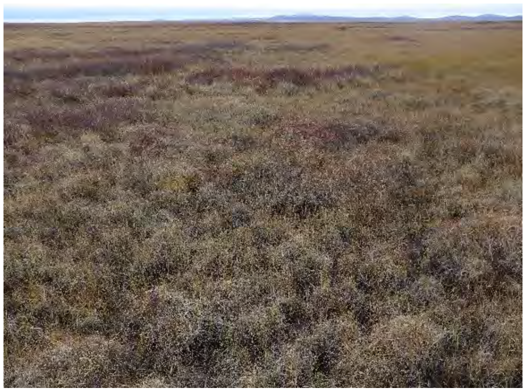
East

South

West

Project/Site:	Kivalina	Site No.:	P34B
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/16/2016	Cowardin:	PEM1F

Notes: Moving west along potential southern route- wetland with surface water, increasing elevation to west. P33 represents edge of standing surface water



North

East

South

West

Project/Site: Kivalina

Applicant/Owner: DOT&PF

Date: 9/16/2017

Site No.: P35

Investigator(s): Stantec

Cowardin: PEM1/SS1F

Notes: Wetland channel feature between pond and longer slough lake. Standing water at surface. No shrubs. Cottongrass present

North

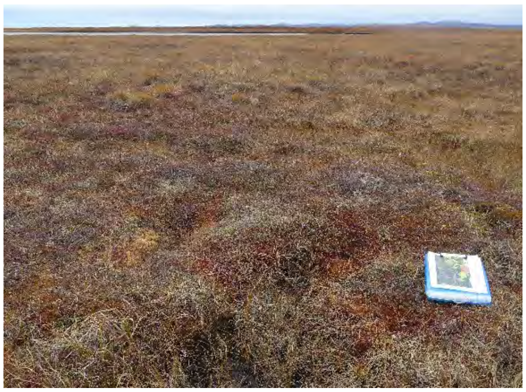
East

South

West

Project/Site:	Kivalina	Site No.:	P36
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/16/2017	Cowardin:	PEM1/SS1C

Notes: Photo taken during Stantec Site visit. Pockets of standing water wetlands throughout this area. Standing water in current location.



North

East

South

West

Project/Site: Kivalina
Applicant/Owner: DOT&PF
Date: 9/16/2017

Site No.: P41A
Investigator(s): Stantec
Cowardin: PEM1/SS1C

Notes: Standing water wetland complex, lateral N-S ridges between

Looking North

Looking East

Looking South

Looking West

Project/Site:	Kivalina	Site No.:	P41B
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/16/2016	Cowardin:	PEM1/SS1C

Notes: Wetland complex, saturated at surface but not standing water at this exact location.

Looking North

Looking East

Looking South

Looking West

Project/Site: Kivalina

Applicant/Owner: DOT&PF

Date: 9/17/2016

Site No.: P42

Investigator(s): Stantec

Cowardin: PSS1/EM1C

Notes: Feature on northern proposed route, north of two lakes. Down sloping to west. Small shrubs present (similar to Photo Points P3 and P4), intermixed with grass vegetation and tussocks.

North

East

South

West

Project/Site:	Kivalina	Site No.:	P48
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/17/2016	Cowardin:	PEM1/SS1C

Notes: Photo taken during Stantec Site visit. Potential drainage feature, standing water. Hummocks widespread, with low emergent and shrub vegetation.

Looking North

Looking East

Looking South

Looking West

Project/Site:	Kivalina	Site No.:	P50
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/17/2016	Cowardin:	PEM1F

Notes: Saturated area just north of small pond, standing water, grasses/sedges only.

Looking North

Looking East

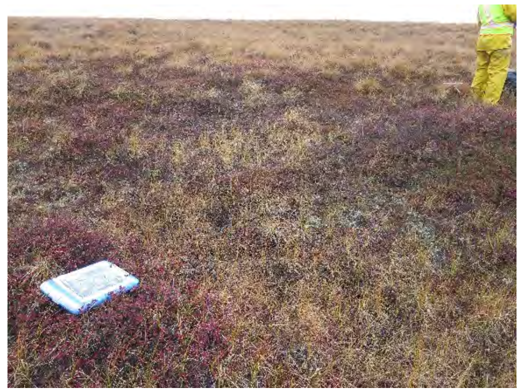
Looking South

Looking West

Project/Site:	Kivalina	Site No.:	P54
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/17/2016	Cowardin:	PEM1/SS1C

Notes: Drainage/wetland feature sloping to lake, sedges, standing water.

Looking North



Looking East

Looking South

Looking West

Project/Site:	Kivalina	Site No.:	P58
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/17/2016	Cowardin:	PEM1F

Notes: Small drainage feature. Grass only in this strip as compared to areas around containing more shrubs. Standing water at surface.

North

East

South

West

Project/Site:	Kivalina	Site No.:	P59
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date:	9/17/2016	Cowardin:	PEM1/SS1C

Notes: Slope break just off the tip of lake toward river/gravel bar. Moss, lichen, sparse grass and shrubs

North

East

South

West

Project/Site:	Kivalina	Site No.:	USACE 1
Applicant/Owner:	DOT&PF	Investigator(s):	Jeremy Grauf
Date:	8/15/2017	Cowardin:	Wetland

Notes: Wetland. There was a visible vegetative shift from wetlands to uplands (see enclosure 1 figure 1 of 10), and the upland soil consisted of shallow (6 inch) organic layer with gravel and coble layer below. -164.386537, 67.808152 (WGS 1984)

Project/Site:	Kivalina	Site No.:	USACE 2
Applicant/Owner:	DOT&PF	Investigator(s):	Jeremy Grauf
Date:	8/15/2017	Cowardin:	Upland

Notes: Upland. -164.387573, 67.808517 (WGS 1984)

Project/Site: Kivalina
Applicant/Owner: DOT&PF
Date: 8/15/2017

Site No.: USACE 3
Investigator(s): Jeremy Grauf
Cowardin: Upland

Notes: Upland. -164.385235, 67.809277 (WGS 1984)

Project/Site:	Kivalina	Site No.:	JAJ-17-009
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec, Justin Junge
Date:	8/16/2017	Cowardin:	Upland

Notes: K-Hill Slope. 0-2cm: Brown silt, 30-50% gravels with small to large sub-rounded to angular pebbles, roots throughout; 2-10cm: brown silty clay loam, >75% gravels with small to very large pebbles and small cobbles, some roots; 10 cmbs terminated due to impassable gravels. 67.809801, -164.386027

Project/Site:	Kivalina	Site No.:	JRH-17-012
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec, John Hemmeter
Date:	8/16/2017	Cowardin:	Wetland

Notes: 0-18cm: Root mat, vegetation layer, brown silty loam, no gravels, rootlets to small roots throughout, loose compaction; 18-38cm grey compacted silt, no gravels, +75% water saturation at 20 cm; 39 cmbs terminated. Permafrost at 40 cmbs. 67.805115, -164.375925

Project/Site:	Kivalina	Site No.:	WCP1
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec, Ross Smith
Date:	8/17/2017	Cowardin:	Wetland

Notes: WCP1 = Wetland Control Point 1. 0-20cm: Saturated active organic mat & organic-rich silt (A/B soil horizons); 20-35cm: Saturated gray silt. Terminated shovel probe at 35 cmbs; soil probe showed no change in sediments before encountering rock at 60 cmbs. 67.810444, -164.409389