

**WETLAND DELINEATION AND PROPOSED JURISDICTIONAL
DETERMINATION FOR PROPOSED AKIAK INFRASTRUCTURE
PROJECT, AKIAK, ALASKA**

Prepared for

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TABLE OF CONTENTS

INTRODUCTION.....	1
STUDY AREA.....	1
METHODS.....	1
FIELD SURVEY	1
WETLAND CLASSIFICATION AND MAPPING	2
ESTABLISHING JURISDICTIONAL STATUS	3
RESULTS AND DISCUSSION	3
FIELD SURVEYS AND HYDROLOGICAL CONDITIONS.....	3
WETLAND CLASSIFICATION AND MAPPING	4
Waters	4
Wetlands.....	4
Uplands	6
JURISDICTIONAL STATUS.....	6
SUMMARY OF FINDINGS.....	7
LITERATURE CITED	7

TABLES

Table 1.	Monthly mean and long-term normal values for air temperature and total monthly precipitation for the Bethel Airport weather station, Bethel, Alaska	9
Table 2.	Areal extent of waters, wetlands, and uplands in the Akiak Infrastructure Project study area, Akiak, Alaska, 2021.....	10

FIGURES

Figure 1.	Akiak Infrastructure Project wetlands study area, Alaska, 2021.....	11
Figure 2.	Wetlands and waters of the Akiak Infrastructure Project wetlands study area, Alaska, 2021.	12
Figure 3.	Antecedent Precipitation for the Akiak Infrastructure Project wetlands study area, Alaska, 2021.....	13

APPENDICES

Appendix A Wetland Determination Data Forms	15
Appendix B. Map Verification Plots	65
Appendix C. Characteristics of wetlands and waters mapped in the Akiak Infrastructure	
Project wetlands study area, Alaska, 2021	71
Figure C1. Characteristics of wetlands and waters mapped in the Lakefront Drive	
wetlands study area, Alaska, 2021	72
Table C1. Characteristics of wetlands and waters mapped in the Akiak Infrastructure	
Project wetlands study area, Alaska, 2021	73

INTRODUCTION

Solstice Alaska Consulting, Inc. (Solstice), on behalf of the Akiak Native Community, requested that ABR, Inc.—Environmental Research & Services (ABR) perform a fine-scale wetland delineation for various components of a proposed infrastructure project in the village of Akiak, within the Bethel Census Area, Alaska. The goals of the infrastructure project include relocating the village landfill and sewage lagoon, and to install a gravel pad for broadband internet facilities. In this study, field efforts were focused on documenting the types and boundaries of all wetlands within the study area. This delineation is suitable for supporting wetland permitting under Section 404 of the Clean Water Act (CWA) and includes an assessment of the proposed jurisdictional status of wetlands and waters identified at the site.

STUDY AREA

The study area comprises four discrete areas in Akiak, Alaska (Figure 1), located along the Kuskokwim River within the Bethel Census Area. The 83-acre study area is centered at latitude 60.910887 and longitude -161.239623 (NAD83 projection), within Section 31 of Range 67W and Section 36 of Range 68W, in Township 10N, Seward Meridian.

The majority of the study area is undeveloped and dominated by closed tall shrub. No National Wetlands Inventory (NWI) mapping is available for the study area (USFWS 2021). Existing wetlands mapping is available in the vicinity of the airport (Three Parameters Plus 1996) and indicates the presence of seasonally flooded-saturated shrub-scrub and forested wetlands, surrounded by deciduous forest uplands. No soils mapping is available through the Web Soil Survey (USDA NRCS 2021).

METHODS

DATA SOURCES

The following data sources were used to facilitate the wetland field survey and mapping efforts:

- High-resolution satellite imagery (Maxar, 0.5-meter resolution, acquired 20 July 2017).
- Interferometric Synthetic Aperture Radar (IFSAR) digital elevation model (DEM) (USGS 2019a), 5-meter resolution
- National Hydrography Dataset (NHD) lines and polygons (USGS

2019b). FIELD SURVEY

During the field survey, a set of wetland determination plots representative of the wetland and upland photosignatures visible on the satellite imagery for the study area were sampled.

Wetland determination plots were sampled following the U.S. Army Corps of Engineers (USACE) 3-parameter approach for defining wetlands (Environmental Laboratory 1987) and the methodology described in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region (USACE 2007). At each wetland determination plot, the USACE-required data to determine the presence of hydrophytic vegetation, hydric soils, and wetland hydrology were recorded. The absolute cover of each vascular plant species at each plot was visually estimated and the presence of hydrophytic vegetation was determined using the Dominance Test (ratio of wetland versus upland dominant plants) and/or the Prevalence Index (weighted average of all species present) using the wetland indicator status per the 2018 National Wetland Plant List v.3.4: Alaska (USACE 2018). Plot dimensions were modified to linear oblong areas when sampling along small drainages so as to properly characterize the plant communities in those areas. At each sample plot, photographs of the area, ground surface and vegetation present, and soil pit soil profile were taken, and GPS location coordinates were recorded. In addition to wetland determination plots, map verification plots were also sampled, at which a subset of wetland data were collected to verify the wetland or upland status for photosignatures that had been previously sampled with full wetland determination plots.

All field data were recorded on customized, ABR-prepared applications, running on Android tablet computers. Navigation at the site was done using ArcGIS Collector (accessed through ArcGIS Online), which allowed real-time depictions of plot locations in the field over the same satellite imagery used in the wetland mapping. Upon completion of field work, the data were uploaded to a wetland-specific relational database maintained on ABR servers and were subjected to a set of sequential data QA/QC procedures. This ensured data accuracy before using them to prepare the wetland map for the project. The ABR wetland database facilitates preparation of the required wetland data forms for each wetland determination plot following USACE guidelines (USACE 2007). Wetland data forms and representative photos are included in Appendices A and B.

WETLAND CLASSIFICATION AND MAPPING

Wetland boundaries were delineated using ArcGIS desktop software. As noted above, the primary imagery used for mapping was high-resolution (0.5-meter pixel resolution) satellite imagery obtained 20 July 2017 and available as part of ESRI's World Imagery basemap. Wetland boundaries were identified using the field ground-reference data collected for this project in combination with the interpretation of satellite photosignatures and the assessment of ancillary GIS data layers (see Data Sources above). Wetland types were mapped at a scale of 1:2,000 and each mapped polygon was assigned a wetland type using NWI notation (FGDC 2013), which is typically used by the U.S. Fish and Wildlife Service's NWI

program (Dahl et al. 2015). Each mapped polygon was also assigned a hydrogeomorphic class (USDA NRCS 2008).

ESTABLISHING JURISDICTIONAL STATUS

Wetlands and waters within the study area were assessed to determine if they met the definition of a water of the U.S. (WOTUS), subject to jurisdiction under Section 404 of the Clean Water Act, and/or a navigable water of the U.S., subject to jurisdiction under Section 10 of the Rivers and Harbors Act. The Navigable Waters Protection Rule (NWPR), defining WOTUS for the Clean Water Act (Clean Water Act 33 CFR Part 328) was published in the Federal Register on 21 April 2020 and became effective on 22 June 2020. On 30 August 2021, however, the U.S. District Court for the District of Arizona vacated and remanded this rule in *Pascua Yaqui Tribe v. U.S. Environmental Protection Agency*. The Environmental Protection Agency (EPA) and the Alaska USACE regulatory division are interpreting WOTUS under the pre-2015 regulatory regime until further notice (EPA 2021). Thus, the proposed jurisdictional status of the wetlands mapped in this study uses the EPA and USACE's current interpretation following *Rapanos v. U.S.* (Rapanos) and *Solid Waste Agency of Northern Cook County v. U.S.* (SWANCC). Information presented in this report is intended to assist the USACE in their final decision on the jurisdictional status of wetlands and waters within the study area.

The characteristics of wetlands and waters within the study area were assessed to determine if they met the criteria for jurisdiction under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act. In this study, the USACE navigable waters list (USACE 2021) was used to determine navigability. Field data and aerial imagery were used to determine connections and proximity of wetlands in the study area to navigable waterways and their tributaries.

RESULTS AND DISCUSSION

FIELD SURVEYS AND HYDROLOGICAL CONDITIONS

Field surveys were conducted 16–17 July 2021 by Sue Ives (PWS #2623) and Robert McNown of ABR. Standard USACE 3-parameter wetland determinations were completed at 16 field plots; 9 were classified as uplands and 7 were classified as wetlands (Figure 2, Appendix A). In addition, a map verification plot was completed at 8 locations (Figure 2, Appendix B). GPS accuracy ranged from 1 to 4 meters, with a median accuracy of 4 meters. Characteristics of each mapped wetland and water are listed in Appendix C, including the NWI code, HGM class, jurisdictional status, size (acres), and centroid latitude and longitude of each map polygon.

The meteorological station nearest to the study area with both long-term averages and daily precipitation values for the current season is the Bethel Airport (station USW00026615) located

approximately 20 miles from the study area (see Arguez et al. [2012] and Menne et al. [2012]). Compared to long-term averages for the Bethel Airport, May 2021 was warmer and drier than normal (Table 1). June through August had temperatures closer to normal. July precipitation was well above normal.

To place the hydrological conditions in the study area at the time of sampling in mid-August 2021 in context, a precipitation analysis similar to the USACE's Antecedent Precipitation Tool (APT) was performed, which involves summarizing precipitation data from the nearest meteorological stations and filling any missing records with data from the next nearest station. Current year 30-day rolling precipitation sums were compared with 30 years of 30-day rolling precipitation sums at the 30th and 70th percentiles, which are a reasonable interpretation of normal conditions (Figure 3). The Bethel Airport provided all long-term and current year precipitation data. for the APT. Figure 3 suggests that hydrologic conditions were normal immediately preceding and during the field visit on 16–17 August 2021. Thus, hydrologic conditions were within typical range and are not believed to have influenced the results of the field survey.

WETLAND CLASSIFICATION AND MAPPING

WATERS

Palustrine Permanently Flooded Unconsolidated Bottom (PUBH) waters were documented in three locations in the vicinity of the sewage lagoon (Figure 2). Encompassing 0.3 acres (0.3% of the study area, Table 2), PUBH waters in the study area are relatively small and shallow, and distinguished from the surrounding vegetated wetlands through aerial imagery interpretation and field notes. PUBH waters mapped within the study area include the sewage lagoon itself and two small natural ponds (Figure 2).

WETLANDS

Palustrine Semipermanently Flooded Persistent Emergent (PEM1F) wetlands were documented in the western end of the study area (Figure 2). Encompassing 2.1 acres (2.5% of the study area, Table 2), PEM1F wetlands are characterized by the wetland determination plots aw-15, aw-16, and aw-18 (Appendix A). The PEM1F wetlands in the study area are dominated by the herbs *Calamagrostis canadensis* (bluejoint, FAC) growing in large loose tussocks, *Carex utriculata* (Northwest Territory sedge, OBL), and *Comarum palustre* (purple marshlocks, OBL). Shallow surface water, 3-7 inches deep, was observed in each of these wetlands meeting wetland hydrology indicator Surface Water (A1). Hydrogen sulfide odor was detected when walking through each of these wetlands, meeting the primary wetland hydrology indicator C1 (Hydrogen Sulfide Odor) and the hydric soil indicator A4 (Hydrogen Sulfide).

Palustrine Seasonally Flooded-Saturated Persistent Emergent (PEM1E) wetlands were documented in three locations in the vicinity of the sewage lagoon (Figure 2), and cover 1.4 acres (1.7% of the study area, Table 2). Two of the PEM1E wetlands surround the small natural PUBH ponds described above. As characterized by the wetland determination plots aw-06 and aw-08, these wetlands were dominated by the herb *Carex utriculata* (OBL). Soils were either thick surface organic horizons meeting the hydric soil indicator Histosol or Histel (A1), or loamy fine sands meeting the hydric soil indicator Alaska Redox (A14). Soils were saturated at the surface with a water table at or near the surface, meeting the primary wetland hydrology indicators High Water Table (A2) and Saturation (A1). The third PEM1E wetland observed in the area is characterized by verification plot aw-02 (Appendix B). This is a small wetland whose hydrology is driven by a leak from the sewage lagoon. This small wetland contained surface water and purple algae, smelled strongly of sewage, and was surrounded by *Calamagrostis canadensis* dominated uplands.

Palustrine Seasonally Flooded-Saturated Broad-leaved Deciduous Scrub-Shrub (PSS1E) wetlands were documented in the western portion of the study area (Figure 2). Encompassing 0.6 acres (0.7% of the study area), PSS1E wetlands occupied mid-elevation portions of low-lying, concave linear features that may correspond to abandoned riverine channel features. As characterized by wetland determination plot aw-19, PSS1E wetlands were dominated by the shrubs *Alnus viridis* (Sitka alder, FAC) and *Salix arbusculoides* (little-tree willow, FACW), and the herbs *Calamagrostis canadensis* (FAC) and *Comarum palustre* (OBL). The silt loam soils met the hydric soil indicator Alaska Redox (A14), and the problematic hydric soil indicator Alaska Gleyed without Hue 5Y or Redder Underlying Layer. Soils were saturated near the surface, meeting the primary wetland hydrology indicator Saturation (A3).

Palustrine Seasonally Saturated Broad-leaved Deciduous Scrub-Shrub (PSS1B) wetlands were documented in the western portion of the study area, adjacent to and slightly upslope of the PSS1E wetlands described above (Figure 2). PSS1B wetlands cover 1.0 acres, or 1.2% of the study area (Table 2). As characterized by verification plot aw-20 (Appendix B), PSS1B wetlands were dominated by the shrubs *Salix arbusculoides* (FACW) and *S. bebbiana* (gray willow, FAC), and the herbs *Calamagrostis canadensis* (FAC) and *Comarum palustre* (OBL). While a full soil profile was not described, probing showed mineral soils with a gleyed matrix and high value,chroma concentrations as pore linings, similar to soils observed at aw-19 (Appendix A).

Palustrine Seasonally Flooded Persistent Emergent (PEM1C) wetlands were documented in an inactive riverine channel that was mapped as a perennial stream by NHD (USGS 2019a, Figure 2). PEM1C wetlands encompass 0.9 acres, or 1.1% of the study area (Table 2). This wetland was 8–10 feet lower in elevation than the surrounding upland forest, with rafted debris

indicating regular flooding from the Kuskokwim River. Vegetation was dominated by the shrub *Ribes hudsonianum* (northern black currant, FAC) and the herb *Calamagrostis canadensis* (FAC). Silt loam soils met the hydric soil indicator Alaska Redox (A14), and multiple primary wetland hydrology indicators were observed: Saturation (A3), Drift Deposits (B3), and Sparsely Vegetated Concave Surface (B8).

UPLANDS

The remaining 76.7 acres (92.5%) of the study area were mapped as non-wetland uplands, either Uplands (U) or Upland (fill) (Us, Figure 2). Uplands in the study area are either tall closed-canopy alder willow shrub or balsam poplar woodlands. Dominant species include the tree *Populus balsamifera* (balsam poplar, FACU); the shrubs *Alnus viridis* (FAC), *Salix alaxensis* (felt-leaf willow, FAC), *S. arbusculoides* (FACW), and *S. bebbiana* (FAC); and the herbs *Calamagrostis canadensis* (FAC), *Equisetum sylvaticum* (woodland horsetail, FAC), and *Rubus arcticus* (northern blackberry, FAC). All plots in the study area met the secondary wetland hydrology indicator Geomorphic Position (D2) because of the study area's location in the Kuskokwim River floodplain, and many U plots also met the secondary wetland hydrology indicator FAC-Neutral Test (D5). U plots did not, however, meet any hydric soil indicators or problematic hydric soil indicators. Although soil profiles at several U plots did have redoximorphic concentrations, the value and/or chroma of the concentrations was too low to meet a hydric soil indicator (e.g., aw-21 in Appendix A).

JURISDICTIONAL STATUS

The study area is in the Kuskokuak Slough-Kuskokwim River subwatershed (HUC 190305021904, USGS 2019b). The nearest TNW to the study area is the Kuskokwim River (Figure 1), which is navigable for 400 miles to McGrath, (USACE 2021), and is located less than one straight-line mile from the study area centroid. With the exception of the sewage lagoon and associated leak (W-01 and W-02, Appendix C), all wetlands within the study area are believed to be jurisdictional under Section 404 of the CWA as wetlands adjacent to TNWs. Wetlands with a reasonably close physical proximity to a jurisdictional water are considered neighboring and thus adjacent. While no FEMA flood maps are available for Akiak, a review of current aerial imagery, soil profiles, and observations of drift deposits in the field indicate that the entire study area is within the floodplain of the Kuskokwim River, a TNW, and thus all study area wetlands are likely to be considered jurisdictional under Section 404 of the CWA.

The sewage lagoon (W-01) and a small leak identified in the field (W-02) are not believed to be jurisdictional under Section 404 of the CWA. The sewage lagoon is an effluent pond constructed so as to not flood by the Kuskokwim River. The small leak from the sewage lagoon

is a relatively new and presumably ephemeral feature, which will be repaired during the village's proposed infrastructure improvement project.

SUMMARY OF FINDINGS

The findings of this study identify wetlands in the study area, generally limited to low lying relict channels in the floodplain of the Kuskokwim River. Wetlands within the study area adjacent to the Kuskokwim River, a TNW, and thus are believed to be jurisdictional under Section 404 of the CWA as wetlands adjacent to Traditional Navigable Waters. This report and wetlands mapping is sufficient to obtain an Approved Jurisdictional Determination from the USACE, which will formally establish the jurisdictional wetland boundaries on the property.

LITERATURE CITED

- Arguez, A., I. Durre, S. Applequist, R. Vose, M. Squires, X. Yin, R. Heim, and T. Owen, 2012: NOAA's 1981–2010 climate normals: An overview. *Bull. Amer. Meteor. Soc.*, 93, 1687-1697.
- Brinson, M. M. 1993. A hydrogeomorphic classification for wetlands. Technical Report WRP-DE-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
- Dahl, T. E., J. Dick, J. Swords, and B. O. Wilen. 2015. Data Collection Requirements and Procedures for Mapping Wetland, Deepwater and Related Habitats of the United States. Division of Habitat and Resource Conservation (version 2), National Standards and Support Team, Madison, WI. 92 pp.
- Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. Vicksburg, MS: U.S. Army Engineer Waterways Experiment Station. [Online]
<https://www.lrh.usace.army.mil/Portals/38/docs/USACE%2087%20Wetland%20Delineation%20Manual.pdf> (Accessed October 15, 2020).
- Environmental Protection Agency (EPA). 2021. Current Implementation of Waters of the United States. <https://www.epa.gov/wotus/current-implementation-waters-united-states>. Accessed September 2021.
- Federal Geographic Data Committee (FGDC). 2013. Classification of Wetlands and Deepwater Habitats of the United States. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, DC.
- Menne, M.J., I. Durre, B. Korzeniewski, S. McNeal, K. Thomas, X. Yin, S. Anthony, R. Ray, R.S. Vose, B.E. Gleason, and T.G. Houston. 2012. Global Historical Climatology Network - Daily (GHCN-Daily), Version 3. NOAA National Climatic Data Center. doi:10.7289/V5D21VHZ.
- Three Parameters Plus Natural Resource Consulting. 1996. Wetlands Analysis, Alaska Department of Transportation & Public Facilities, Airport Improvement Project, Akiak, Alaska. Draft Report. 79pp.

- United States Department of Agriculture Natural Resources Conservation Service (USDA NRCS). 2008. Hydrogeomorphic Wetland Classification System: An Overview and Modification to Better Meet the Needs of the Natural Resources Conservation Service. Technical Note No. 190–8–76. 8 pp.
- . 2021. Web Soil Survey [online] <https://websoilsurvey.sc.egov.usda.gov/> (Accessed 27 May 2021).
- U.S. Army Corps of Engineers (USACE). 2007. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region (Version 2.0), ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-07-24. Vicksburg, MS: U.S. Army Engineer Research and Development Center.
- . 2018. National Wetland Plant List. Version 3.4. [online] http://wetland-plants.usace.army.mil/nwpl_static/v34/home/home.html (Accessed October 15, 2020).
- _____. 2021. Navigable Waters of Alaska. [online] <https://www.poa.usace.army.mil/Missions/Regulatory/Recognizing-Wetlands/Navigable-Waters/> (Accessed 28 May 2021).
- U.S. Fish and Wildlife Service (USFWS). 2021. National Wetlands Inventory website. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Available online at <http://www.fws.gov/wetlands/>.
- U.S. Geological Survey (USGS). 2019a. Interferometric Synthetic Aperture Radar (IFSAR) Alaska, 2019-05-30. U.S. Geological Survey Earth Resources Observation and Science Center (EROS), Sioux Falls, South Dakota. Accessed 14 August 2019. <https://doi.org/10.5066/P9C064CO>
- . 2019b. National Hydrography Dataset [online] <https://www.usgs.gov/core-science-systems/ngp/national-hydrography/access-national-hydrography-products> (Accessed October 14, 2020).
- Viereck, L. A., C. T. Dyrness, A. R. Batten, and K. J. Wenzlick. 1992. The Alaska vegetation classification. U.S. Dept. of Agric., Forest Serv., Pacific Northwest Research Station, Portland, OR. Gen. Tech. Rep. PNW-GTR-286. 278 pp.

Table 1. Monthly mean (May 1–August 31, 2021) and long-term normal (1991–2020) values for air temperature (°C) and total monthly precipitation (mm) for the Bethel Airport weather station, Bethel, Alaska (station id USW00026615).

Month	Temperature			Precipitation (mm)			n
	2021	1991– 2020	Difference from Normal	2021	1991– 2020	% of Normal	
May	7.6	6.1	1.5	13.1	30.7	42	31
June	11.1	11.8	-0.7	37.4	45.0	83	30
July	12.5	13.5	-1.0	107.6	65.3	164	31
August	11.5	12.2	-0.6	62.5	85.3	73	31

Table 2. Areal extent (acres and percent of study area) of waters, wetlands, and uplands in the Akiak Infrastructure Project study area, Akiak, Alaska, 2021.

NWI Code	NWI Descriptions	Area (Acres)	% of Study Area
Waters			
PUBH	Palustrine Permanently Flooded Unconsolidated Bottom	.3	0.3
Total Waters:		0.3	0.3
Wetlands			
PEM1F	Palustrine Semipermanently Flooded Persistent Emergent	2.1	2.5
PEM1E	Palustrine Seasonally Flooded-Saturated Persistent Emergent	1.4	1.7
PSS1E	Palustrine Seasonally Flooded-Saturated Broad-leaved Deciduous Scrub-Shrub	0.6	0.7
PEM1C	Palustrine Seasonally Flooded Persistent Emergent	0.9	1.1
PSS1B	Palustrine Seasonally Saturated Broad-leaved Deciduous Scrub-Shrub	1.0	1.2
Total Wetlands		6.0	7.2
Uplands			
U	Upland	74.1	89.3
Us	Upland (fill)	2.6	3.2
Total Uplands		76.7	92.5
Grand Total		83.0	100.0

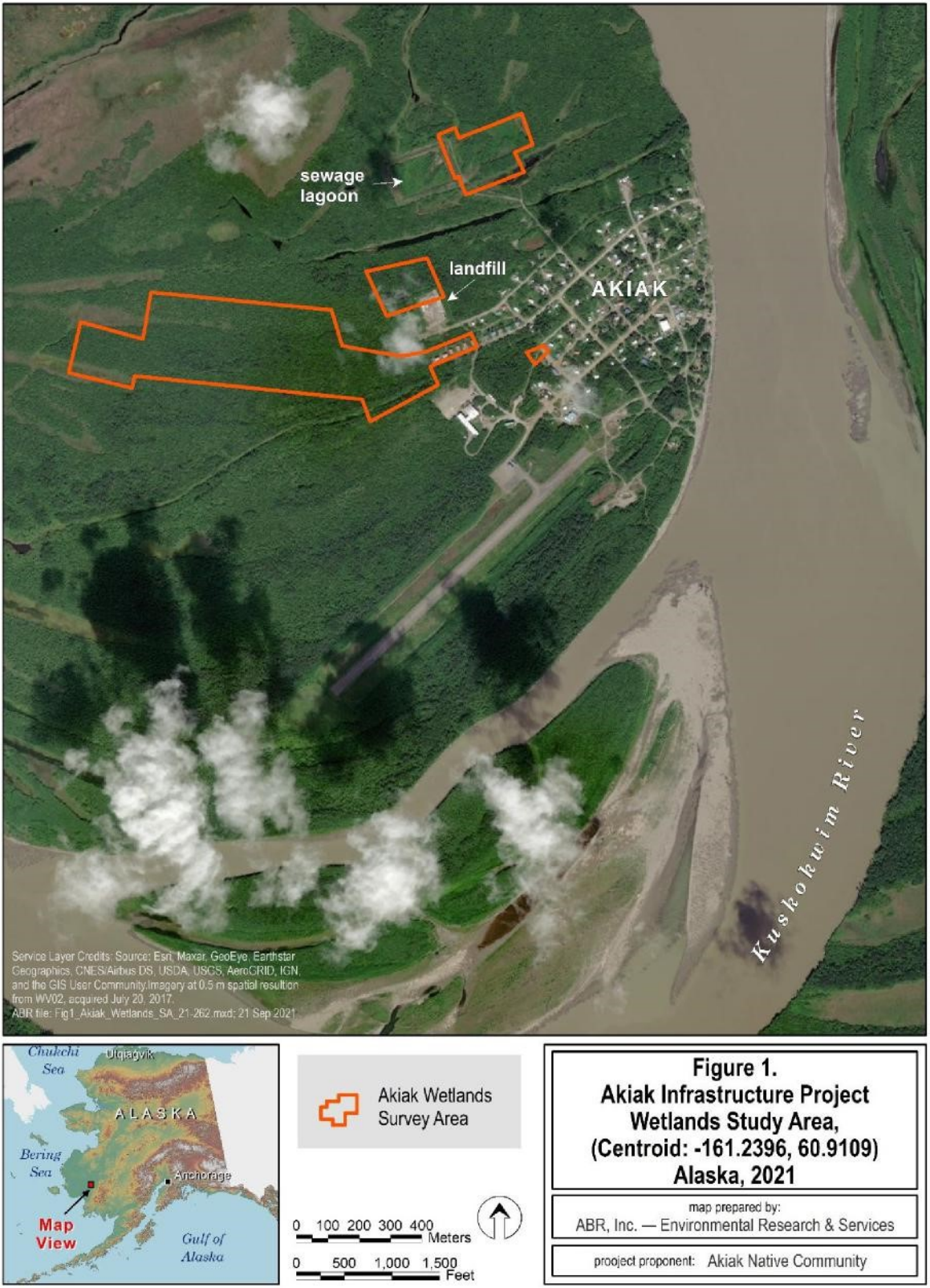


Figure 1. Akiak Infrastructure Project wetlands study area, Alaska, 2021.

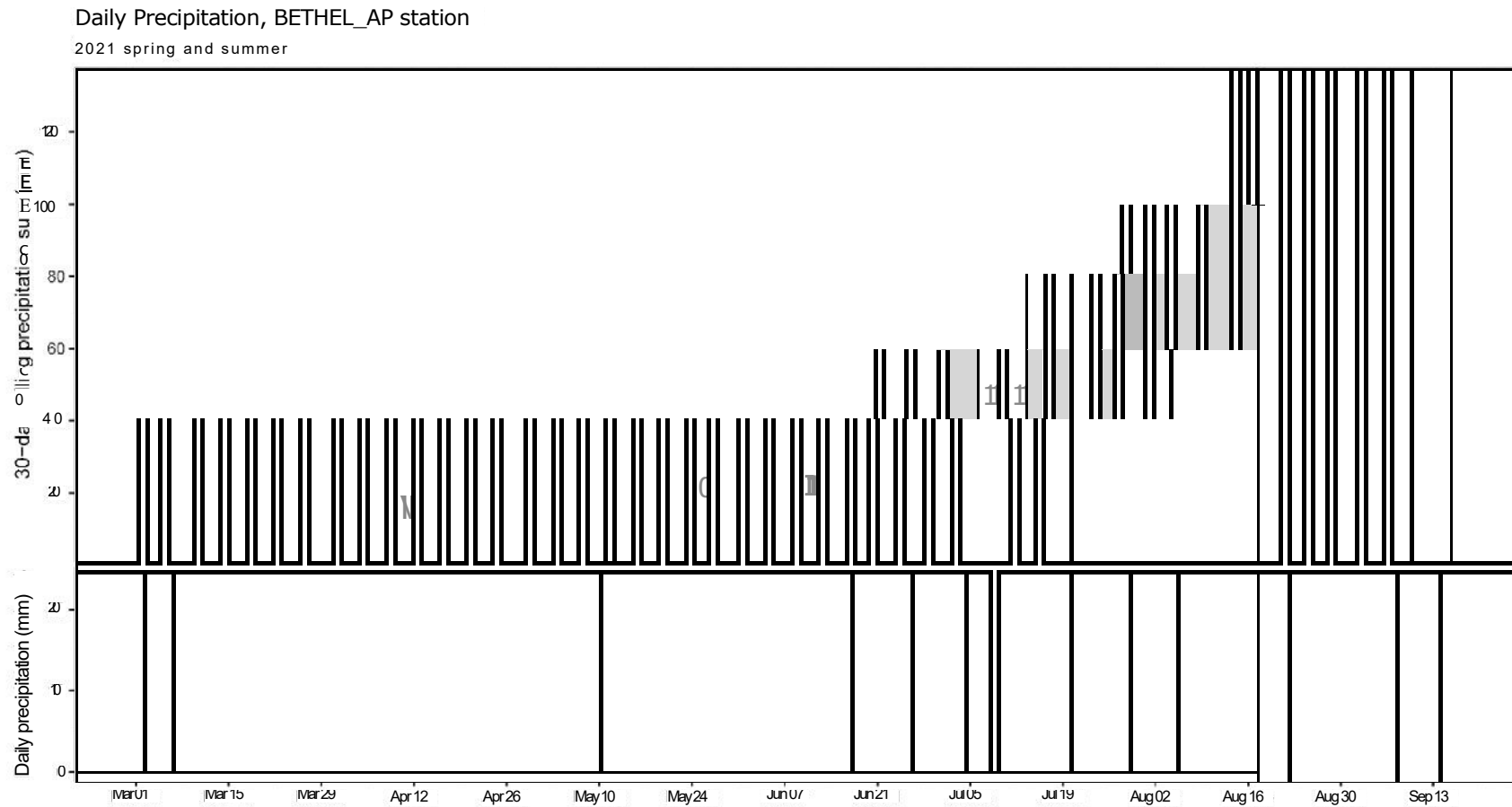


Figure 3. Antecedent Precipitation for the Akiak Infrastructure Project wetlands study area, Alaska, 2021.

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Appendix A. Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM - ALASKA REGION

Project/Site: Akiak Wetland Delineation Borough/City: Bethel Census Area Sampling Date: 2021-08-16
 Applicant/Owner: Solstice Sampling Point: aw-04
 Investigator(s): RWM, SLI Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
 Local relief (concave, convex, none): none Slope: 0.0 % / 0.0 ° Elevation: 92
 Subregion: Alaska Lat.: 60.9152 Long.: -161.2290 Datum: WGS84
 Soil Map Unit Name: _____ NWI classification: U
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No _____ (If no, explain in Remarks)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ 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 <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/>	
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	
Remarks: Site on an inactive floodplain. There is level topography in plot, but nearby are what may be small excavations and spoils. The excavated area was probed and displayed non-hydric soils.	

VEGETATION - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:
	Total Cover:	0.0			Number of Dominant Species That are OBL, FACW, or FAC: 4 (A)
	50% of total cover:	0.0	20% of total cover:	0.0	Total Number of Dominant Species Across all Strata: 4 (B)
1.	Sapling/Shrub Stratum				Percent of Dominant Species That are OBL, _____
2.	Salix bebbiana	35.0	<input checked="" type="checkbox"/>	FAC	
3.	Salix arbusculoides	25.0	<input checked="" type="checkbox"/>	FACW	
4.	Alnus viridis	15.0		FAC	
5.	Betula neoalaskana	5.0		FACU	
	Total Cover:	80.0			Prevalence Index worksheet:
	50% of total cover:	40.0	20% of total cover:	16.0	Total % Cover of: Multiply by:
1.	Herb Stratum				OBL Species 0.0 × 1 = 0.0
2.	Calamagrostis canadensis	10.0	<input checked="" type="checkbox"/>	FAC	FACW Species 25.0 × 2 = 50.0
3.	Equisetum arvense	10.0	<input checked="" type="checkbox"/>	FAC	FAC Species 74.0 × 3 = 222.0
4.	Polemonium acutiflorum	3.0		FAC	FACU Species 5.2 × 4 = 20.8
5.	Viola sp.	3.0			UPL Species 0.0 × 5 = 0.0
6.	Rubus arcticus	1.0		FAC	Column Totals: 104.2 (A) 292.8 (B)
7.	Thalictrum sparsiflorum	0.1		FACU	Prevalence Index = B/A = 2.810
	Total Cover:	27.2			
	50% of total cover:	13.6	20% of total cover:	5.4	
					Hydrophytic Vegetation Indicators:
					<input checked="" type="checkbox"/> Dominance Test is > 50%
					<input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0
					Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet)
					Problematic Hydrophytic Vegetation ¹ (Explain)
					¹ Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.
					Plot size (radius, or length × width) 10m radius
					% Cover of Wetland Bryophytes (Where applicable)
					% Bare Ground 90.0
					Total Cover of Bryophytes 7.0
					Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No
Remarks:					

SOIL
Sampling Point: aw-04

Depth		Redox Features				Mod	Remarks
(inches)	Color (moist) %	Color (moist) %	Type ¹	Loc ²	Texture		
0-2	/ 100	/	A		fibric		
2-12	10yr 2/2 100	/	A		silt loam		
12-18	10yr 3/2 80 10yr 3/3 20		C	PL	silt loam		
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent						² Location: PL=Pore Lining, RC=Root Channel,	
Hydric Soil Indicators:		Indicators for Problematic Hydric Soils³:					
Histosol or Histel (A1)		Alaska Color Change (TA4) ⁴				Alaska Gleyed Without Hue 5Y or Redder	
Histic Epipedon (A2)		Alaska Alpine Swales (TA5)				Underlying Layer	
Hydrogen Sulfide (A4)		Alaska Redox With 2.5Y Hue				Other (Explain in Remarks)	
Thick Dark Surface (A12)							
Alaska Gleyed (A13)		³ One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic. ⁴ Give details of color change in Remarks.					
Alaska Redox (A14)							
Alaska Gleyed Pores (A15)							
Restrictive Layer (if present):							
Type: None						Hydric Soil Present?	
Depth (inches):						Yes No ✓	
Remarks: No hydric soil indicators							

HYDROLOGY

Wetland Hydrology Indicators:				Secondary Indicators (2 or more required)	
Primary Indicators (any one is sufficient)				Water Stained Leaves (B9)	
Surface Water (A1)	Inundation Visible on Aerial Imagery (B7)	Drainage Patterns (B10)			
High Water Table (A2)	Sparsely Vegetated Concave Surface (B8)	Oxidized Rhizospheres along Living Roots (C3)			
Saturation (A3)	Marl Deposits (B15)	Presence of Reduced Iron (C4)			
Water Marks (B1)	Hydrogen Sulfide Odor (C1)	Salt Deposits (C5)			
Sediment Deposits (B2)	Dry-Season Water Table (C2)	Stunted or Stressed Plants (D1)			
Drift Deposits (B3)	Other (Explain in Remarks)	.1 Geomorphic Position			
Algal Mat or Crust (B4)		Shallow Aquitard (D3)			
Iron Deposits (B5)		Microtopographic Relief (D4)			
Surface Soil Cracks (B6)		.1 FAC-neutral Test (D5)			
Field Observations:					
Surface Water Present?	Yes No .1	Depth (inches): 0			
Water Table Present?	Yes No .1	Depth (inches):			
Saturation Present?					
(includes capillary fringe)	Yes No .1	Depth			
				Wetland Hydrology Present? Yes ✓ No	
Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:					
Remarks: D2--Kuskokwim River floodplain					

Sampling Point: aw-04

NWI classification: U



Hydric Soil Indicators: None

Wetland Hydrology Indicators: Geomorphic Position (D2), FAC-Neutral Test (D5)



WETLAND DETERMINATION DATA FORM - ALASKA REGION

Project/Site: Akiak Wetland Delineation Borough/City: Bethel Census Area Sampling Date: 2021-08-16
 Applicant/Owner: Solstice Sampling Point: aw-05
 Investigator(s): SLI, RWM Landform (hillside, terrace, hummocks, etc.): Nonpatterned
 Local relief (concave, convex, none): none Slope: 0.0 % / 0.0 ° Elevation: 62
 Subregion: Alaska Lat.: 60.9156 Long.: -161.2277 Datum: WGS84
 Soil Map Unit Name: _____ NWI classification: U
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No _____ (If no, explain in Remarks)
 Are Vegetation____, Soil____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ 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 <input checked="" type="checkbox"/> No	Is the Sampled Area within a Wetland?	Yes	No	<input checked="" type="checkbox"/>
Hydric Soil Present? Yes No <input checked="" type="checkbox"/>				
Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>				

Remarks: A previously cleared area, with shrubs now 5-7ft tall. The plot center in the low point of clearing.

VEGETATION - Use scientific names of plants. List all species in the plot.

Absolute		Dominant Indicator		Dominance Test worksheet:	
Tree Stratum	% Cover	Species?	Status	Number of Dominant Species That are OBL, FACW, or FAC:	
Total Cover:	0.0			4	(A)
50% of total cover: 0.0		20% of total cover: 0.0		Total Number of Dominant Species Across all Strata:	
Sapling/Shrub Stratum				4	(B)
1. <i>Alnus viridis</i>	15.0	<input checked="" type="checkbox"/>	FAC	Percent of Dominant Species That are OBL,	
2. <i>Salix alaxensis</i>	10.0	<input checked="" type="checkbox"/>	FAC		
3. <i>Salix arbusculoides</i>	5.0		FACW		
Total Cover:				Prevalence Index worksheet:	
50% of total cover: 15.0		20% of total cover: 6.0		Total % Cover of: Multiply by:	
Herb Stratum				OBL Species	3.2 × 1 = 3.2
1. <i>Calamagrostis canadensis</i>	30.0	<input checked="" type="checkbox"/>	FAC	FACW Species	5.2 × 2 = 10.4
2. <i>Agrostis scabra</i>	20.0	<input checked="" type="checkbox"/>	FAC	FAC Species	75.0 × 3 = 225.0
3. <i>Carex utriculata</i>	3.0		OBL	FACU Species	0.0 × 4 = 0.0
4. <i>Sium suave</i>	0.1		OBL	UPL Species	0.0 × 5 = 0.0
5. <i>Comarum palustre</i>	0.1		OBL	Column Totals:	83.4 (A) 238.6 (B)
6. <i>Galium trifidum</i>	0.1		FACW	Prevalence Index = B/A = 2.861	
7. <i>Ranunculus pensylvanicus</i>	0.1		FACW	Hydrophytic Vegetation Indicators:	
8. <i>Rorippa sp.</i>	0.1			<input checked="" type="checkbox"/> Dominance Test is > 50%	
Total Cover:				<input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0	
50% of total cover: 26.8		20% of total cover: 10.7		Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet)	
				Problematic Hydrophytic Vegetation ¹ (Explain)	
				Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
				Plot size (radius, or length × width) 10m radius	
				% Cover of Wetland Bryophytes (Where applicable)	
				% Bare Ground 70.0	
				Total Cover of Bryophytes 25.0	
				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No	

Remarks: This plot would be closed tall alder if not for extensive alder dieback. There are sharp boundaries and a relatively short shrub canopy which suggests the area has been cleared. A strange species assemblage is present, with obligate wetland species but no soil or hydrology indicators.

SOIL
Sampling Point: aw-05

Depth (inches)	Matrix		Redox Features			Mod	Remarks
	Color (moist)	% Color (moist)	% Type ¹	Loc ²	Texture		
0-0	/	/	A		fibric		
0-4	10yr 3/3	100	/	A	silt loam		
4-17	Variegated	/	/	A	loamy fine sand		
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent ² Location: PL=Pore Lining, RC=Root Channel, M=Matrix							
Hydric Soil Indicators:				Indicators for Problematic Hydric Soils³:			
Histosol or Histel (A1)				Alaska Color Change (TA4) ⁴			
Histic Epipedon (A2)				Alaska Alpine Swales (TA5)			
Hydrogen Sulfide (A4)				Alaska Redox With 2.5Y Hue			
Thick Dark Surface (A12)				Alaska Gleyed Without Hue 5Y or Redder			
Alaska Gleyed (A13)				Underlying Layer			
Alaska Redox (A14)				Other (Explain in Remarks)			
Alaska Gleyed Pores (A15)				³ One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic. ⁴ Give details of color change in Remarks.			
Restrictive Layer (if present):							
Type: None						Hydric Soil Present?	
Depth (inches):						Yes No ✓	
Remarks: No hydric soil indicators.							

HYDROLOGY

Wetland Hydrology Indicators:				Secondary Indicators (2 or more required)			
Primary Indicators (any one is sufficient)				Water Stained Leaves (B9)			
Surface Water (A1)	Inundation Visible on Aerial Imagery (B7)	Drainage Patterns (B10)					
High Water Table (A2)	Sparsely Vegetated Concave Surface (B8)	Oxidized Rhizospheres along Living Roots (C3)					
Saturation (A3)	Marl Deposits (B15)	Presence of Reduced Iron (C4)					
Water Marks (B1)	Hydrogen Sulfide Odor (C1)	Salt Deposits (C5)					
Sediment Deposits (B2)	Dry-Season Water Table (C2)	Stunted or Stressed Plants (D1)					
Drift Deposits (B3)	Other (Explain in Remarks)	1. Geomorphic Position (D2)					
Algal Mat or Crust (B4)		Shallow Aquitard (D3)					
Iron Deposits (B5)		Microtopographic Relief (D4)					
Surface Soil Cracks (B6)		FAC-neutral Test (D5)					
Field Observations:							
Surface Water Present?	Yes	No	.1	Depth (inches):	0		
Water Table Present?	Yes	No	.1	Depth (inches):			
Saturation Present?							
(includes capillary fringe)	Yes	No	.1	Depth			
				Wetland Hydrology Present? Yes No ✓			
Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:							
Remarks: D2--Kuskokwim River floodplain							

Sampling Point: aw-05

NWI classification: U



Hydric Soil Indicators: None

Wetland Hydrology Indicators: Geomorphic Position (D2)



WETLAND DETERMINATION DATA FORM - ALASKA REGION

Project/Site: Akiak Wetland Delineation Borough/City: Bethel Census Area Sampling Date: 2021-08-16
 Applicant/Owner: Solstice Sampling Point: aw-06
 Investigator(s): RWM, SLI Landform (hillside, terrace, hummocks, etc.): Basins Or Depressions
 Local relief (concave, convex, none): concave Slope: 0.0 % / 0.0 ° Elevation: 51
 Subregion: Alaska Lat.: 60.9157 Long.: -161.2270 Datum: WGS84
 Soil Map Unit Name: _____ NWI classification: PEM1E

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No _____ (If no, explain in Remarks)
 Are Vegetation____, Soil____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ 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 <input checked="" type="checkbox"/>	No
Hydric Soil Present?	Yes <input checked="" type="checkbox"/>	No
Wetland Hydrology Present?	Yes <input checked="" type="checkbox"/>	No

Is the Sampled Area within a Wetland?

Yes ☒ ,f No ☐

Remarks: The plot center is in the sedge fringe surrounding a small body of water. There is a relatively steep rising step to uplands at the wetland boundary. Uplands are tall willow-alder as at aw-03. The boundary is visible in imagery. A small finger of wetland extends west towards aw-05. Map based on photo-signature. There is a shallow waterbody in the center of basin, approximately 2-4ft deep, and unvegetated in center.

VEGETATION - Use scientific names of plants. List all species in the plot.

Absolute Tree Stratum		% Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:	
Total Cover:		0.0			Number of Dominant Species That are OBL, FACW, or FAC: 1 (A)	
50% of total cover: 0.0					Total Number of Dominant Species Across all Strata: 1 (B)	
50% of total cover: 0.0					Percent of Dominant Species That are OBL,	
Sapling/Shrub Stratum					Prevalence Index worksheet:	
1.	Salix arbusculoides	0.1		FACW	Total % Cover of: Multiply by:	
Total Cover:		0.1			OBL Species 76.3 × 1 = 76.3	
50% of total cover: 0.0					FACW Species 2.1 × 2 = 4.2	
50% of total cover: 0.0					FAC Species 0.0 × 3 = 0.0	
50% of total cover: 0.0					FACU Species 0.0 × 4 = 0.0	
50% of total cover: 0.0					UPL Species 0.0 × 5 = 0.0	
50% of total cover: 0.0					Column Totals: 78.4 (A) 80.5 (B)	
50% of total cover: 0.0					Prevalence Index = B/A = 1.027	
Herb Stratum					Hydrophytic Vegetation Indicators:	
1.	Carex utriculata	70.0	✓	OBL	✓ Dominance Test is > 50%	
2.	Eleocharis palustris	5.0		OBL	✓ Prevalence Index is ≤ 3.0	
3.	Ranunculus gmelinii	2.0		FACW	Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet)	
4.	Potamogeton epihydrus	1.0		OBL	Problematic Hydrophytic Vegetation ¹ (Explain)	
5.	Cicuta bulbifera	0.1		OBL	Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
6.	Equisetum fluviatile	0.1		OBL	Plot size (radius, or length × width) 5m radius	
7.	Sium suave	0.1		OBL	% Cover of Wetland Bryophytes (Where applicable)	
Total Cover:		78.3			% Bare Ground 95.0	
50% of total cover: 39.2					Total Cover of Bryophytes 5.0	
50% of total cover: 39.2					Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> ,f No <input type="checkbox"/>	

Remarks: This plot is centered in the wet sedge fringe surrounding small body of water.

SOIL
Sampling Point: aw-06

Depth (inches)	Matrix		Redox Features						Mod	Remarks
	Color(moist)	% Color (moist)	%Type ¹	Loc ²	Texture					
0-2	/	/	A		peat					
2-10	5y 2.5/1	90 7.5yr 4/4	10 C	PL	loamy fine sand				Positive alpha alpha at 10 inches. Alaska re-dox	
10-16	2.5y 3/2	90 7.5yr 3/3	10 C	PL	loamy fine					
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent ² Location: PL=Pore Lining, RC=Root Channel,										
Hydric Soil Indicators:					Indicators for Problematic Hydric Soils³:					
Histosol or Histel (A1)					Alaska Color Change (TA4) ⁴					
Histic Epipedon (A2)					Alaska Alpine Swales (TA5)					
Hydrogen Sulfide (A4)					Alaska Redox With 2.5Y Hue .1					
Thick Dark Surface (A12)					Other (Explain in Remarks)					
Alaska Gleyed (A13)					³ One indicator or hydrophytic vegetation,					
.1 Alaska Redox (A14)					and an appropriate landscape position					
Alaska Gleyed Pores (A15)					⁴ Give details of color change in Remarks.					
Restrictive Layer (if present): Type: None Depth (inches):										
					Hydric Soil Present? Yes ✓					
Remarks: other--A positive reaction to alpha alpha dipyridol at 10 inches indicating the presence of reduced iron.										

HYDROLOGY

Wetland Hydrology Indicators:				Secondary Indicators (2 or more required)	
Primary Indicators (any one is sufficient)				Water Stained Leaves (B9)	
Surface Water (A1)				Inundation Visible on Aerial Imagery (B7)	Drainage Patterns (B10)
.1 High Water Table (A2)				Sparsely Vegetated Concave Surface (B8)	Oxidized Rhizospheres along Living Roots
.1 Saturation (A3)				Marl Deposits (B15)	.1 Presence of Reduced Iron (C4)
Water Marks (B1)				Hydrogen Sulfide Odor (C1)	Salt Deposits (C5)
Sediment Deposits (B2)				Dry-Season Water Table (C2)	Stunted or Stressed Plants (D1)
Drift Deposits (B3)				Other (Explain in Remarks)	.1 Geomorphic Position (D2)
Algal Mat or Crust (B4)					Shallow Aquitard (D3)
.1 Iron Deposits (B5)					Microtopographic Relief(D4)
Surface Soil Cracks (B6)					.1 FAC-neutral Test (D5)
Field Observations:					
Surface Water Present? Yes No .1 Depth (inches):				Wetland Hydrology Present? Yes ✓	
Water Table Present? Yes .1 No Depth (inches): 0					
Saturation Present? (includes capillary fringe) Yes .1 No Depth (inches): 0					
Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:					
Remarks: Primary hydrology indicator B5 (iron deposits in the form of a biogenic sheen). Secondary hydrology indicators C4 (presence of reduced iron indicated by a positive reaction to alpha alpha dipyridol) and D2 (geomorphic position indicated by its location in a small depression and Kuskokwim River floodplain).					

Sampling Point: aw-06
NWI classification: PEM1E



Hydric Soil Indicators: Other (explain in remarks), Alaska Redox (A14)

Wetland Hydrology Indicators: Saturation (A3), FAC-Neutral Test (D5), Presence of Reduced Iron (C4), Iron Deposits (B5), High Water Table (A2), Geomorphic Position (D2)



WETLAND DETERMINATION DATA FORM - ALASKA REGION

Project/Site: Akiak Wetland Delineation Borough/City: Bethel Census Area Sampling Date: 2021-08-16
 Applicant/Owner: Solstice Sampling Point: aw-08
 Investigator(s): RWM, SLI Landform (hillside, terrace, hummocks, etc.): Basins Or Depressions
 Local relief (concave, convex, none): concave Slope: 0.0 % / 0.0 ° Elevation: 70
 Subregion: Alaska Lat.: 60.9143 Long.: -161.2274 Datum: WGS84
 Soil Map Unit Name: _____ NWI classification: PEM1E

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No _____ (If no, explain in Remarks)
 Are Vegetation____, Soil____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ 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 <input checked="" type="checkbox"/>	No
Hydric Soil Present?	Yes <input checked="" type="checkbox"/>	No
Wetland Hydrology Present?	Yes <input checked="" type="checkbox"/>	No

**Is the Sampled Area
within a Wetland?**

Yes ,f No

Remarks: Plot in wet sedge fringe of shallow waterbody. Topography rises to the adjacent shrub uplands, with a thin band of Calamagrostis canadensis before the shrubs. Observed a small wood frog in plot, 3 ducks (Northern Shovelers), and multiple shorebirds in adjacent waterbody.

VEGETATION - Use scientific names of plants. List all species in the plot.

Absolute		Dominant Indicator		Dominance Test worksheet:	
Tree Stratum	% Cover	Species?	Status	Number of Dominant Species That are OBL, FACW, or FAC:	
Total Cover:	0.0			1	(A)
50% of total cover: 0.0			20% of total cover: 0.0	Total Number of Dominant Species Across all Strata:	
Sapling/Shrub Stratum				1	(B)
Total Cover:	0.0			Percent of Dominant Species That are OBL,	
50% of total cover: 0.0			20% of total cover: 0.0		
Herb Stratum					
1. Carex utriculata	60.0	<input checked="" type="checkbox"/>	OBL	Prevalence Index worksheet:	
2. Comarum palustre	5.0		OBL	Total % Cover of: Multiply by:	
3. Galium trifidum	5.0		FACW	OBL Species	75.3 × 1 = 75.3
4. Epilobium palustre	5.0		OBL	FACW Species	7.0 × 2 = 14.0
5. Calamagrostis canadensis	3.0		FAC	FAC Species	3.0 × 3 = 9.0
6. Ranunculus gmelinii	2.0		FACW	FACU Species	0.0 × 4 = 0.0
7. Utricularia macrorhiza	2.0		OBL	UPL Species	0.0 × 5 = 0.0
8. Sium suave	1.0		OBL	Column Totals:	85.3 (A) 98.3 (B)
9. Glyceria grandis	1.0		OBL	Prevalence Index = B/A = 1.152	
0. Cicuta virosa	1.0		OBL		
11. Calamagrostis purpurascens	1.0		U	Hydrophytic Vegetation Indicators:	
1. Beckmannia syzigachne	0.1		OBL	<input checked="" type="checkbox"/> Dominance Test is > 50%	
2. Unknown Crucifer	0.1			<input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0	
14. Equisetum fluviatile	0.1		OBL	Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet)	
15. Lemna minor	0.1		OBL	Problematic Hydrophytic Vegetation ¹ (Explain)	
Total Cover:	86.4			Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
50% of total cover: 43.2			20% of total cover: 17.3		
				Plot size (radius, or length × width) 5m radius	
				% Cover of Wetland Bryophytes (Where applicable)	
				% Bare Ground 95.0	
				Total Cover of Bryophytes 0.1	
				Hydrophytic Vegetation Present?	
				<u>Yes</u> ,f <u>No</u>	

Remarks: A wet sedge fringe, with grasses in microtopographic highs and scattered calamagrostis canadensis pedestals.

SOIL
Sampling Point: aw-08

Depth (inches)	Matrix Color (moist)	%Color (moist)	Redox Features Type ¹ Loc ² Texture	Mod	Remarks
0-3	/	/	A	peat	
3-12	/	/	A	mucky peat	Silt layers from flooding but still organic. Al-pha alpha positive at 5
12-18	/	/	A	muck	Histosol
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent			² Location: PL=Pore Lining, RC=Root Channel,		
Hydric Soil Indicators:					
Indicators for Problematic Hydric Soils³:					
.1 Histosol or Histel (A1) Alaska Color Change (TA4) ⁴ Alaska Gleyed Without Hue 5Y or					
Histic Epipedon (A2) Alaska Alpine Swales (TA5) Underlying Layer					
Hydrogen Sulfide (A4) Alaska Redox With 2.5Y Hue .1 Other (Explain in Remarks)					
Thick Dark Surface (A12)					
Alaska Gleyed (A13) ³ One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology, must					
Alaska Redox (A14) and an appropriate landscape position be present unless disturbed or problematic.					
Alaska Gleyed Pores (A15) ⁴ Give details of color change in Remarks.					
Restrictive Layer (if present):					
Type: None					
Depth (inches):					
Hydric Soil Present? Yes ✓					
Remarks: other--A positive reaction to alpha alpha dipyridol at 5 inches indicating the presence of reduced iron. This is reacting to reduced iron in flooding infused silt					

HYDROLOGY

Wetland Hydrology Indicators:				Secondary Indicators (2 or more required)	
Primary Indicators (any one is sufficient)				Water Stained Leaves (B9)	
Surface Water (A1)				Inundation Visible on Aerial Imagery (B7)	
.1 High Water Table (A2)				Drainage Patterns (B10)	
.1 Saturation (A3)				Oxidized Rizospheres along Living Roots	
Water Marks (B1)				.1 Presence of Reduced Iron (C4)	
Sediment Deposits (B2)				Salt Deposits (C5)	
Drift Deposits (B3)				Stunted or Stressed Plants (D1)	
Algal Mat or Crust (B4)				.1 Geomorphic Position (D2)	
Iron Deposits (B5)				Shallow Aquitard (D3)	
Surface Soil Cracks (B6)				Microtopographic Relief(D4)	
				.1 FAC-neutral Test (D5)	
Field Observations:					
Surface Water Present? Yes No .1 Depth (inches): 0					
Water Table Present? Yes .1 No Depth (inches): 2					
Saturation Present?					
(includes capillary fringe) Yes .1 No Depth (inches): 0					
Wetland Hydrology Present? Yes ✓					
Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:					
Remarks: This plot is in a wet sedge fringe adjacent to a waterbody. Hydrology indicator C4(presence of reduced iron) with a positive reaction to alpha alpha dipyridol, and geomorphic position(d2) due to its location in a basin within the Kuskokwim River floodplain.					

Sampling Point: aw-08
NWI classification: PEM1E



Hydric Soil Indicators: Histosol or Histel (A1), Other (explain in remarks)

Wetland Hydrology Indicators: FAC-Neutral Test (D5), Presence of Reduced Iron (C4), Saturation (A3), Geomorphic Position (D2), High Water Table (A2)



WETLAND DETERMINATION DATA FORM - ALASKA REGION

Project/Site: Akiak Wetland Delineation Borough/City: Bethel Census Area Sampling Date: 2021-08-16
 Applicant/Owner: Solstice Sampling Point: aw-09
 Investigator(s): RWM, SLI Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
 Local relief (concave, convex, none): none Slope: 0.0 % / 0.0 ° Elevation: 82
 Subregion: Alaska Lat.: 60.9144 Long.: -161.2285 Datum: WGS84
 Soil Map Unit Name: _____ NWI classification: U
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No _____ (If no, explain in Remarks)
 Are Vegetation____, Soil____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ 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 <input checked="" type="checkbox"/> No <input type="checkbox"/>				Is the Sampled Area within a Wetland?	Yes	No	<input checked="" type="checkbox"/>
Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>							
Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>							
Remarks: Site is tall closed alder, about 5-7ft higher than the adjacent wetland characterized by aw-08.							

VEGETATION - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status	
	Total Cover:	0.0			
	50% of total cover:	0.0	20% of total cover:	0.0	
	Sapling/Shrub Stratum				
1.	Alnus viridis	85.0	<input checked="" type="checkbox"/>	FAC	
2.	Ribes triste	7.0		FAC	
3.	Viburnum edule	2.0		FACU	
	Total Cover:	94.0			
	50% of total cover:	47.0	20% of total cover:	18.8	
	Herb Stratum				
1.	Equisetum sylvaticum	20.0	<input checked="" type="checkbox"/>	FAC	
2.	Calamagrostis canadensis	15.0	<input checked="" type="checkbox"/>	FAC	
3.	Rubus arcticus	5.0		FAC	
4.	Thalictrum sparsiflorum	3.0		FACU	
5.	Trientalis europaea	1.0		FACU	
6.	Mertensia paniculata	1.0		FACU	
7.	Sanguisorba sp.	0.1			
8.	Aconitum delphiniifolium	0.1		FAC	
	Total Cover:	45.2			
	50% of total cover:	22.6	20% of total cover:	9.0	

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,

Prevalence Index worksheet:
 Total % Cover of: Multiply by:
 OBL Species 0.0 × 1 = 0.0
 FACW Species 0.0 × 2 = 0.0
 FAC Species 132.1 × 3 = 396.3
 FACU Species 7.0 × 4 = 28.0
 UPL Species 0.0 × 5 = 0.0
 Column Totals: 139.1 (A) 424.3 (B)
 Prevalence Index = B/A = 3.050

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
 Prevalence Index is ≤ 3.0
 Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
 Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.
 Plot size (radius, or length × width) 5m radius
 % Cover of Wetland Bryophytes (Where applicable)
 % Bare Ground 90.0
 Total Cover of Bryophytes 5.0

Hydrophytic Vegetation Present? **Yes** ☒ **No**

Remarks:

SOIL
Sampling Point: aw-09

Depth		Redox Features							
(inches)	Color (moist) %	Color (moist) %	Type ¹	Loc ²	Texture	Mod	Remarks		
0-5	/	/	A		fibric				
5-17	10yr 3/2 60	10yr 3/3 40	C	PL	silt loam				
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent						² Location: PL=Pore Lining, RC=Root Channel,			
Hydric Soil Indicators:			Indicators for Problematic Hydric Soils³:						
Histosol or Histel (A1)			Alaska Color Change (TA4) ⁴				Alaska Gleyed Without Hue 5Y or Redder		
Histic Epipedon (A2)			Alaska Alpine Swales (TA5)				Underlying Layer		
Hydrogen Sulfide (A4)			Alaska Redox With 2.5Y Hue				Other (Explain in Remarks)		
Thick Dark Surface (A12)									
Alaska Gleyed (A13)			One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology,						
Alaska Redox (A14)			and an appropriate landscape position must be present unless disturbed or problematic.						
Alaska Gleyed Pores (A15)			Give details of color change in Remarks.						
Restrictive Layer (if present):									
Type: None						Hydric Soil Present?			
Depth (inches):						Yes No ✓			
Remarks: No hydric soil indicators									

HYDROLOGY

Wetland Hydrology Indicators:				Secondary Indicators (2 or more required)			
Primary Indicators (any one is sufficient)				Water Stained Leaves (B9)			
Surface Water (A1)	Inundation Visible on Aerial Imagery (B7)	Drainage Patterns (B10)					
High Water Table (A2)	Sparsely Vegetated Concave Surface (B8)	Oxidized Rhizospheres along Living	Roots (C3)				
Saturation (A3)	Marl Deposits (B15)	Presence of Reduced Iron (C4)					
Water Marks (B1)	Hydrogen Sulfide Odor (C1)	Salt Deposits (C5)					
Sediment Deposits (B2)	Dry-Season Water Table (C2)	Stunted or Stressed Plants (D1)					
Drift Deposits (B3)	Other (Explain in Remarks)	Geomorphic Position (D2)					
Algal Mat or Crust (B4)		Shallow Aquitard (D3)					
Iron Deposits (B5)		Microtopographic Relief (D4)					
Surface Soil Cracks (B6)		FAC-neutral Test (D5)					
Field Observations:							
Surface Water Present?	Yes	No	.1	Depth (inches):	0		
Water Table Present?	Yes	No	.1	Depth (inches):			
Saturation Present?							
(includes capillary fringe)	Yes	No	.1	Depth			
				Wetland Hydrology Present?			
				Yes No ✓			
Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:							
Remarks: D2--Kuskokwim River floodplain							

Sampling Point: aw-09

NWI classification: U



Hydric Soil Indicators: None

Wetland Hydrology Indicators: Geomorphic Position (D2)



WETLAND DETERMINATION DATA FORM - ALASKA REGION

Project/Site: Akiak Wetland Delineation Borough/City: Bethel Census Area Sampling Date: 2021-08-16
 Applicant/Owner: Solstice Sampling Point: aw-11
 Investigator(s): SLI, RWM Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
 Local relief (concave, convex, none): none Slope: 0.0 % / 0.0 ° Elevation: 91
 Subregion: Alaska Lat.: 60.9091 Long.: -161.2264 Datum: WGS84
 Soil Map Unit Name: _____ NWI classification: U
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No _____ (If no, explain in Remarks)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ 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 <input checked="" type="checkbox"/> No <input type="checkbox"/>				Is the Sampled Area within a Wetland?	Yes	No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>						
Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>						
Remarks: This plot is representative of the potential LEO footprint. All adjacent cleared areas were walked and observed similar elevation and level terrain.						

VEGETATION - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status	
1.	Populus balsamifera	5.0		FACU	
	Total Cover:	5.0			
	50% of total cover:	2.5	20% of total cover:	1.0	
	Sapling/Shrub Stratum				
1.	Alnus viridis	60.0	<input checked="" type="checkbox"/>	FAC	
2.	Viburnum edule	30.0	<input checked="" type="checkbox"/>	FACU	
3.	Rubus idaeus	20.0		FACU	
4.	Salix bebbiana	15.0		FAC	
5.	Rosa acicularis	10.0		FACU	
	Total Cover:	135.0			
	50% of total cover:	67.5	20% of total cover:	27.0	
	Herb Stratum				
1.	Calamagrostis canadensis	15.0	<input checked="" type="checkbox"/>	FAC	
2.	Equisetum sylvaticum	7.0	<input checked="" type="checkbox"/>	FAC	
3.	Actaea rubra	3.0		FAC	
4.	Thalictrum sparsiflorum	2.0		FACU	
5.	Aconitum delphinifolium	1.0		FAC	
6.	Athyrium filix-femina	1.0			
7.	Mertensia paniculata	1.0		FACU	
8.	Trientalis europaea	0.1		FACU	
	Total Cover:	30.1			
	50% of total cover:	15.0	20% of total cover:	6.0	

Dominance Test worksheet:
 Number of Dominant Species That are OBL, FACW, or FAC: 3 (A)
 Total Number of Dominant Species Across all Strata: 4 (B)
 Percent of Dominant Species That are OBL, _____

Prevalence Index worksheet:
 Total % Cover of: Multiply by:
 OBL Species 0.0 × 1 = 0.0
 FACW Species 0.0 × 2 = 0.0
 FAC Species 101.0 × 3 = 303.0
 FACU Species 68.1 × 4 = 272.4
 UPL Species 0.0 × 5 = 0.0
 Column Totals: 169.1 (A) 575.4 (B)
 Prevalence Index = B/A = 3.403

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
 Prevalence Index is ≤ 3.0
 Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
 Problematic Hydrophytic Vegetation¹ (Explain)
 Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.
 Plot size (radius, or length × width) 10m radius
 % Cover of Wetland Bryophytes (Where applicable)
 % Bare Ground 90.0
 Total Cover of Bryophytes 5.0

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks: Representative of adjacent cleared areas

SOIL
Sampling Point: aw-11

Depth (inches)	Matrix		Redox Features						Mod	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²	Texture			
0-4	/		/		A		fibric			
4-18	10yr	3/2 80	10yr	3/4 20	C	PL	very fine sandy loam			
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent ² Location: PL=Pore Lining, RC=Root Channel,										
Hydric Soil Indicators:					Indicators for Problematic Hydric Soils³:					
Histosol or Histel (A1)					Alaska Color Change (TA4) ⁴			Alaska Gleyed Without Hue 5Y or Redder		
Histic Epipedon (A2)					Alaska Alpine Swales (TA5)			Underlying Layer		
Hydrogen Sulfide (A4)					Alaska Redox With 2.5Y Hue			Other (Explain in Remarks)		
Thick Dark Surface (A12)										
Alaska Gleyed (A13)					One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology,					
Alaska Redox (A14)					and an appropriate landscape position must be present unless disturbed or problematic.					
Alaska Gleyed Pores (A15)					Give details of color change in Remarks.					
Restrictive Layer (if present):										
Type: None										
Depth (inches):										
										Hydric Soil Present? Yes No ✓
Remarks: No hydric soil indicators										

HYDROLOGY

Wetland Hydrology Indicators:				Secondary Indicators (2 or more required)			
Primary Indicators (any one is sufficient)				Water Stained Leaves (B9)			
Surface Water (A1)				Inundation Visible on Aerial Imagery (B7)	Drainage Patterns (B10)		
High Water Table (A2)				Sparsely Vegetated Concave Surface (B8)	Oxidized Rhizospheres along Living	Roots (C3)	
Saturation (A3)				Marl Deposits (B15)	Presence of Reduced Iron (C4)		
Water Marks (B1)				Hydrogen Sulfide Odor (C1)	Salt Deposits (C5)		
Sediment Deposits (B2)				Dry-Season Water Table (C2)	Stunted or Stressed Plants (D1)		
Drift Deposits (B3)				Other (Explain in Remarks)	1. Geomorphic Position (D2)		
Algal Mat or Crust (B4)					Shallow Aquitard (D3)		
Iron Deposits (B5)					Microtopographic Relief (D4)		
Surface Soil Cracks (B6)					FAC-neutral Test (D5)		
Field Observations:							
Surface Water Present?	Yes	No	.1	Depth (inches):	0		
Water Table Present?	Yes	No	.1	Depth (inches):			
Saturation Present?							
(includes capillary fringe)	Yes	No	.1	Depth			
				Wetland Hydrology Present? Yes No ✓			
Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:							
Remarks: D2--Kuskokwim River floodplain							

Sampling Point: aw-11

NWI classification: U



Hydric Soil Indicators: None

Wetland Hydrology Indicators: Geomorphic Position (D2)



WETLAND DETERMINATION DATA FORM - ALASKA REGION

Project/Site: Akiak Wetland Delineation Borough/City: Bethel Census Area Sampling Date: 2021-08-17
 Applicant/Owner: Solstice Sampling Point: aw-12
 Investigator(s): SLI, RWM Landform (hillside, terrace, hummocks, etc.): Nonpatterned
 Local relief (concave, convex, none): none Slope: 0.0 % / 0.0 ° Elevation: 62
 Subregion: Alaska Lat.: 60.9113 Long.: -161.2330 Datum: WGS84
 Soil Map Unit Name: _____ NWI classification: U
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No _____ (If no, explain in Remarks)
 Are Vegetation____, Soil____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ 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 <input checked="" type="checkbox"/> No <input type="checkbox"/>				Is the Sampled Area within a Wetland? Yes No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>				
Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>				
Remarks: The perimeter of landfill has been brushed, and then a steep berm separates the brushed clearing from adjacent undisturbed lands as characterized by this plot.				

VEGETATION - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status	
1.	Populus balsamifera	15.0	<input checked="" type="checkbox"/>	FACU	Dominance Test worksheet: Number of Dominant Species That are OBL, FACW, or FAC: 5 (A) Total Number of Dominant Species Across all Strata: 6 (B) Percent of Dominant Species That are OBL,
	Total Cover:	15.0			
	50% of total cover:	7.5	20% of total cover:	3.0	
	Sapling/Shrub Stratum				
1.	Alnus viridis	50.0	<input checked="" type="checkbox"/>	FAC	Prevalence Index worksheet: Total % Cover of: Multiply by: OBL Species 0.0 × 1 = 0.0 FACW Species 0.0 × 2 = 0.0 FAC Species 137.3 × 3 = 411.9 FACU Species 25.3 × 4 = 101.2 UPL Species 0.0 × 5 = 0.0 Column Totals: 162.6 (A) 513.1 (B) Prevalence Index = B/A = 3.156 Hydrophytic Vegetation Indicators: <input checked="" type="checkbox"/> Dominance Test is > 50% Prevalence Index is ≤ 3.0 Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) Problematic Hydrophytic Vegetation ¹ (Explain) Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic. Plot size (radius, or length × width) 10m radius % Cover of Wetland Bryophytes (Where applicable) % Bare Ground 75.0 Total Cover of Bryophytes 20.0 Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No
2.	Salix bebbiana	30.0	<input checked="" type="checkbox"/>	FAC	
3.	Ribes triste	30.0	<input checked="" type="checkbox"/>	FAC	
4.	Viburnum edule	5.0		FACU	
5.	Rosa acicularis	1.0		FACU	
6.	Rubus idaeus	1.0		FACU	
	Total Cover:	117.0			
	50% of total cover:	58.5	20% of total cover:	23.4	
	Herb Stratum				
1.	Calamagrostis canadensis	15.0	<input checked="" type="checkbox"/>	FAC	
2.	Rubus arcticus	7.0	<input checked="" type="checkbox"/>	FAC	
3.	Thalictrum sparsiflorum	3.0		FACU	
4.	Equisetum sylvaticum	3.0		FAC	
5.	Athyrium filix-femina	2.0			
6.	Equisetum arvense	2.0		FAC	
7.	Trientalis europaea	0.1		FACU	
8.	Polemonium acutiflorum	0.1		FAC	
9.	Mertensia paniculata	0.1		FACU	
10.	Angelica lucida	0.1		FACU	
11.	Actaea rubra	0.1		FAC	
12.	Aconitum delphinifolium	0.1		FAC	
	Total Cover:	32.6			
	50% of total cover:	16.3	20% of total cover:	6.5	

Remarks:

SOIL
Sampling Point: aw-12

Depth (inches)	Matrix		Redox Features						Mod	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²	Texture			
0-4	/		/		A		fibric			
4-10	2.5y	3/1 95	10yr	3/2 5	C	PL	very fine sandy loam			
10-19	10yr	3/3		/	A		very fine sandy loam			
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent ² Location: PL=Pore Lining, RC=Root Channel,										
Hydric Soil Indicators:					Indicators for Problematic Hydric Soils³:					
Histosol or Histel (A1)					Alaska Color Change (TA4) ⁴			Alaska Gleyed Without Hue 5Y or Redder		
Histic Epipedon (A2)					Alaska Alpine Swales (TA5)			Underlying Layer		
Hydrogen Sulfide (A4)					Alaska Redox With 2.5Y Hue			Other (Explain in Remarks)		
Thick Dark Surface (A12)										
Alaska Gleyed (A13)					One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology,					
Alaska Redox (A14)					and an appropriate landscape position must be present unless disturbed or problematic.					
Alaska Gleyed Pores (A15)					Give details of color change in Remarks.					
Restrictive Layer (if present):										
Type: None										
Depth (inches):										
										Hydric Soil Present? Yes No ✓
Remarks: No hydric soil indicators										

HYDROLOGY

Wetland Hydrology Indicators:				Secondary Indicators (2 or more required)			
Primary Indicators (any one is sufficient)				Water Stained Leaves (B9)			
Surface Water (A1)	Inundation Visible on Aerial Imagery (B7)	Drainage Patterns (B10)					
High Water Table (A2)	Sparsely Vegetated Concave Surface (B8)	Oxidized Rhizospheres along Living	Roots (C3)				
Saturation (A3)	Marl Deposits (B15)	Presence of Reduced Iron (C4)					
Water Marks (B1)	Hydrogen Sulfide Odor (C1)	Salt Deposits (C5)					
Sediment Deposits (B2)	Dry-Season Water Table (C2)	Stunted or Stressed Plants (D1)					
Drift Deposits (B3)	Other (Explain in Remarks)	Geomorphic Position (D2)					
Algal Mat or Crust (B4)		Shallow Aquitard (D3)					
Iron Deposits (B5)		Microtopographic Relief (D4)					
Surface Soil Cracks (B6)		FAC-neutral Test (D5)					
Field Observations:							
Surface Water Present?	Yes	No	.1	Depth (inches):	0		
Water Table Present?	Yes	No	.1	Depth (inches):			
Saturation Present?							
(includes capillary fringe)	Yes	No	.1	Depth			
				Wetland Hydrology Present? Yes No ✓			
Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:							
Remarks: D2--Kuskokwim River floodplain							

Sampling Point: aw-12

NWI classification: U



Hydric Soil Indicators: None

Wetland Hydrology Indicators: Geomorphic Position (D2)



WETLAND DETERMINATION DATA FORM - ALASKA REGION

Project/Site: Akiak Wetland Delineation Borough/City: Bethel Census Area Sampling Date: 2021-08-17
 Applicant/Owner: Solstice Sampling Point: aw-14
 Investigator(s): RWM, SLI Landform (hillside, terrace, hummocks, etc.): Channel
 Local relief (concave, convex, none): concave Slope: 0.0 % / 0.0 ° Elevation: 65
 Subregion: Alaska Lat.: 60.9079 Long.: -161.2342 Datum: WGS84
 Soil Map Unit Name: _____ NWI classification: PEM1C

Are climatic/hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks)
 Are Vegetation __, Soil __, or Hydrology __ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ 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 <u>✓</u> No	Is the Sampled Area within a Wetland? Yes <u>✓</u> No
Hydric Soil Present? Yes <u>✓</u> No	
Wetland Hydrology Present? Yes <u>✓</u> No	

Remarks: An inactive/abandoned channel, mapped as perennial stream by NHD. 8-10ft lower than adjacent forest. There was no surface water at time of site visit, but unvegetated low points suggest this feature receives and retains flood waters from the Kuskokwim. Bounds are visible in imagery as a transition from graminoid channel (wetland) to Populus balsamifera woodland (upland).

VEGETATION - Use scientific names of plants. List all species in the plot.

Absolute		Dominant Indicator		Dominance Test worksheet:	
Tree Stratum	% Cover	Species?	Status	Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)	
Total Cover:	0.0			Total Number of Dominant Species Across all Strata: 2 (B)	
50% of total cover: 0.0		20% of total cover: 0.0		Percent of Dominant Species That are OBL, FACW, or FAC: 100.0% (A/B)	
Sapling/Shrub Stratum					
1. Ribes hudsonianum	5.0	✓	FAC		
2. Salix bebbiana	1.0		FAC		
Total Cover:	6.0				
50% of total cover: 3.0		20% of total cover: 1.2			
Herb Stratum				Prevalence Index worksheet:	
1. Calamagrostis canadensis	70.0	✓	FAC	Total % Cover of: Multiply by:	
2. Comarum palustre	15.0		OBL	OBL Species 20.1 × 1 = 20.1	
3. Carex utriculata	5.0		OBL	FACW Species 0.0 × 2 = 0.0	
0. Galium trifidum ssp. trifidum	3.0			FAC Species 79.0 × 3 = 237.0	
4. Rubus arcticus	3.0		FAC	FACU Species 0.0 × 4 = 0.0	
5. Unknown Crucifer	2.0			UPL Species 0.0 × 5 = 0.0	
6. Sium suave	0.1		OBL	Column Totals: 99.1 (A) 257.1 (B)	
Total Cover:	98.1			Prevalence Index = B/A = 2.594	
50% of total cover: 49.0		20% of total cover: 19.6			
				Hydrophytic Vegetation Indicators:	
				✓ Dominance Test is > 50%	
				✓ Prevalence Index is ≤ 3.0	
				Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet)	
				Problematic Hydrophytic Vegetation ¹ (Explain)	
				Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
				Plot size (radius, or length × width) 2x10m	
				% Cover of Wetland Bryophytes (Where applicable)	
				% Bare Ground 25.0	
				Total Cover of Bryophytes 60.0	
				Hydrophytic Vegetation Present? Yes <u>✓</u> No	

Remarks: This plot characterizes vegetation rooted in the channel feature, excluding any overhanging alder/willow rooted in adjacent higher forest. Salix and Ribes rooted atop dead downed wood.

SOIL
Sampling Point: aw-14

Depth (inches)	Matrix			Redox Features					Mod	Remarks
	Color (moist)	% Color	(moist) %	Type ¹	Loc ²	Texture				
0-3	/	/		A		fibric				
3-19	5y 3/1	85	7.5yr 4/4	15	C	PL silt loam				
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent ² Location: PL=Pore Lining, RC=Root Channel,										
Hydric Soil Indicators:			Indicators for Problematic Hydric Soils³:							
Histosol or Histel (A1)			Alaska Color Change (TA4) ⁴				Alaska Gleyed Without Hue 5Y or Redder			
Histic Epipedon (A2)			Alaska Alpine Swales (TA5)				Underlying Layer			
Hydrogen Sulfide (A4)			Alaska Redox With 2.5Y Hue				Other (Explain in Remarks)			
Thick Dark Surface (A12)										
Alaska Gleyed (A13)			³ One indicator or hydrophytic vegetation,				one primary indicator of wetland hydrology, must			
.1 Alaska Redox (A14)			and an appropriate landscape position				be present unless disturbed or problematic.			
Alaska Gleyed Pores (A15)			⁴ Give details of color change in Remarks.							
Restrictive Layer (if present):										
Type: None										
Depth (inches):										
Hydric Soil Present? Yes ✓										
Remarks: Horizon 2 meets Alaska redox requirements with 10% or more redoximorphic features as pore linings with value and chroma 4 or greater, and a 5Y matrix with a chroma of 3 or less.										

HYDROLOGY

Wetland Hydrology Indicators:				Secondary Indicators (2 or more required)	
Primary Indicators (any one is sufficient)				Water Stained Leaves (B9)	
Surface Water (A1)				Inundation Visible on Aerial Imagery (B7)	Drainage Patterns (B10)
High Water Table (A2)			.1	Sparsely Vegetated Concave Surface (B8)	Oxidized Rhizospheres along Living Roots
.1 Saturation (A3)				Marl Deposits (B15)	Presence of Reduced Iron (C4)
Water Marks (B1)				Hydrogen Sulfide Odor (C1)	Salt Deposits (C5)
Sediment Deposits (B2)				Dry-Season Water Table (C2)	Stunted or Stressed Plants (D1)
.1 Drift Deposits (B3)				Other (Explain in Remarks)	.1 Geomorphic Position (D2)
Algal Mat or Crust (B4)					Shallow Aquitard (D3)
Iron Deposits (B5)					Microtopographic Relief (D4)
Surface Soil Cracks (B6)					FAC-neutral Test (D5)
Field Observations:					
Surface Water Present?	Yes	No	.1	Depth (inches): 0	Wetland Hydrology Present? Yes ✓
Water Table Present?	Yes	No	.1	Depth (inches):	
Saturation Present?					
(includes capillary fringe)	Yes	.1	No	Depth (inches): 7	
Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:					
Remarks: Meets primary hydrology indicators B3 (Drift Deposits) with litter and woody litter entrained in overhanging willows and B8 (Sparsely Vegetated Concave Surface) with concave low areas at edge of relict channel. This site also meets secondary wetland hydrology indicator D2 (Geomorphic Position) as it is a relict channel feature in close proximity to the Kuskokwim River.					

Sampling Point: aw-14
NWI classification: PEM1C



Hydric Soil Indicators: Alaska Redox (A14)

Wetland Hydrology Indicators: Drift Deposits (B3), Saturation (A3), Geomorphic Position (D2), Sparsely Vegetated Concave Surface (B8)



WETLAND DETERMINATION DATA FORM - ALASKA REGION

Project/Site: Akiak Wetland Delineation Borough/City: Bethel Census Area Sampling Date: 2021-08-17
 Applicant/Owner: Solstice Sampling Point: aw-15
 Investigator(s): SLI Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
 Local relief (concave, convex, none): concave Slope: 0.0 % / 0.0 ° Elevation: 58
 Subregion: Alaska Lat.: 60.9087 Long.: -161.2517 Datum: WGS84
 Soil Map Unit Name: _____ NWI classification: PEM1F

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No _____ (If no, explain in Remarks)
 Are Vegetation____, Soil____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ 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 <input checked="" type="checkbox"/> No	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No	
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No	

Remarks: This characterizes the darker photo-signature in the center of the wetland. Deep water precludes sampling in center.

VEGETATION - Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
Total Cover:	0.0		
	50% of total cover: 0.0	20% of total cover: 0.0	
Sapling/Shrub Stratum			
Total Cover:	0.0		
	50% of total cover: 0.0	20% of total cover: 0.0	
Herb Stratum			
1. Carex utriculata	60.0	<input checked="" type="checkbox"/>	OBL
2. Calamagrostis canadensis	3.0		FAC
3. Equisetum fluviatile	0.1		OBL
Total Cover:	63.1		
	50% of total cover: 31.6	20% of total cover: 12.6	

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, _____

Prevalence Index worksheet:
 Total % Cover of: Multiply by:
 OBL Species 60.1 × 1 = 60.1
 FACW Species 0.0 × 2 = 0.0
 FAC Species 3.0 × 3 = 9.0
 FACU Species 0.0 × 4 = 0.0
 UPL Species 0.0 × 5 = 0.0
 Column Totals: 63.1 (A) 69.1 (B)
 Prevalence Index = B/A = 1.095

Hydrophytic Vegetation Indicators:
☒ Dominance Test is > 50%
☒ Prevalence Index is ≤ 3.0
 Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
 Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length × width) 10m radius
 % Cover of Wetland Bryophytes (Where applicable)
 % Bare Ground 0.0
 Total Cover of Bryophytes 0.0

Hydrophytic Vegetation Present? Yes ☒ No

Remarks: _____

SOIL
Sampling Point: aw-15

Depth (inches)	Matrix Color (moist) %	Redox Features Color (moist) % Type ¹ Loc ²	Mod	Remarks
Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent			Location: PL=Pore Lining, RC=Root Channel,	
Hydric Soil Indicators:		Indicators for Problematic Hydric Soils³:		
Histosol or Histel (A1)		Alaska Color Change (TA4) ⁴		Alaska Gleyed Without Hue 5Y or Redder
Histic Epipedon (A2)		Alaska Alpine Swales (TA5)		Underlying Layer
.1	Hydrogen Sulfide (A4)	Alaska Redox With 2.5Y Hue		Other (Explain in Remarks)
Thick Dark Surface (A12)				
Alaska Gleyed (A13)		³ One indicator or hydrophytic vegetation,		one primary indicator of wetland hydrology, must be present unless disturbed or problematic.
Alaska Redox (A14)		and an appropriate landscape position		
Alaska Gleyed Pores (A15)		⁴ Give details of color change in Remarks.		
Restrictive Layer (if present):			Hydric Soil Present? Yes ✓	
Type: None				
Depth (inches):				
Remarks: Hydrogen sulfide (H2S) odor was present when walking through wetland (wetland soil indicator A4). Soils inundated.				

HYDROLOGY

Wetland Hydrology Indicators:				Secondary Indicators (2 or more required)	
Primary Indicators (any one is sufficient)					
.1	Surface Water (A1)	Inundation Visible on	Aerial Imagery (B7)	Water Stained Leaves (B9)	
.1	High Water Table (A2)	Sparsely Vegetated	Concave Surface (B8)	Drainage Patterns (B10)	
.1	Saturation (A3)	Marl Deposits (B15)		Oxidized Rhizospheres along Living Roots (C3)	
	Water Marks (B1)	.1 Hydrogen Sulfide Odor (C1)		Presence of Reduced Iron (C4)	
	Sediment Deposits (B2)	Dry-Season Water Table (C0)		Salt Deposits (C5)	
	Drift Deposits (B3)	Other (Explain in Remarks)		Stunted or Stressed Plants (D1)	
	Algal Mat or Crust (B4)			.1 Geomorphic Position (D2)	
	Iron Deposits (B5)			Shallow Aquitard (D3)	
	Surface Soil Cracks (B6)			Microtopographic Relief (D4)	
				.1 FAC-neutral Test (D5)	
Field Observations:				Wetland Hydrology Present? Yes ✓ No	
	Surface Water Present? Yes .1 No	Depth (inches):	7		
	Water Table Present? Yes .1 No	Depth (inches):	0		
	Saturation Present?				
	(includes capillary fringe) Yes .1 No	Depth (inches):	0		
Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:					
Remarks: H2S odor (Primary wetland hydrology indicator C1) detected when walking through wetland. Secondary hydrology indicator D2 is met due to close proximity to the Kuskokwim river					

Sampling Point: aw-15
NWI classification: PEM1F



Hydric Soil Indicators: Hydrogen Sulfide (A4)

Wetland Hydrology Indicators: Geomorphic Position (D2), High WaterTable (A2), FAC-Neutral Test (D5), Hydrogen Sulfide Odor (C1), Surface Water (A1), Saturation (A3)

NO LANDSCAPE PHOTO TAKEN

WETLAND DETERMINATION DATA FORM - ALASKA REGION

Project/Site: Akiak Wetland Delineation Borough/City: Bethel Census Area Sampling Date: 2021-08-17
 Applicant/Owner: Solstice Sampling Point: aw-16
 Investigator(s): SLI Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
 Local relief (concave, convex, none): concave Slope: 0.0 % / 0.0 ° Elevation: 72
 Subregion: Alaska Lat.: 60.9085 Long.: -161.2507 Datum: WGS84
 Soil Map Unit Name: _____ NWI classification: PEM1F

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No _____ (If no, explain in Remarks)
 Are Vegetation____, Soil____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ 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 <input checked="" type="checkbox"/> No	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No	
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No	
Remarks: This plot is sampled between Carex utriculata wet sedge marsh (aw-15) and alder-willow uplands (aw-17).	

VEGETATION - Use scientific names of plants. List all species in the plot.

Absolute	Tree Stratum	% Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:
Total Cover:		0.0			Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)
50% of total cover: 0.0			20% of total cover: 0.0		Total Number of Dominant Species Across all Strata: 2 (B)
Sapling/Shrub Stratum					Percent of Dominant Species That are OBL,
1.	Salix pulchra	3.0		FACW	
Total Cover:		3.0			
50% of total cover: 1.5			20% of total cover: 0.6		
Herb Stratum					Prevalence Index worksheet:
1.	Calamagrostis canadensis	60.0	<input checked="" type="checkbox"/>	FAC	Total % Cover of: Multiply by:
2.	Comarum palustre	20.0	<input checked="" type="checkbox"/>	OBL	OBL Species 25.1 × 1 = 25.1
3.	Glyceria grandis	5.0		OBL	FACW Species 3.0 × 2 = 6.0
4.	Sium suave	0.1		OBL	FAC Species 60.0 × 3 = 180.0
0.	Galium trifidum ssp. trifidum	0.1			FACU Species 0.0 × 4 = 0.0
Total Cover:		85.2			UPL Species 0.0 × 5 = 0.0
50% of total cover: 42.6			20% of total cover: 17.0		Column Totals: 88.1 (A) 211.1 (B)
					Prevalence Index = B/A = 2.396
					Hydrophytic Vegetation Indicators:
					<input checked="" type="checkbox"/> Dominance Test is > 50%
					<input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0
					Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet)
					Problematic Hydrophytic Vegetation ¹ (Explain)
					¹ Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.
					Plot size (radius, or length × width) 5m radius
					% Cover of Wetland Bryophytes (Where applicable)
					% Bare Ground 95.0
					Total Cover of Bryophytes 0.0
					Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No
Remarks: Calamagrostis canadensis growing in large pedestals.					

SOIL
Sampling Point: aw-16

Depth (inches)	Matrix Color (moist) %	Redox Features Color (moist) % Type ¹ Loc ²	Mod	Remarks
Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent			Location: PL=Pore Lining, RC=Root Channel,	
Hydric Soil Indicators:		Indicators for Problematic Hydric Soils³:		
Histosol or Histel (A1)		Alaska Color Change (TA4) ⁴		Alaska Gleyed Without Hue 5Y or Redder
Histic Epipedon (A2)		Alaska Alpine Swales (TA5)		Underlying Layer
.1	Hydrogen Sulfide (A4)	Alaska Redox With 2.5Y Hue		Other (Explain in Remarks)
Thick Dark Surface (A12)		one primary indicator of wetland hydrology, must be present unless disturbed or problematic.		
Alaska Gleyed (A13)				
Alaska Redox (A14)				
Alaska Gleyed Pores (A15)				
Restrictive Layer (if present): Type: None Depth (inches):		Hydric Soil Present? Yes ✓		
Remarks: H2S odor detected when walking through wetland (Hydric soil indicator A4)				

HYDROLOGY

Wetland Hydrology Indicators:				Secondary Indicators (2 or more required)	
Primary Indicators (any one is sufficient)					
.1	Surface Water (A1)	Inundation Visible on Aerial Photo (B7)	Water Stained Leaves (B9)		
.1	High Water Table (A2)	Sparsely Vegetated Grass	Drainage Patterns (B10)		
.1	Saturation (A3)	Marl Deposits (B15)	Surface (B8)	Oxidized Rhizospheres along Living Roots	
	Water Marks (B1)	.1 Hydrogen Sulfide Odor (C1)		Presence of Reduced Iron (C4)	
	Sediment Deposits (B2)	Dry-Season Water Table (C1)		Salt Deposits (C5)	
	Drift Deposits (B3)	Other (Explain in Remarks)		Stunted or Stressed Plants (D1)	
	Algal Mat or Crust (B4)		.1	Geomorphic Position (D2)	
	Iron Deposits (B5)			Shallow Aquitard (D3)	
	Surface Soil Cracks (B6)			Microtopographic Relief (D4)	
			.1	FAC-neutral Test (D5)	
Field Observations: Surface Water Present? Yes .1 No Depth (inches): 5 Water Table Present? Yes .1 No Depth (inches): 0 Saturation Present? (includes capillary fringe) Yes .1 No Depth (inches): 0				Wetland Hydrology Present? Yes ✓ No	
Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:					
Remarks: Water surrounding Calamagrostis canadensis pedestals is generally 5-6in deep, with scattered deeper pits. H2S odor detected while walking through the plot. D2--Kuskokwim River floodplain					

Sampling Point: aw-16
NWI classification: PEM1F



Hydric Soil Indicators: Hydrogen Sulfide (A4)

Wetland Hydrology Indicators: High Water Table (A2), Geomorphic Position (D2), Saturation (A3), FAC-Neutral Test (D5), Hydrogen Sulfide Odor (C1), Surface Water (A1)

NO LANDSCAPE PHOTO TAKEN

WETLAND DETERMINATION DATA FORM - ALASKA REGION

Project/Site: Akiak Wetland Delineation Borough/City: Bethel Census Area Sampling Date: 2021-08-17
 Applicant/Owner: Solstice Sampling Point: aw-17
 Investigator(s): RWM, SLI Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
 Local relief (concave, convex, none): none Slope: 0.0 % / 0.0 ° Elevation: 73
 Subregion: Alaska Lat.: 60.9089 Long.: -161.2504 Datum: WGS84
 Soil Map Unit Name: _____ NWI classification: U
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks)
 Are Vegetation____, Soil____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ 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 <u>✓</u> No _____	Is the Sampled Area within a Wetland?	Yes	No	✓
Hydric Soil Present? Yes _____ No <u>✓</u>				
Wetland Hydrology Present? Yes _____ No <u>✓</u>				

Remarks: tall alder-willow with scattered poplar. typical for the area

VEGETATION - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status	
	Total Cover:	0.0			
	50% of total cover:	0.0	20% of total cover:	0.0	
	Sapling/Shrub Stratum				
1.	Salix bebbiana	40.0	✓	FAC	
2.	Alnus viridis	30.0	✓	FAC	
3.	Alnus viridis	15.0		FAC	
4.	Viburnum edule	7.0		FACU	
5.	Salix arctica	5.0		FACU	
	Total Cover:	97.0			
	50% of total cover:	48.5	20% of total cover:	19.4	
	Herb Stratum				
1.	Calamagrostis canadensis	20.0	✓	FAC	
2.	Rubus arcticus	7.0		FAC	
3.	Equisetum arvense	3.0		FAC	
4.	Thalictrum sparsiflorum	3.0		FACU	
5.	Angelica lucida	1.0		FACU	
6.	Athyrium filix-femina	1.0			
7.	Polemonium acutiflorum	1.0		FAC	
8.	Viola sp.	1.0			
9.	Trientalis europaea	0.1		FACU	
10.	Mertensia paniculata	0.1		FACU	
	Total Cover:	37.2			
	50% of total cover:	18.6	20% of total cover:	7.4	

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, _____

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by:
 OBL Species 0.0 × 1 = 0.0
 FACW Species 0.0 × 2 = 0.0
 FAC Species 116.0 × 3 = 348.0
 FACU Species 16.2 × 4 = 64.8
 UPL Species 0.0 × 5 = 0.0
 Column Totals: 132.2 (A) 412.8 (B)
 Prevalence Index = B/A = 3.123

Hydrophytic Vegetation Indicators:
 ✓ Dominance Test is > 50%
 Prevalence Index is ≤ 3.0
 Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
 Problematic Hydrophytic Vegetation¹ (Explain)
¹ Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length × width)	10m radius
% Cover of Wetland Bryophytes (Where applicable)	
% Bare Ground	0.0
Total Cover of Bryophytes	50.0

Hydrophytic Vegetation Present? Yes ✓ No

Remarks:

SOIL
Sampling Point: aw-17

Depth		Redox Features									
(inches)	Color (moist) %	Color (moist) %	Type ¹	Loc ²	Texture	Mod	Remarks				
0-4	/	/	A		fibric						
4-15	10yr 3/3	/	A		silt loam						
15-18	10yr 3/2 95	10yr 3/3 5	C	PL	silt loam						
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent						² Location: PL=Pore Lining, RC=Root Channel,					
Hydric Soil Indicators:						Indicators for Problematic Hydric Soils³:					
Histosol or Histel (A1)						Alaska Color Change (TA4) ⁴					
Histic Epipedon (A2)						Alaska Alpine Swales (TA5)					
Hydrogen Sulfide (A4)						Alaska Redox With 2.5Y Hue					
Thick Dark Surface (A12)						Alaska Gleyed Without Hue 5Y or Redder					
Alaska Gleyed (A13)						Underlying Layer					
Alaska Redox (A14)						Other (Explain in Remarks)					
Alaska Gleyed Pores (A15)						One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.					
						Give details of color change in Remarks.					
Restrictive Layer (if present):											
Type: None						Hydric Soil Present? Yes No ✓					
Depth (inches):											
Remarks: no hydric soil indicators											

HYDROLOGY

Wetland Hydrology Indicators:				Secondary Indicators (2 or more required)			
Primary Indicators (any one is sufficient)				Water Stained Leaves (B9)			
Surface Water (A1)	Inundation Visible on Aerial Imagery (B7)	Drainage Patterns (B10)					
High Water Table (A2)	Sparsely Vegetated Concave Surface (B8)	Oxidized Rhizospheres along Living	Roots (C3)				
Saturation (A3)	Marl Deposits (B15)	Presence of Reduced Iron (C4)					
Water Marks (B1)	Hydrogen Sulfide Odor (C1)	Salt Deposits (C5)					
Sediment Deposits (B2)	Dry-Season Water Table (C2)	Stunted or Stressed Plants (D1)					
Drift Deposits (B3)	Other (Explain in Remarks)	Geomorphic Position (D2)					
Algal Mat or Crust (B4)		Shallow Aquitard (D3)					
Iron Deposits (B5)		Microtopographic Relief (D4)					
Surface Soil Cracks (B6)		FAC-neutral Test (D5)					
Field Observations:							
Surface Water Present?	Yes	No	.1	Depth (inches):	0		
Water Table Present?	Yes	No	.1	Depth (inches):			
Saturation Present?							
(includes capillary fringe)	Yes	No	.1	Depth			
				Wetland Hydrology Present? Yes No ✓			
Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:							
Remarks: D2--Kuskokwim River floodplain							

Sampling Point: aw-17

NWI classification: U



Hydric Soil Indicators: None

Wetland Hydrology Indicators: Geomorphic Position (D2)



WETLAND DETERMINATION DATA FORM - ALASKA REGION

Project/Site: Akiak Wetland Delineation Borough/City: Bethel Census Area Sampling Date: 2021-08-17
 Applicant/Owner: Solstice Sampling Point: aw-18
 Investigator(s): SLI Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
 Local relief (concave, convex, none): concave Slope: 0.0 % / 0.0 ° Elevation: 62
 Subregion: Alaska Lat.: 60.9102 Long.: -161.2489 Datum: WGS84
 Soil Map Unit Name: _____ NWI classification: PEM1F

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No _____ (If no, explain in Remarks)
 Are Vegetation____, Soil____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ 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 <input checked="" type="checkbox"/> No	Is the Sampled Area within a Wetland? Yes ,f No
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No	
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No	
Remarks: This plot is the easternmost extent of the wetland that runs through the northern portion of the proposed landfill.	

VEGETATION - Use scientific names of plants. List all species in the plot.

Absolute		Dominant Indicator		Dominance Test worksheet:	
Tree Stratum	% Cover	Species?	Status	Number of Dominant Species That are OBL, FACW, or FAC:	
Total Cover:	0.0			2	(A)
50% of total cover: 0.0			20% of total cover: 0.0	Total Number of Dominant Species Across all Strata:	
				2	(B)
Sapling/Shrub Stratum				Percent of Dominant Species That are OBL,	
1. Salix pulchra	5.0		FACW		
Total Cover:	5.0				
50% of total cover: 2.5			20% of total cover: 1.0		
Herb Stratum				Prevalence Index worksheet:	
1. Carex utriculata	40.0	<input checked="" type="checkbox"/>	OBL	Total % Cover of:	Multiply by:
2. Comarum palustre	25.0	<input checked="" type="checkbox"/>	OBL	OBL Species 65.1	× 1 = 65.1
3. Calamagrostis canadensis	10.0		FAC	FACW Species 5.1	× 2 = 10.2
4. Galium trifidum	0.1		FACW	FAC Species 10.0	× 3 = 30.0
5. Equisetum fluviatile	0.1		OBL	FACU Species 0.0	× 4 = 0.0
Total Cover:	75.2			UPL Species 0.0	× 5 = 0.0
50% of total cover: 37.6			20% of total cover: 15.0	Column Totals: 80.2	(A) 105.3 (B)
				Prevalence Index = B/A = 1.313	
				Hydrophytic Vegetation Indicators:	
				<input checked="" type="checkbox"/> Dominance Test is > 50%	
				<input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0	
				Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet)	
				Problematic Hydrophytic Vegetation ¹ (Explain)	
				¹ Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
				Plot size (radius, or length × width) 2x10m	
				% Cover of Wetland Bryophytes (Where applicable)	
				% Bare Ground 0.0	
				Total Cover of Bryophytes 10.0	
				Hydrophytic Vegetation Present? Yes ,f No	
Remarks: Calamagrostis canadensis pedestals are surrounded by standing water with Carex utriculata and Comarum palustre.					

SOIL
Sampling Point: aw-18

Depth (inches)	Matrix Color (moist) %	Redox Features Color (moist) % Type ¹ Loc ²	Mod	Remarks
Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent			Location: PL=Pore Lining, RC=Root Channel,	
Hydric Soil Indicators:		Indicators for Problematic Hydric Soils³:		
Histosol or Histel (A1)		Alaska Color Change (TA4) ⁴		Alaska Gleyed Without Hue 5Y or Redder
Histic Epipedon (A2)		Alaska Alpine Swales (TA5)		Underlying Layer
.1	Hydrogen Sulfide (A4)	Alaska Redox With 2.5Y Hue		Other (Explain in Remarks)
Thick Dark Surface (A12)		one primary indicator of wetland hydrology, must be present unless disturbed or problematic.		
Alaska Gleyed (A13)				
Alaska Redox (A14)				
Alaska Gleyed Pores (A15)				
Restrictive Layer (if present): Type: None Depth (inches):		Hydric Soil Present? Yes ✓		
Remarks: H2S detected when probing with shovel (hydric soil indicator A4)				

HYDROLOGY

Wetland Hydrology Indicators:		Secondary Indicators (2 or more required)	
Primary Indicators (any one is sufficient)			
.1 Surface Water (A1)	Inundation Visible on Aerials (B7)	Water Stained Leaves (B9)	
.1 High Water Table (A2)	Sparsely Vegetated Grass	Drainage Patterns (B10)	
.1 Saturation (A3)	Marl Deposits (B15)	Surface (B8)	Oxidized Rhizospheres along Living Roots
Water Marks (B1)	.1 Hydrogen Sulfide Odor (C1)	Presence of Reduced Iron (C4)	
Sediment Deposits (B2)	Dry-Season Water Table (C2)	Salt Deposits (C5)	
Drift Deposits (B3)	Other (Explain in Remarks)	Stunted or Stressed Plants (D1)	
Algal Mat or Crust (B4)		.1	Geomorphic Position (D2)
Iron Deposits (B5)			Shallow Aquitard (D3)
Surface Soil Cracks (B6)			Microtopographic Relief (D4)
		.1	FAC-neutral Test (D5)
Field Observations: Surface Water Present? Yes .1 No Depth (inches): 3 Water Table Present? Yes .1 No Depth (inches): 0 Saturation Present? (includes capillary fringe) Yes .1 No Depth (inches): 0		Wetland Hydrology Present? Yes ✓ No	
Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:			
Remarks: Calamagrostis canadensis pedestals in standing water. Primary hydrology indicator C1 detected (H2S odor) when probing with shovel. D2--Kuskokwim River floodplain			

Sampling Point: aw-18
NWI classification: PEM1F



Hydric Soil Indicators: Hydrogen Sulfide (A4)

Wetland Hydrology Indicators: Saturation (A3), FAC-Neutral Test (D5), Hydrogen Sulfide Odor (C1), Surface Water (A1), High Water Table (A2), Geomorphic Position (D2)

NO LANDSCAPE PHOTO TAKEN

WETLAND DETERMINATION DATA FORM - ALASKA REGION

Project/Site: Akiak Wetland Delineation Borough/City: Bethel Census Area Sampling Date: 2021-08-17
 Applicant/Owner: Solstice Sampling Point: aw-19
 Investigator(s): RWM, SLI Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
 Local relief (concave, convex, none): concave Slope: 0.0 % / 0.0 ° Elevation: 61
 Subregion: Alaska Lat.: 60.9101 Long.: -161.2482 Datum: WGS84
 Soil Map Unit Name: _____ NWI classification: PSS1E

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No _____ (If no, explain in Remarks)
 Are Vegetation____, Soil____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ 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 <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland?	Yes ,f	No
Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____			
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____			

Remarks: This wetland extends up a swale. It is surrounded by alder-willow uplands to the North and South.

VEGETATION - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status	
	Total Cover:	0.0			
	50% of total cover:	0.0	20% of total cover:	0.0	
	Sapling/Shrub Stratum				
1.	Salix arbusculoides	15.0	✓	FACW	
2.	Alnus viridis	7.0	✓	FAC	
3.	Salix richardsonii	5.0		FACW	
	Total Cover:	27.0			
	50% of total cover:	13.5	20% of total cover:	5.4	
	Herb Stratum				
1.	Comarum palustre	35.0	✓	OBL	
2.	Calamagrostis canadensis	30.0	✓	FAC	
3.	Carex utriculata	10.0		OBL	
4.	Carex aquatilis	2.0		OBL	
5.	Equisetum fluviatile	2.0		OBL	
6.	Poa pratensis	1.0		FACU	
7.	Sium suave	0.1		OBL	
8.	Polemonium acutiflorum	0.1		FAC	
9.	Glyceria grandis	0.1		OBL	
	Total Cover:	80.3			
	50% of total cover:	40.2	20% of total cover:	16.1	

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, _____

Prevalence Index worksheet:
 Total % Cover of: Multiply by:
 OBL Species 49.2 × 1 = 49.2
 FACW Species 20.0 × 2 = 40.0
 FAC Species 37.1 × 3 = 111.3
 FACU Species 1.0 × 4 = 4.0
 UPL Species 0.0 × 5 = 0.0
 Column Totals: 107.3 (A) 204.5 (B)
 Prevalence Index= B/A = 1.906

Hydrophytic Vegetation Indicators:
 ✓ Dominance Test is > 50%
 ✓ Prevalence Index is ≤ 3.0

Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
 Problematic Hydrophytic Vegetation¹ (Explain)
 Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length × width) 2x10m
 % Cover of Wetland Bryophytes (Where applicable)
 % Bare Ground 0.0
 Total Cover of Bryophytes 0.0

Hydrophytic Vegetation Present? Yes ,f No

Remarks: _____

SOIL
Sampling Point: aw-19

Depth (inches)	Matrix		Redox Features			Mod	Remarks
	Color(moist) %	Color (moist) %	Type ¹	Loc ²	Texture		
0-2		/	A		peat		
2-4	10yr 3/2	/	A		mucky peat		
4-10	5y 2.5/2 90	7.5yr 3/4 10	C	PL	silt loam	Positive alpha alpha	
10-17	n 90	10yr 4/6 10	C	PL	silt loam	Alaska redox, and Alaska gleyed without underlying redder layer	
Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent					Location: PL=Pore Lining, RC=Root Channel, M=Matrix		
Hydric Soil Indicators:			Indicators for Problematic Hydric Soils³:				
Histosol or Histel (A1)			Alaska Color Change (TA4) ⁴			.1 Alaska Gleyed Without Hue 5Y or Redder	
Histic Epipedon (A2)			Alaska Alpine Swales (TA5)			Underlying Layer	
Hydrogen Sulfide (A4)			Alaska Redox With 2.5Y Hue			.1 Other (Explain in Remarks)	
Thick Dark Surface (A12)							
Alaska Gleyed (A13)			³ One indicator or hydrophytic vegetation,			one primary indicator of wetland hydrology, must	
.1 Alaska Redox (A14)			and an appropriate landscape position			be present unless disturbed or problematic.	
Alaska Gleyed Pores (A15)			⁴ Give details of color change in Remarks.				
Restrictive Layer (if present):							
Type: None						Hydric Soil Present? Yes ✓	
Depth (inches):							
Remarks: other--A positive reaction to alpha alpha dipyridol at 9 inches indicating the presence of reduced iron.							

HYDROLOGY

Wetland Hydrology Indicators:			Secondary Indicators (2 or more required)	
Primary Indicators (any one is sufficient)			Water Stained Leaves (B9)	
Surface Water (A1)	Inundation Visible on Aerial Imagery (B7)	Drainage Patterns (B10)		
High Water Table (A2)	Sparsely Vegetated Concave Surface (B8)	Oxidized Rhizospheres along Living Roots		
.1 Saturation (A3)	Marl Deposits (B15)	.1 Presence of Reduced Iron (C4)		
Water Marks (B1)	Hydrogen Sulfide Odor (C1)	Salt Deposits (C5)		
Sediment Deposits (B2)	Dry-Season Water Table (C2)	Stunted or Stressed Plants (D1)		
Drift Deposits (B3)	Other (Explain in Remarks)	.1 Geomorphic Position (D2)		
Algal Mat or Crust (B4)		Shallow Aquitard (D3)		
Iron Deposits (B5)		Microtopographic Relief(D4)		
Surface Soil Cracks (B6)		.1 FAC-neutral Test (D5)		
Field Observations:				
Surface Water Present? Yes	No	.1	Depth (inches):	
Water Table Present? Yes	.1	No	Depth (inches): 16	
Saturation Present?				
(includes capillary fringe) Yes	.1	No	Depth (inches): 4	
			Wetland Hydrology Present? Yes ✓	
Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:				
Remarks: Scattered pockets of shallow surface water. C4--positive reaction to alpha alpha dipyridol. D2--Kuskokwim River floodplain				

Sampling Point: aw-19
NWI classification: PSS1E



Hydric Soil Indicators: Alaska Redox (A14), Other (explain in remarks), Alaska Gleyed without Hue 5Y or Redder Underlying Layer

Wetland Hydrology Indicators: Geomorphic Position (D2), Presence of Reduced Iron (C4), FAC-Neutral Test (D5), Saturation (A3)



WETLAND DETERMINATION DATA FORM - ALASKA REGION

Project/Site: Akiak Wetland Delineation Borough/City: Bethel Census Area Sampling Date: 2021-08-17
 Applicant/Owner: Solstice Sampling Point: aw-21
 Investigator(s): SLI, RWM Landform (hillside, terrace, hummocks, etc.): Nonpatterned
 Local relief (concave, convex, none): none Slope: 0.0 % / 0.0 ° Elevation: 65
 Subregion: Alaska Lat.: 60.9101 Long.: -161.2430 Datum: WGS84
 Soil Map Unit Name: _____ NWI classification: U
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No _____ (If no, explain in Remarks)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ 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 <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes No <input checked="" type="checkbox"/>
Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/>	
Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	
Remarks: The shallow swale from aw-20 was followed to this plot. It appears to be at a slightly higher elevation. See the marked map for the boundary location, where tall shrub canopy cover increases.	

VEGETATION - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:
	Total Cover:	0.0			Number of Dominant Species That are OBL, FACW, or FAC: 4 (A)
	50% of total cover:	0.0	20% of total cover:	0.0	Total Number of Dominant Species Across all Strata: 4 (B)
1.	<u>Salix arbusculoides</u>	40.0	<input checked="" type="checkbox"/>	FACW	Prevalence Index worksheet: Total % Cover of: Multiply by: OBL Species 20.0 × 1 = 20.0 FACW Species 44.1 × 2 = 88.2 FAC Species 86.0 × 3 = 258.0 FACU Species 6.0 × 4 = 24.0 UPL Species 0.0 × 5 = 0.0 Column Totals: 156.1 (A) 390.2 (B) Prevalence Index = B/A = 2.500
2.	<u>Salix alaxensis</u>	20.0	<input checked="" type="checkbox"/>	FAC	
3.	<u>Alnus viridis</u>	7.0		FAC	
4.	<u>Salix richardsonii</u>	3.0		FACW	
5.	<u>Viburnum edule</u>	3.0		FACU	
	Total Cover:	73.0			
	50% of total cover:	36.5	20% of total cover:	14.6	
	Herb Stratum				
1.	<u>Calamagrostis canadensis</u>	50.0	<input checked="" type="checkbox"/>	FAC	Hydrophytic Vegetation Indicators: <input checked="" type="checkbox"/> Dominance Test is > 50% <input checked="" type="checkbox"/> Prevalence Index is ≤ 3.0 Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) Problematic Hydrophytic Vegetation ¹ (Explain) Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic. Plot size (radius, or length × width) 10m radius % Cover of Wetland Bryophytes (Where applicable) % Bare Ground 0.0 Total Cover of Bryophytes 0.0 Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No
2.	<u>Comarum palustre</u>	20.0	<input checked="" type="checkbox"/>	OBL	
3.	<u>Rubus arcticus</u>	7.0		FAC	
4.	<u>Polemonium acutiflorum</u>	2.0		FAC	
5.	<u>Angelica genuflexa</u>	1.0		FACW	
6.	<u>Thalictrum sparsiflorum</u>	1.0		FACU	
7.	<u>Trientalis europaea</u>	1.0		FACU	
8.	<u>Urtica dioica</u>	1.0		FACU	
9.	<u>Impatiens noli-tangere</u>	0.1		FACW	
	Total Cover:	83.1			
	50% of total cover:	41.6	20% of total cover:	16.6	
Remarks:					

SOIL
Sampling Point: aw-21

Depth (inches)	Matrix			Redox Features					Mod	Remarks
	Color (moist)	% Color	(moist) %	Type ¹	Loc ²	Texture				
1-3	/	/		A		fibric				
3-16	2.5y	3/1	60	10yr3/3	40	C	PL	silt loam		
16-19	2.5y	3/2	70	10yr3/3	30	C	PL	silt loam		
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent ²Location: PL=Pore Lining, RC=Root Channel,										
Hydric Soil Indicators:						Indicators for Problematic Hydric Soils³:				
Histosol or Histel (A1)						Alaska Color Change (TA4) ⁴				
Histic Epipedon (A2)						Alaska Alpine Swales (TA5)				
Hydrogen Sulfide (A4)						Alaska Redox With 2.5Y Hue				
Thick Dark Surface (A12)						Other (Explain in Remarks)				
Alaska Gleyed (A13)						One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic. Give details of color change in Remarks.				
Alaska Redox (A14)										
Alaska Gleyed Pores (A15)										
Restrictive Layer (if present): Type: None Depth (inches):										
										Hydric Soil Present? Yes No ✓
Remarks: No hydric soil indicators are met.										

HYDROLOGY

Wetland Hydrology Indicators:				Secondary Indicators (2 or more required)			
Primary Indicators (any one is sufficient)				Water Stained Leaves (B9)			
Surface Water (A1)	Inundation Visible on Aerial Imagery (B7)	Drainage Patterns (B10)					
High Water Table (A2)	Sparsely Vegetated Concave Surface (B8)	Oxidized Rhizospheres along Living Roots (C3)					
Saturation (A3)	Marl Deposits (B15)	Presence of Reduced Iron (C4)					
Water Marks (B1)	Hydrogen Sulfide Odor (C1)	Salt Deposits (C5)					
Sediment Deposits (B2)	Dry-Season Water Table (C2)	Stunted or Stressed Plants (D1)					
Drift Deposits (B3)	Other (Explain in Remarks)	.1 Geomorphic Position					
Algal Mat or Crust (B4)		Shallow Aquitard (D3)					
Iron Deposits (B5)		Microtopographic Relief (D4)					
Surface Soil Cracks (B6)		.1 FAC-neutral Test (D5)					
Field Observations:							
Surface Water Present?	Yes	No	.1	Depth (inches):	0		
Water Table Present?	Yes	No	.1	Depth (inches):			
Saturation Present?							
(includes capillary fringe)	Yes	No	.1	Depth			
				Wetland Hydrology Present? Yes ✓ No			
Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:							
Remarks: D2--Kuskokwim River floodplain							

Sampling Point: aw-21

NWI classification: U



Hydric Soil Indicators: None

Wetland Hydrology Indicators: Geomorphic Position (D2), FAC-Neutral Test (D5)



WETLAND DETERMINATION DATA FORM - ALASKA REGION

Project/Site: Akiak Wetland Delineation Borough/City: Bethel Census Area Sampling Date: 2021-08-17
 Applicant/Owner: Solstice Sampling Point: aw-22
 Investigator(s): SLI, RWM Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
 Local relief (concave, convex, none): none Slope: 0.0 % / 0.0 ° Elevation: 64
 Subregion: Alaska Lat.: 60.9085 Long.: -161.2425 Datum: WGS84
 Soil Map Unit Name: _____ NWI classification: U
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No _____ (If no, explain in Remarks)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ 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 <input checked="" type="checkbox"/>	No	Is the Sampled Area within a Wetland?	Yes	No	<input checked="" type="checkbox"/>
Hydric Soil Present?	Yes	No <input checked="" type="checkbox"/>				
Wetland Hydrology Present?	Yes	No <input checked="" type="checkbox"/>				
Remarks:						

VEGETATION - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status	
	Total Cover:	0.0			
	50% of total cover:	0.0	20% of total cover:	0.0	
	Sapling/Shrub Stratum				
1.	<i>Alnus viridis</i>	35.0	<input checked="" type="checkbox"/>	FAC	
2.	<i>Alnus viridis</i>	20.0	<input checked="" type="checkbox"/>	FAC	
3.	<i>Salix alaxensis</i>	10.0		FAC	
4.	<i>Viburnum edule</i>	7.0		FACU	
5.	<i>Salix richardsonii</i>	5.0		FACW	
6.	<i>Rosa acicularis</i>	5.0		FACU	
7.	<i>Ribes triste</i>	1.0		FAC	
	Total Cover:	83.0			
	50% of total cover:	41.5	20% of total cover:	16.6	
	Herb Stratum				
1.	<i>Calamagrostis canadensis</i>	30.0	<input checked="" type="checkbox"/>	FAC	
2.	<i>Rubus arcticus</i>	15.0	<input checked="" type="checkbox"/>	FAC	
3.	<i>Equisetum arvense</i>	10.0		FAC	
4.	<i>Mertensia paniculata</i>	3.0		FACU	
5.	<i>Dryopteris expansa</i>	3.0		FACU	
6.	<i>Thalictrum sparsiflorum</i>	2.0		FACU	
7.	<i>Galium boreale</i>	1.0		FACU	
8.	<i>Trientalis europaea</i>	1.0		FACU	
9.	<i>Viola</i> sp.	1.0			
10.	<i>Aconitum delphiniifolium</i>	0.1		FAC	
11.	<i>Artemisia tilesii</i>	0.1		FACU	
12.	<i>Chamaenerion angustifolium</i>	0.1		FACU	
13.	<i>Polemonium acutiflorum</i>	0.1		FAC	
	Total Cover:	66.4			
	50% of total cover:	33.2	20% of total cover:	13.3	
					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,
					Prevalence Index worksheet: Total % Cover of: Multiply by: OBL Species 0.0 × 1 = 0.0 FACW Species 5.0 × 2 = 10.0 FAC Species 121.2 × 3 = 363.6 FACU Species 22.2 × 4 = 88.8 UPL Species 0.0 × 5 = 0.0 Column Totals: 148.4 (A) 462.4 (B) Prevalence Index = B/A = 3.116
					Hydrophytic Vegetation Indicators: <input checked="" type="checkbox"/> Dominance Test is > 50% Prevalence Index is ≤ 3.0 Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) Problematic Hydrophytic Vegetation ¹ (Explain)
					Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.
					Plot size (radius, or length × width) 10m radius
					% Cover of Wetland Bryophytes (Where applicable)
					% Bare Ground 0.0
					Total Cover of Bryophytes 0.0
					Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No
Remarks:					

SOIL
Sampling Point: aw-22

Depth (inches)	Matrix		Redox Features			Mod	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ² Texture	
0-4	/		/		A	fibric	
4-8	7.5yr	2.5/2	/		A	silt loam	
8-13	10yr	3/2	/		A		
13-17	Variegated	/	/		A	loamy fine sand	
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent ² Location: PL=Pore Lining, RC=Root Channel, M=Matrix							
Hydric Soil Indicators:				Indicators for Problematic Hydric Soils³:			
Histosol or Histel (A1)				Alaska Color Change (TA4) ⁴ Alaska Gleyed Without Hue 5Y or Redder			
Histic Epipedon (A2)				Alaska Alpine Swales (TA5) Underlying Layer			
Hydrogen Sulfide (A4)				Alaska Redox With 2.5Y Hue Other (Explain in Remarks)			
Thick Dark Surface (A12)							
Alaska Gleyed (A13)				One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology,			
Alaska Redox (A14)				and an appropriate landscape position must be present unless disturbed or problematic.			
Alaska Gleyed Pores (A15)				Give details of color change in Remarks.			
Restrictive Layer (if present):							
Type: None						Hydric Soil Present? Yes No ✓	
Depth (inches):							
Remarks: no hydric soil indicators							

HYDROLOGY

Wetland Hydrology Indicators:				Secondary Indicators (2 or more required)			
Primary Indicators (any one is sufficient)				Water Stained Leaves (B9)			
Surface Water (A1)				Inundation Visible on Aerial Imagery (B7)	Drainage Patterns (B10)		
High Water Table (A2)				Sparsely Vegetated Concave Surface (B8)	Oxidized Rhizospheres along Living	Roots (C3)	
Saturation (A3)				Marl Deposits (B15)	Presence of Reduced Iron (C4)		
Water Marks (B1)				Hydrogen Sulfide Odor (C1)	Salt Deposits (C5)		
Sediment Deposits (B2)				Dry-Season Water Table (C2)	Stunted or Stressed Plants (D1)		
Drift Deposits (B3)				Other (Explain in Remarks)	Geomorphic Position (D2)		
Algal Mat or Crust (B4)					Shallow Aquitard (D3)		
Iron Deposits (B5)					Microtopographic Relief (D4)		
Surface Soil Cracks (B6)					FAC-neutral Test (D5)		
Field Observations:							
Surface Water Present?	Yes	No	.1	Depth (inches):	0		
Water Table Present?	Yes	No	.1	Depth (inches):			
Saturation Present?							
(includes capillary fringe)	Yes	No	.1	Depth			
				Wetland Hydrology Present? Yes No ✓			
Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:							
Remarks: D2--Kuskokwim River floodplain							

Sampling Point: aw-22

NWI classification: U



Hydric Soil Indicators: None

Wetland Hydrology Indicators: Geomorphic Position (D2)



WETLAND DETERMINATION DATA FORM - ALASKA REGION

Project/Site: Akiak Wetland Delineation Borough/City: Bethel Census Area Sampling Date: 2021-08-17
 Applicant/Owner: Solstice Sampling Point: aw-24
 Investigator(s): RWM, SLI Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
 Local relief (concave, convex, none): none Slope: 0.0 % / 0.0 ° Elevation: 69
 Subregion: Alaska Lat.: 60.9088 Long.: -161.2360 Datum: WGS84
 Soil Map Unit Name: _____ NWI classification: U
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No _____ (If no, explain in Remarks)
 Are Vegetation____, Soil____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ 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 <input checked="" type="checkbox"/>	No	Is the Sampled Area within a Wetland?	Yes	No	<input checked="" type="checkbox"/>
Hydric Soil Present?	Yes	No <input checked="" type="checkbox"/>				
Wetland Hydrology Present?	Yes _____	No <input checked="" type="checkbox"/>				
Remarks:						

VEGETATION - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status	
	Total Cover:	0.0			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,
	50% of total cover:	0.0	20% of total cover:	0.0	
	Sapling/Shrub Stratum				
1.	Alnus viridis	60.0	<input checked="" type="checkbox"/>	FAC	Prevalence Index worksheet: Total % Cover of: Multiply by: OBL Species 0.0 × 1 = 0.0 FACW Species 0.0 × 2 = 0.0 FAC Species 127.2 × 3 = 381.6 FACU Species 27.4 × 4 = 109.6 UPL Species 0.0 × 5 = 0.0 Column Totals: 154.6 (A) 491.2 (B) Prevalence Index = B/A = 3.177
2.	Alnus viridis	25.0	<input checked="" type="checkbox"/>	FAC	
3.	Viburnum edule	15.0		FACU	
4.	Rosa acicularis	10.0		FACU	
	Total Cover:	110.0			Hydrophytic Vegetation Indicators: <input checked="" type="checkbox"/> Dominance Test is > 50% Prevalence Index is ≤ 3.0 Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic. Plot size (radius, or length × width) 10m radius % Cover of Wetland Bryophytes (Where applicable) % Bare Ground 0.0 Total Cover of Bryophytes 30.0
	50% of total cover:	55.0	20% of total cover:	22.0	
	Herb Stratum				
1.	Calamagrostis canadensis	35.0	<input checked="" type="checkbox"/>	FAC	Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No
2.	Rubus arcticus	7.0		FAC	
3.	Gymnocarpium dryopteris	1.0		FACU	
4.	Mertensia paniculata	1.0		FACU	
5.	Trientalis europaea	0.1		FACU	
6.	Polemonium acutiflorum	0.1		FAC	
7.	Thalictrum sparsiflorum	0.1		FACU	
8.	Aconitum delphiniifolium	0.1		FAC	
9.	Chamaenerion angustifolium	0.1		FACU	
10.	Galium boreale	0.1		FACU	
	Total Cover:	44.6			
	50% of total cover:	22.3	20% of total cover:	8.9	

Remarks:

SOIL

Sampling Point: aw-24

Depth (inches)	Matrix Color (moist)	Redox Features % Color (moist) % Type ¹ Loc ² Texture	Mod	Remarks
0-1	/	/ A	fibric	
1-4	/	/ A	hemic	
4-14	10yr 3/3 100	/ A	silt loam	
14-17	Variegated / 100	/ A	loamy fine sand	
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent ² Location: PL=Pore Lining, RC=Root Channel, M=Matrix				
Hydric Soil Indicators:		Indicators for Problematic Hydric Soils³:		
Histosol or Histel (A1)		Alaska Color Change (TA4) ⁴ Alaska Gleyed Without Hue 5Y or Redder		
Histic Epipedon (A2)		Alaska Alpine Swales (TA5) Underlying Layer		
Hydrogen Sulfide (A4)		Alaska Redox With 2.5Y Hue Other (Explain in Remarks)		
Thick Dark Surface (A12)				
Alaska Gleyed (A13)		³ One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic. ⁴ Give details of color change in Remarks.		
Alaska Redox (A14)				
Alaska Gleyed Pores (A15)				
Restrictive Layer (if present):				
Type: None				Hydric Soil Present? Yes No ✓
Depth (inches):				
Remarks: No hydric soil indicators				

HYDROLOGY

Wetland Hydrology Indicators:		Secondary Indicators (2 or more required)	
Primary Indicators (any one is sufficient)		Water Stained Leaves (B9)	
Surface Water (A1)	Inundation Visible on Aerial Imagery (B7)	Drainage Patterns (B10)	Roots (C3)
High Water Table (A2)	Sparsely Vegetated Concave Surface (B8)	Oxidized Rhizospheres along Living	
Saturation (A3)	Marl Deposits (B15)	Presence of Reduced Iron (C4)	
Water Marks (B1)	Hydrogen Sulfide Odor (C1)	Salt Deposits (C5)	
Sediment Deposits (B2)	Dry-Season Water Table (C2)	Stunted or Stressed Plants (D1)	
Drift Deposits (B3)	Other (Explain in Remarks)	1. Geomorphic Position (D2)	
Algal Mat or Crust (B4)		Shallow Aquitard (D3)	
Iron Deposits (B5)		Microtopographic Relief (D4)	
Surface Soil Cracks (B6)		FAC-neutral Test (D5)	
Field Observations:			
Surface Water Present? Yes No .1	Depth (inches): 0	Wetland Hydrology Present? Yes No ✓	
Water Table Present? Yes No .1	Depth (inches):		
Saturation Present?			
(includes capillary fringe) Yes No .1	Depth		
Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:			
Remarks: D2--Kuskokwim River floodplain			

Sampling Point: aw-24

NWI classification: U



Hydric Soil Indicators: None

Wetland Hydrology Indicators: Geomorphic Position (D2)



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Appendix B. Map Verification Plots

Sampling Point: aw-01

Site: Akiak Wetland Delineation

Date: 2021-08-16

NWI classification: U

Viereck code:

Species: *Alnus viridis*, *Salix arbusculoides*, *Salix alaxensis*, *Calamagrostis canadensis*, *Deschampsia caespitosa*

Notes: Upland trail and adjacent clearing along the side of sewage lagoon.



Sampling Point: aw-02

Site: Akiak Wetland Delineation

Date: 2021-08-16

NWI classification: PEM1E

Viereck code:

Species: *Calamagrostis canadensis*, *Glyceria* sp., *Beckmannia syzigachne*

Notes: Wet area along trail, with some leaking from sewage lagoon. Bright purple algae observed in standing water, and a strong odor was present. Wet area is fairly localized, 15-20ft in diameter, before transitioning to *Calamagrostis canadensis* with no obvious surface water.



Sampling Point: aw-03

Site: Akiak Wetland Delineation

Date: 2021-08-16

NWI classification: U

Viereck code:

Species: *Equisetum arvense*, *Calamagrostis canadensis*,
Deschampsia caespitosa, *Arctagrostis latifolia*

Notes: Agraminoid meadow with a relatively dark photo-signature. Probing with a shovel shows moist mineral soils with no redox features. This site is too near to the leaking sewage lagoon to safely characterize soils.



Sampling Point: aw-07

Site: Akiak Wetland Delineation

Date: 2021-08-16

NWI classification: U

Viereck code: Closed Tall Alder-Willow

Species: *Salixarbusculoides*, *Salixbebbiana*, *Alnus viridis*

Notes: Border of small depression characterized by aw-06. Uplands are about 8-10ft higher than wetlands. There are no channelized connections to other wetlands/waters. Based on topographic position, this would flood from the Kuskokwim river through overbank flooding.



Sampling Point: aw-10

Site: Akiak Wetland Delineation

Date: 2021-08-16

NWI classification: PEM1B

Viereck code: Subarctic Lowland Sedge Wet Meadow

Species: *Carex utriculata*

Notes: This wetland extends to a small trail visible in imagery. The trail is several feet higher in elevation than the wetland. The graminoid photosignature on the other side of trail is upland. It loses hydric soils and wetland hydrology.



Sampling Point: aw-13

Site: Akiak Wetland Delineation

Date: 2021-08-17

NWI classification: U

Viereck code: Closed Tall Alder-Willow

Species: *Populus balsamifera*, *Salix bebbiana*, *Ribes triste*, *Alnus viridis*, *Calamagrostis canadensis*

Notes: This plot characterizes part of the study area near the landfill as characterized by aw-12 and aw-13. *Populus balsamifera* cover varies, but has a consistent tall alder-willow canopy with well drained alluvial soils. There are no relict channels or depressions in this portion of the study area.



Sampling Point: aw-20

Site: Akiak Wetland Delineation

Date: 2021-08-17

NWI classification: PSS1B

Viereck code: Open Tall Alder-Willow

Species: *Salix bebbiana*, *Salix arbusculoides*, *Comarum palustre*, *Calamagrostis canadensis*

Notes: Probing shows mineral soils with a gleyed matrix and high value/chroma redoximorphic feature concentrations as pore linings, as at aw-19.



Sampling Point: aw-23

Site: Akiak Wetland Delineation

Date: 2021-08-17

NWI classification: U

Viereck code:

Species: *Alnus viridis*, *Rosa acicularis*, *Populus balsamifera*, *Calamagrostis canadensis*

Notes: A wide trail cleared through uplands, It is visible in google earth imagery. No fill is placed, only cleared. All cleared trails are level and dry uplands without depressions or inactive riverine channels.



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Appendix C. Characteristics of wetlands and waters mapped in the Akiak Infrastructure Project
wetlands study area, Alaska, 2021

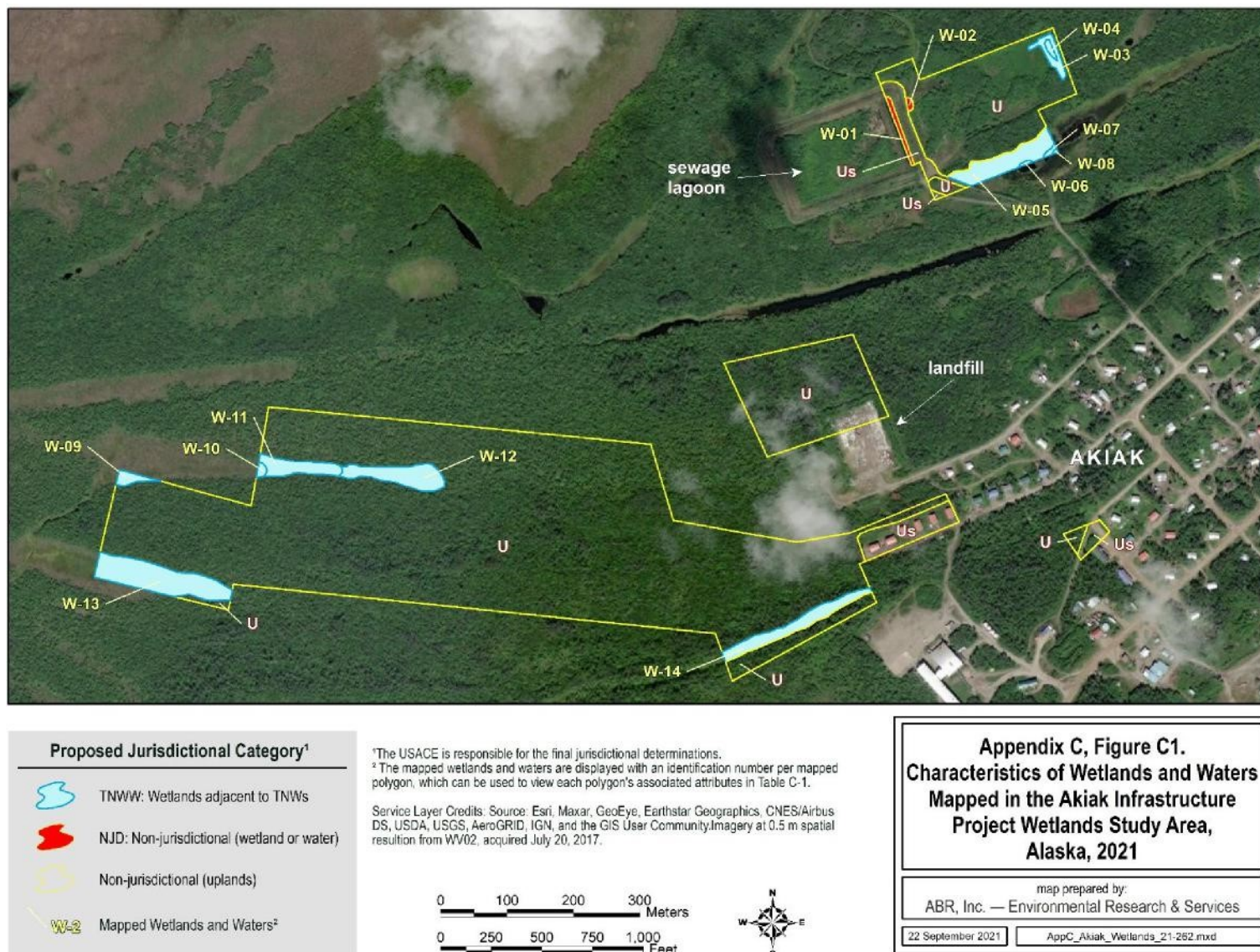


Figure C1. Characteristics of wetlands and waters mapped in the Lakefront Drive wetlands study area, Alaska, 2021

Table C1. Characteristics of wetlands and waters mapped in the Akiak Infrastructure Project wetlands study area, Alaska, 2021.

Wetland Number	NWI Code ^a	HGM Class ^b	Vegetation Class ^c	Proposed Jurisdictional Category	Area (acres)	Longitude (NAD83)	Latitude (NAD83)
W-01	PUBH	Depressional	Water	Non-jurisdictional	0.1	-161.2310	60.9146
W-02	PEM1E	Depressional	Subarctic Lowland Grass Wet Meadow	Non-jurisdictional	<0.1	-161.2307	60.9150
W-03	PEM1E	Depressional	Subarctic Lowland Sedge Wet Meadow	Wetlands adjacent to TNWs	0.3	-161.2268	60.9156
W-04	PUBH	Depressional	Water	Wetlands adjacent to TNWs	0.1	-161.2268	60.9157
W-05	PEM1E	Depressional	Subarctic Lowland Sedge Wet Meadow	Wetlands adjacent to TNWs	1.1	-161.2282	60.9142
W-06	PUBH	Depressional	Water	Wetlands adjacent to TNWs	<0.1	-161.2275	60.9142
W-07	PUBH	Depressional	Water	Wetlands adjacent to TNWs	<0.1	-161.2268	60.9143
W-08	PEM1E	Depressional	Subarctic Lowland Sedge Wet Meadow	Wetlands adjacent to TNWs	<0.1	-161.2267	60.9143
W-09	PEM1F	Depressional	Subarctic Lowland Grass Wet Meadow	Wetlands adjacent to TNWs	0.2	-161.2524	60.9101
W-10	PEM1F	Depressional	Subarctic Lowland Grass Wet Meadow	Wetlands adjacent to TNWs	0.1	-161.2489	60.9102
W-11	PSS1E	Depressional	Open Low Alder-Willow	Wetlands adjacent to TNWs	0.6	-161.2478	60.9102
W-12	PSS1B	Depressional	Open Tall Alder-Willow	Wetlands adjacent to TNWs	1.0	-161.2451	60.9100
W-13	PEM1F	Depressional	Fresh Sedge Marsh	Wetlands adjacent to TNWs	1.8	-161.2517	60.9087
W-14	PEM1C	Riverine	Subarctic Lowland Grass Wet Meadow	Wetlands adjacent to TNWs	0.9	-161.2341	60.9080

^a National Wetland Inventory (NWI) code derived from FGDC (2013)

^b Hydrogeomorphic (HGM) class derived from Brinson (1993)

^c Vegetation class from Viereck et al. (1992)