Appendix D

Newtok (Mertarvik) Airport Environmental Study (Excerpt)

NEWTOK (MERTARVIK) AIRPORT ENVIRONMENTAL STUDY

CFAPT00307 / AIP 3-02-0487-001-2017

CONCEPT DESIGN NARRATIVE

November 2017

Prepared for:

Alaska Department of
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Central Region
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1. INTRODUCTION

The village of Newtok, located on the north bank of the Ninglick River in western Alaska, has experienced rapid and continuous erosion that threatens its existence. There is no cost-effective way to protect Newtok from the encroaching Ninglick River, so the residents of Newtok have decided to relocate and construct a new village at a site called Mertarvik, 9 miles to the southeast on Nelson Island (Figure 1). A collaborative effort of federal, state, and local agencies and organizations have been working to design and construct the infrastructure needed for the phased relocation of Newtok to Mertarvik.

Construction of an airport at the new village site of Mertarvik is critical, as the area has no roads connecting it to other communities. The residents of Mertarvik will rely heavily on air transportation for travel, movement of supplies, and emergency medical evacuations.

The Alaska Department of Transportation & Public Facilities (DOT&PF) commissioned PDC Engineers (PDC) to provide engineering and environmental services in support of an Environmental Impact Statement (EIS) being prepared by the U.S. Army Corps of Engineers (USACE) for the Denali Commission, with the Federal Aviation Administration (FAA) as a cooperating agency. For this project, PDC supplemented prior study work of potential environmental effects summarized in the *Mertarvik Airport Site Selection Study* (PDC, 2012). This supplemental study considered changes to the apron and road layouts and material waste disposal sites to accommodate community development.

2. DESIGN ANALYSIS

A. Airport Layout

The *Mertarvik Airport Site Selection Study* (PDC, 2012) and ultimate development shown on the *Newtok Airport Layout Plan* (DOT&PF, 2014) provided the basis for the airport facilities under this study. Per DOT&PF's request, revisions to the ultimate layout included relocating the aircraft parking apron and airport access road as shown in bold dashed linetype on Figure 2.

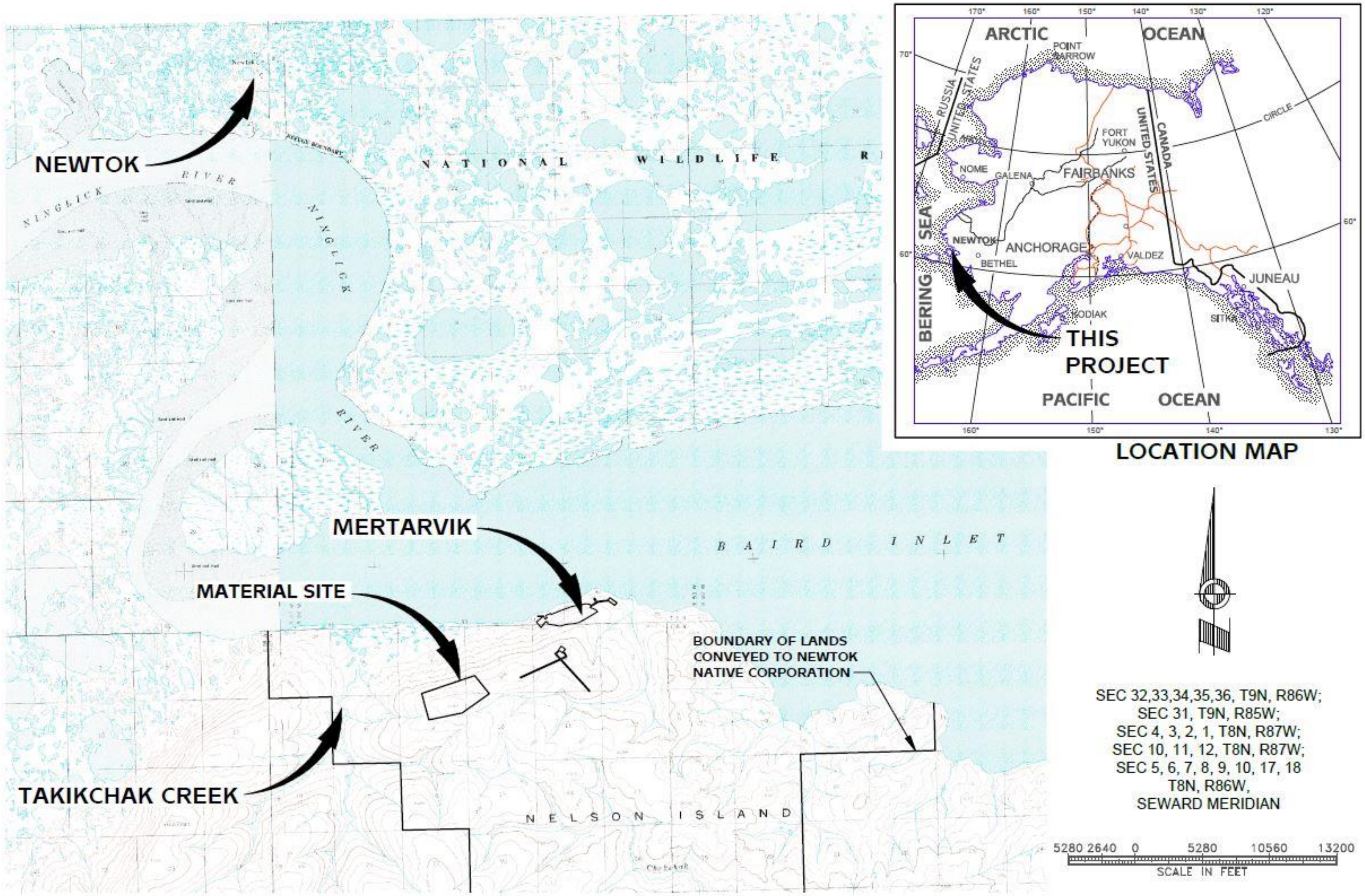

Figure 1. Location and Vicinity Map

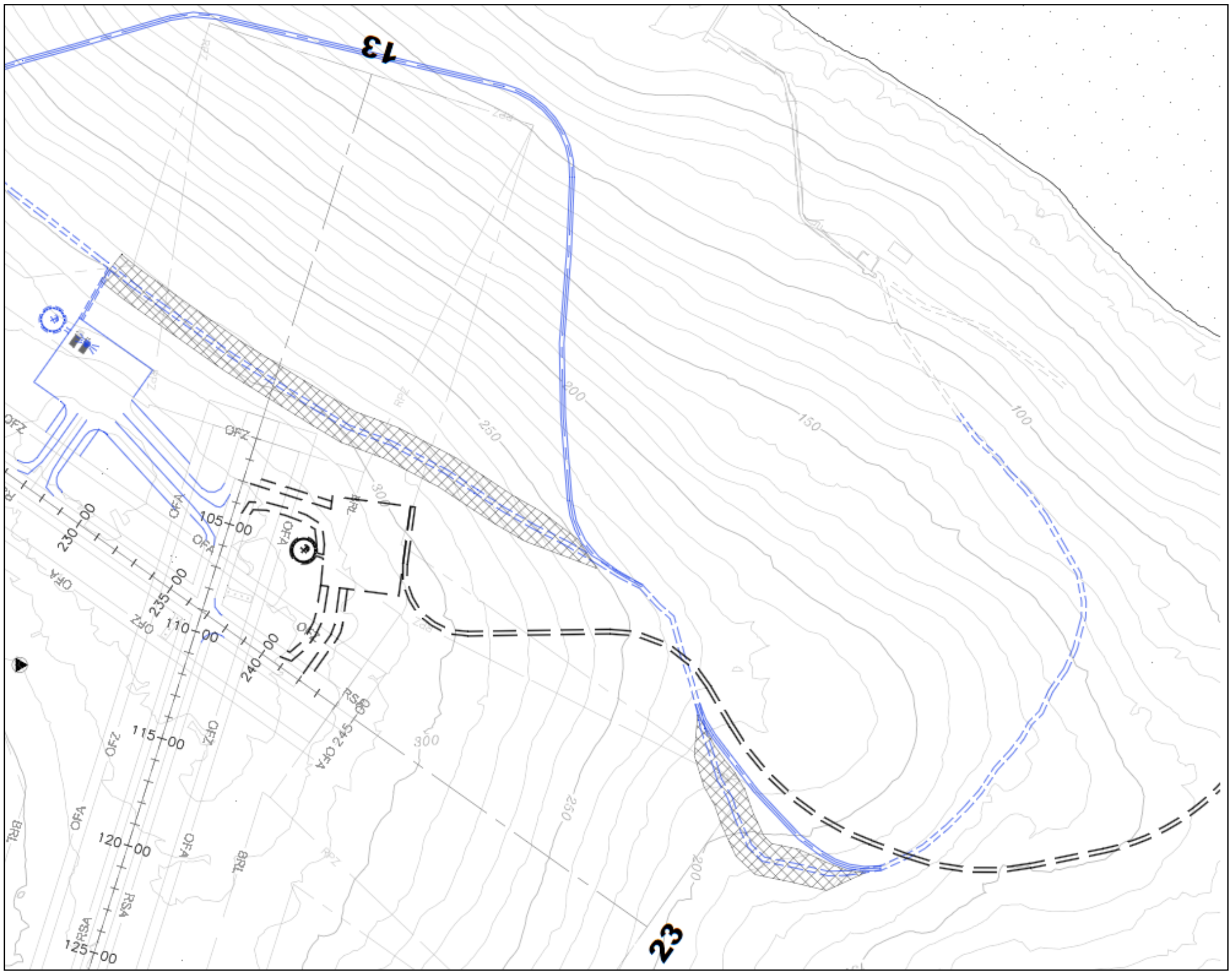

Figure 2. Revisions to ALP Ultimate Layout

B. Design Standards

The airport concept design reflects an Runway Design Code of B-II-4000 and meets the minimum FAA design standards specified in the FAA Advisory Circular (AC) 150/5300-13A, *Airport Design*. Airspace criteria are established in Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace.* The airport access road was designed in accordance with the Alaska Highway Preconstruction Manual and American Association of State Highway and Transportation Officials (AASHTO) references within the manual. Tables 1 and 2 presents design criteria proposed for development of a new airport and access road on Nelson Island.

Table 1. Airport Design Criteria

Airport Feature	Standard
Runway Design Code/ Approach Visibility Minimums	B-II-4000 / greater than ¾ mile
Runway Surface	Aggregate
Dimensions and Offsets	
Runway Length	4,000 feet
Runway Width	75 feet
Runway Safety Area Width and Length	150 feet and 300 feet beyond each end, respectively
Taxiway Width	50 feet[1]
Taxiway Safety Area	118 feet[1]
Apron	350 feet x 400 feet
Apron Offset from Runway Centerline	400 feet
Slopes and Grades	
Longitudinal Grades	
Runway	Maximum 2%
Taxiway	Maximum 2%
Apron	Maximum 2%
Transverse Grades	
Runway/Runway Safety Area	Maximum 2% / 5%
Taxiway/Taxiway Safety Area	Maximum 2% / 5%
Apron	Maximum 2% (when combined with the longitudinal grades, the combined grades not to exceed 2%)

1 Taxiway and taxiway safety area widths were increased to the next higher Aircraft Design Group to accommodate occasional use of larger aircraft, to provide additional room for snow removal, and to provide a thermal barrier to protect frozen ground beneath the taxiway.

Table 2. AASHTO Guidelines for Road Design Criteria

Design Feature	Requirement
Functional Classification	Rural Industrial/Commercial Local Road
Width of Traveled Way	10 feet each lane, providing a 20-foot-wide traveled way
Design Speed	30 miles per hour[1]
Stopping Sight Distance	200 feet
Passing Sight Distance	N/A
Maximum Allowable Grade	14% (5% preferred)
Maximum Allowable Degree of Curvature	20.75 degrees (minimum radius of 275 feet) with a 6% superelevation

1 Based on anticipated road speeds.

C. Soils and Grading

Newtok Island is mainly composed of quaternary and tertiary volcanic rock. The lowlands are poorly draining flat terrain with numerous lakes, marshes, and meandering streams. The highlands are rolling terrain with gentle slopes. The region is underlain by permafrost.

Soils at the airport relocation site are typically silts with high moisture content with some sand and gravels. The thickness of the soil over bedrock was encountered from as little as four feet to more than 31.5 feet. The permafrost conditions across the site are similarly variable.

Geotechnical Assumptions

Through a separate contract with DOT&PF, R&M Consultants performed geotechnical exploration of the airport sites and potential material sites and provided preliminary recommendations for conceptual design of the aircraft embankments. Those recommendations and conversations with DOT&PF Materials resulted in the assumptions presented in Table 3 below.

Table 3. Geotechnical Assumptions

Material	Recommendation
Surfacing Materials	Anticipated to be imported
Embankment Materials	Anticipated to come from Hill 460
Embankment	Minimum 6-foot thick extending 5-6 feet above adjacent ground 6H:1V cut/fill side slopes
Geosynthetic Reinforcement	Under all aircraft embankments, within surface along haul routes during construction
Stripping of Vegetative/ Organic Mat	Sub-excavate to a depth of 5 feet below runways, taxiways, apron, and access road

Potential Material Source

A massive rock outcrop exists on top of the ridge, hereafter designated Hill 460, just south of the proposed village relocation site (Figure 1). This bedrock exposure was the only significant outcrop observed in the immediate vicinity of the proposed village relocation site that appeared capable of providing sufficient quantities of borrow and aggregate materials potentially suitable for construction of the new airport and access road. The bedrock exposure ranged in height from approximately 30 to 100 feet along the northern flank. The depth of overburden may be greater than 10 feet across portions of the hill. Boulders and rubble along the top of the ridge generally appeared be a hard, massive dark gray to black vesicular basalt. Basalt is often formed in layers, called flows, one laid on top of another; these flows may have different composition, structure, and weathering characteristics. Thus, the rock may become softer and more weathered with depth.

The hill northeast of Runway 31 was considered but eliminated as a material source. Preliminary geotechnical data noted bedrock was found at depths greater than 15.5 feet. This depth of overburden material (at least 4.0 feet of organics over 10 to 15.5 feet of silt) would add significant quantity to the waste disposal areas and increase associated environmental (wetland) impacts without providing the quantity of useable material needed for construction.

Overburden Disposal

The overburden soils recovered from the proposed material source designated Hill 460, as well as the foundation soils underlying the vegetative mat at the airport site are assumed to be susceptible to erosion. Future designs will need to consider appropriate erosion-control measures to protect these materials, especially where exposed on embankment side-slopes or in cuts and ditches (e.g. permanent erosion protection matting, rock blanket, etc.).

Sub-excavation and overburden materials will be disposed of on airport property. Disposal embankments should be sloped to drain, protected from erosion, and located below the Part 77 Airspace surfaces. Potential disposal areas for purposes of evaluating impacts are shown on Figure 3. The disposal areas were sized to accommodate the estimated sub-excavation and overburden removal within the airport property boundary without creating obstructions to the FAA Part 77 imaginary surfaces. Waste Disposal Site A (east of Runway 13-31) was sited in the low saddle present between hill peaks, allowing for deep fills. Waste Disposal Site B was selected for the lower lying terrain south of Runway 5-23. The south side of Runway 5-23 appears to offer greater subgrade stability (silty gravels, cobbles, boulders) than the area north which consists of deep silts.

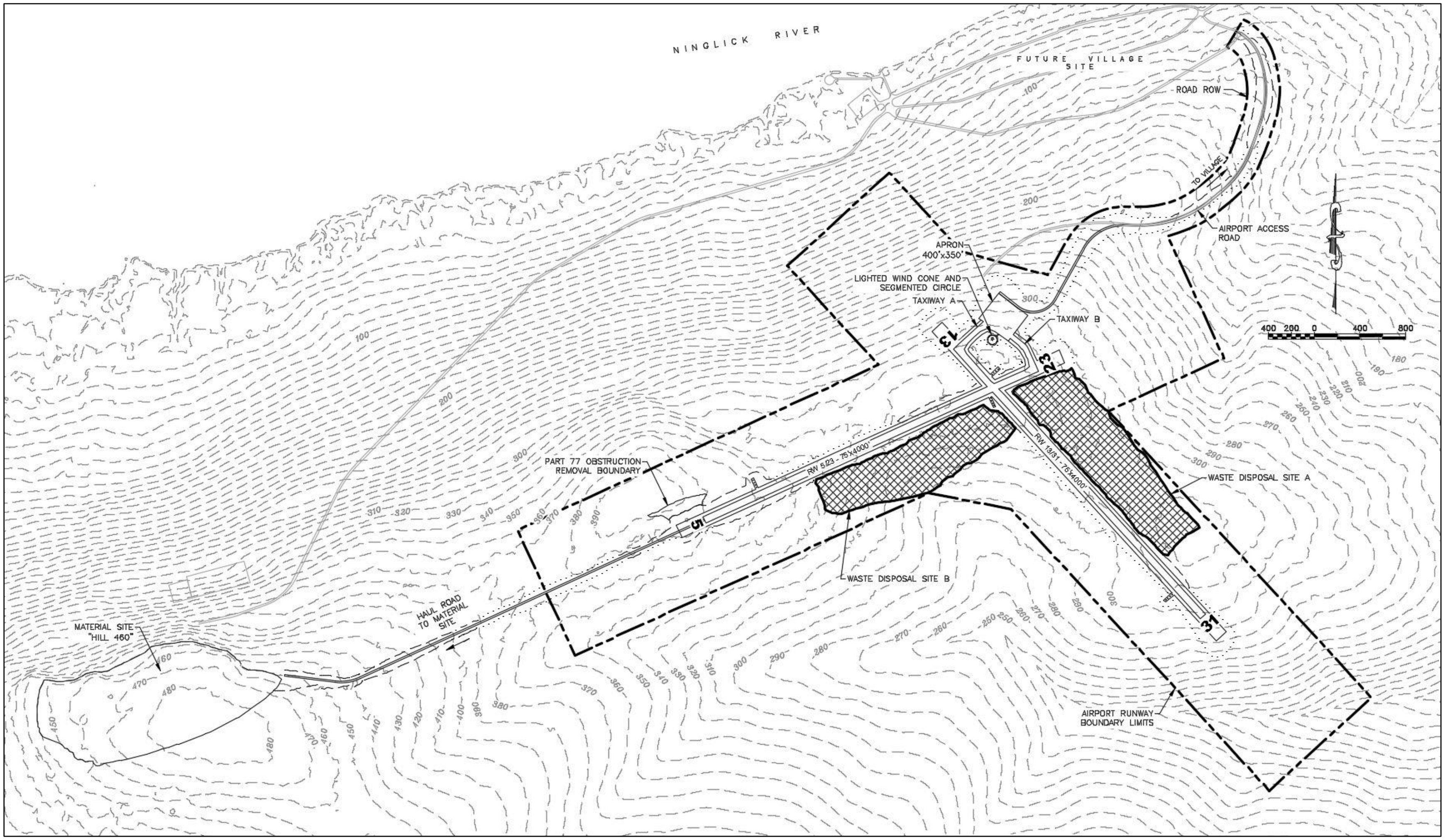

Figure 3. Project Layout Plan

3. ENVIRONMENTAL REVIEW

PDC completed a desktop exercise to update potential environmental effects of the preferred airport, access road, and material site alternative summarized in the *Mertarvik Airport Site Selection Study* (PDC, 2012). Impacts not re-evaluated from the 2012 Study include: Air Quality; Coastal Barriers; Section4(f), Farmlands; Floodplains; Hazardous Materials; Light Emissions & Visual Effects; Natural Resources & Energy Supply; Noise; Socioeconomic, Environmental Justice, and Children's Health & Safety Risks.

Updated entries to the *Mertarvik Airport Site Selection Study* (PDC, 2012)environmental impacts are shown in italic and can be found in Appendix A.

Cultural Resource services included limited background research summarized in a short letter report included in Appendix B.

Anticipated wetland impacts for the ultimate airport development are approximately 232 acres. See Table 4 below and Appendix C for wetland impact breakdowns by project component and wetland type. Cut/fill volumes within upland areas are not included.

Table 4. Wetland Impacts by Project Component

Project Component	Wetland Type	Impact Area* (AC)	Rounded Fill Vol (CY)	Rounded Cut Vol (CY)
Runways	L2UB	0.04	440	270
	PEM1	12.82	138,330	86,410
	PEM1/SS6	10.48	113,080	70,640
	PSS7	0.51	5,510	3,440
	PSS/ML1	48.41	522,350	326,270
	subtotal	**72.26**	**779,710**	**487,030**
Taxiways	PEM1	0.0902	3,910	940
	PEM1/SS6	0.0992	4,300	1,030
	PSS/ML1	1.728	74,830	17,830
	subtotal	**1.9174**	**83,040**	**19,800**
Apron	PEM1	0.42	8,380	2,530
	PEM1/SS6	1.07	21,350	6,440
	PSS7	2.05	40,900	12,340
	PSS/ML1	5.88	117,300	35,370
	subtotal	**9.42**	**187,930**	**56,680**

Project Component	Wetland Type	Impact Area* (AC)	Rounded Fill Vol (CY)	Rounded Cut Vol (CY)
Access Rd	PEM1	2.13	25,240	14,740
	PEM1/SS6	0.74	8,770	5,120
	PSS7	12.24	145,020	84,660
	PSS/ML1	5.43	64,340	37,560
	subtotal	**20.54**	**243,370**	**142,080**
Obstruction Removal	PEM1	0.14	0	850
	PSS/ML1	1.51	0	9,170
	subtotal	**1.65**	**0**	**10,020**
Material Waste Disposal	L2UB	0.09	1,650	0
	PEM1	14.07	257,390	0
	PEM1/SS6	8.84	161,720	0
	PSS/ML1	36.23	662,760	0
	subtotal	**59.23**	**1,083,520**	**0**
Temporary Haul Rd	L2UB	0.15	550	250
	PEM1	1.11	4,060	1,850
	PEM1/SS6	2.11	7,710	3,500
	PSS/ML1	11.91	43,520	19,760
	subtotal	**15.28**	**55,840**	**25,360**
Material Source	PEM1	9.3	0	7,530
	PSS/ML1	41.92	0	33,930
	subtotal	**51.22**	**0**	**41,460**
	TOTAL	**232**	**2,433,410**	**782,430**

* includes a 10-foot construction work area around perimeter

Total impacted area by wetland type:

L2UB........................Lacustrine Litoral Unconsolidated Bottom .... 0.28 acres
PEM1.......................Palustrine Emergent Persistent...40.08 acres
PEM1/SS6.............Palustrine Emergent Persistent/Scrub-shrub Deciduous...............................23.34 acres
PSS7.........................Palustrine scrub-shrub evergreen ....14.80 acres
PSS/ML1................Palustrine Scrub-shrub/Moss peat... 153.02 acres

4. REFERENCES

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APPENDIX C

(of the Airport Environmental Study)

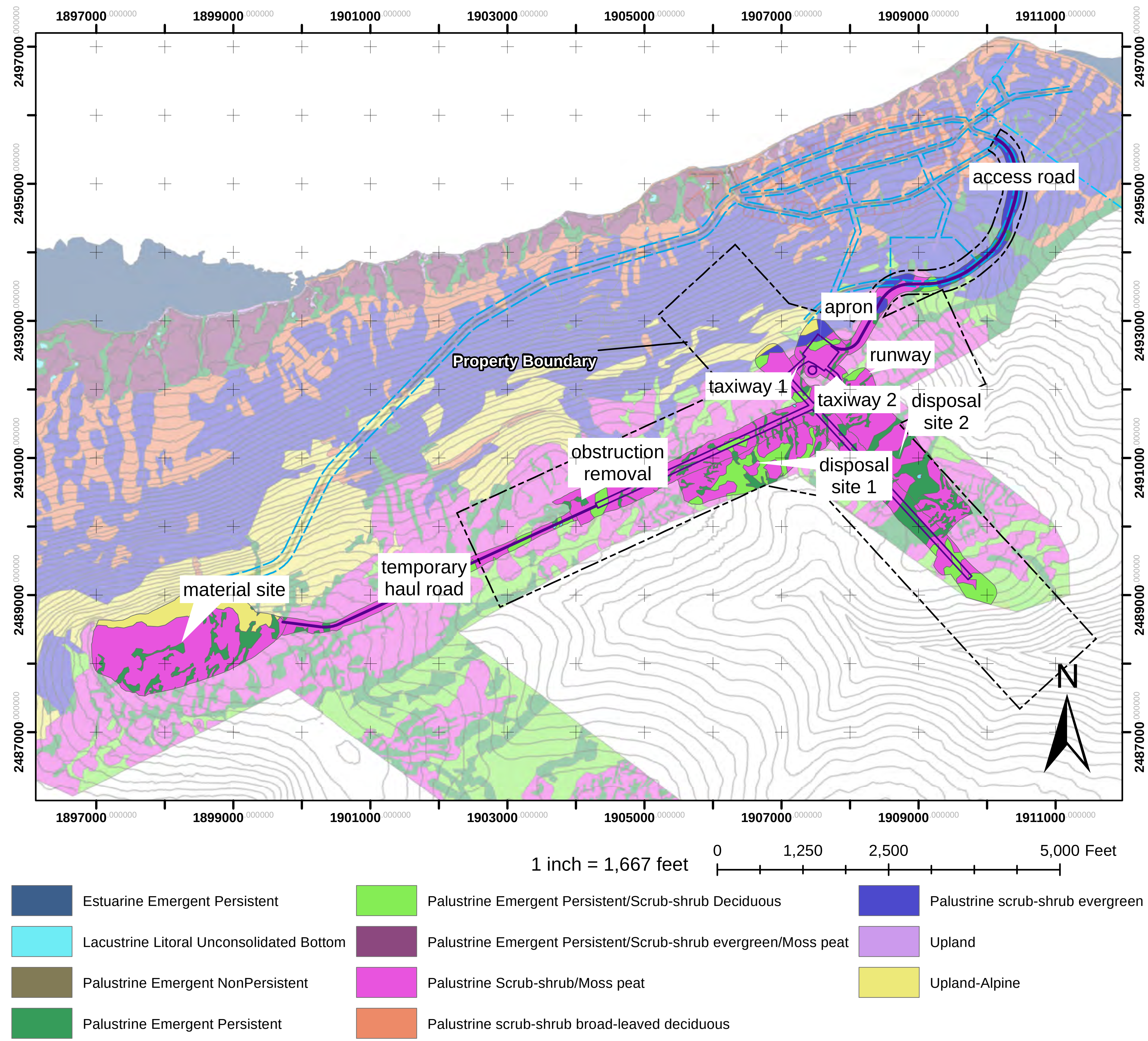
Wetland Impact Maps with Summary Statistics

Date: 8/29/2017

Mertarvik Airport Construction Boundaries Wetlands Delineation

Summary Statistics: total area for each extent area and wetland type

Extent	Wetland Type	Area (AC)
access road	Palustrine Emergent Persistent	2.12
access road	Palustrine Emergent Persistent/Scrub-shrub Deciduous	0.74
access road	Palustrine scrub-shrub evergreen	12.23
access road	Palustrine Scrub-shrub/Moss peat	5.42
apron	Palustrine Emergent Persistent	0.42
apron	Palustrine Emergent Persistent/Scrub-shrub Deciduous	1.06
apron	Palustrine scrub-shrub evergreen	2.04
apron	Palustrine Scrub-shrub/Moss peat	5.87
apron	Upland-Alpine	0.78
disposal site 1	Palustrine Emergent Persistent	3.75
disposal site 1	Palustrine Emergent Persistent/Scrub-shrub Deciduous	8.41
disposal site 1	Palustrine Scrub-shrub/Moss peat	14.14
disposal site 2	Lacustrine Litoral Unconsolidated Bottom	0.08
disposal site 2	Palustrine Emergent Persistent	10.31
disposal site 2	Palustrine Emergent Persistent/Scrub-shrub Deciduous	0.42
disposal site 2	Palustrine Scrub-shrub/Moss peat	22.09
material site	Palustrine Emergent Persistent	9.29
material site	Palustrine Scrub-shrub/Moss peat	41.91
material site	Upland-Alpine	12.95
obstruction removal	Palustrine Emergent Persistent	0.13
obstruction removal	Palustrine Scrub-shrub/Moss peat	1.51
runway	Lacustrine Litoral Unconsolidated Bottom	0.03
runway	Palustrine Emergent Persistent	12.81
runway	Palustrine Emergent Persistent/Scrub-shrub Deciduous	10.48
runway	Palustrine scrub-shrub evergreen	0.5
runway	Palustrine Scrub-shrub/Moss peat	48.4
runway	Upland-Alpine	0.41
taxiway 1	Palustrine Emergent Persistent	0.07
taxiway 1	Palustrine Scrub-shrub/Moss peat	0.72
taxiway 2	Palustrine Emergent Persistent	0.02
taxiway 2	Palustrine Emergent Persistent/Scrub-shrub Deciduous	0.1
taxiway 2	Palustrine Scrub-shrub/Moss peat	1.01
temporary haul road	Lacustrine Litoral Unconsolidated Bottom	0.15
temporary haul road	Palustrine Emergent Persistent	1.1
temporary haul road	Palustrine Emergent Persistent/Scrub-shrub Deciduous	2.11
temporary haul road	Palustrine Scrub-shrub/Moss peat	11.91
temporary haul road	Upland-Alpine	0.01

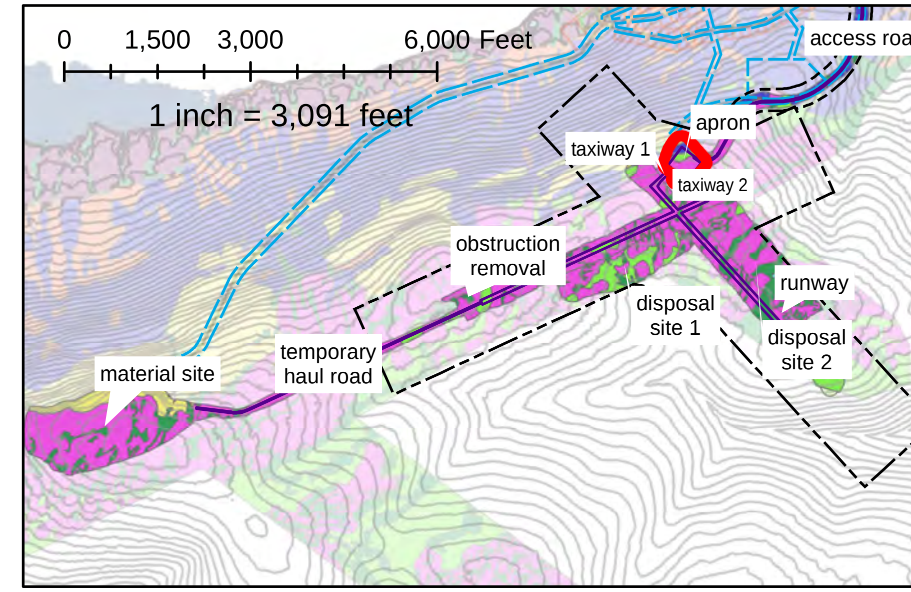


Date: 8/29/2017

Mertarvik Airport Construction Boundaries Wetlands Delineation

Legend

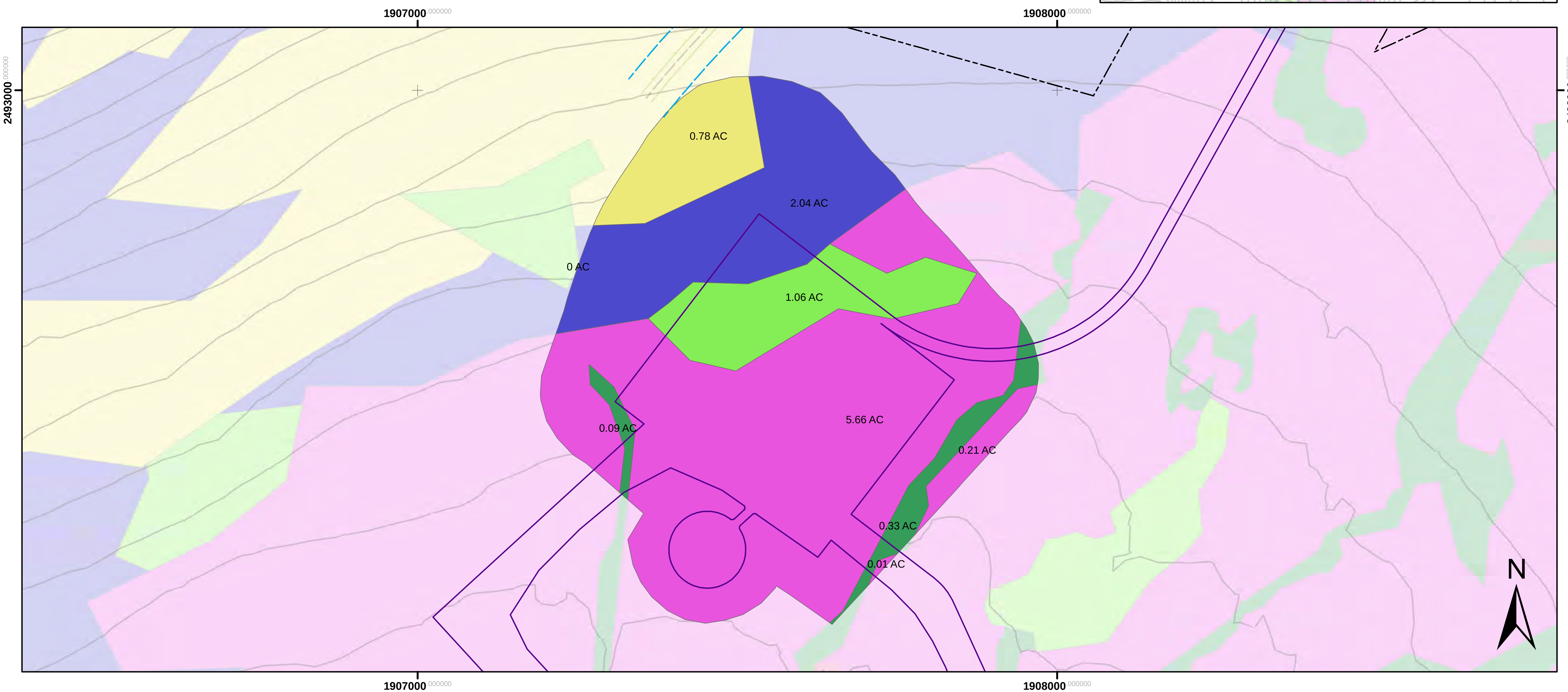
- Estuarine Emergent Persistent
- Lacustrine Litoral Unconsolidated Bottom
- Palustrine Emergent NonPersistent
- Palustrine Emergent Persistent
- Palustrine Emergent Persistent/Scrub-shrub Deciduous
- Palustrine Emergent Persistent/Scrub-shrub evergreen/Moss peat
- Palustrine Scrub-shrub/Moss peat
- Palustrine scrub-shrub broad-leaved deciduous
- Palustrine scrub-shrub evergreen
- Upland
- Upland-Alpine



Extent: apron

0 115 230 460 Feet

1 inch = 150 feet



Date: 8/29/2017

Mertarvik Airport
Construction Boundaries
Wetlands Delineation

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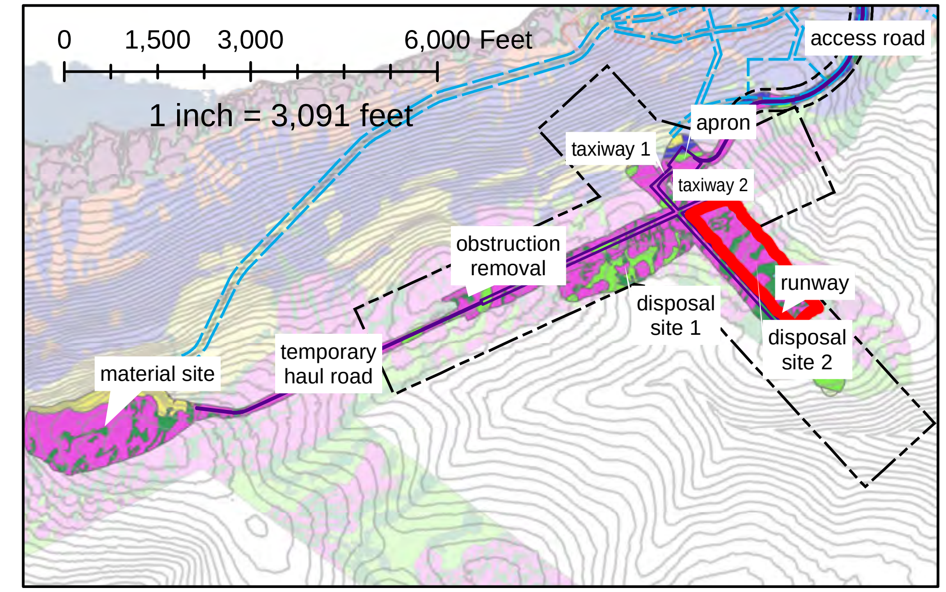
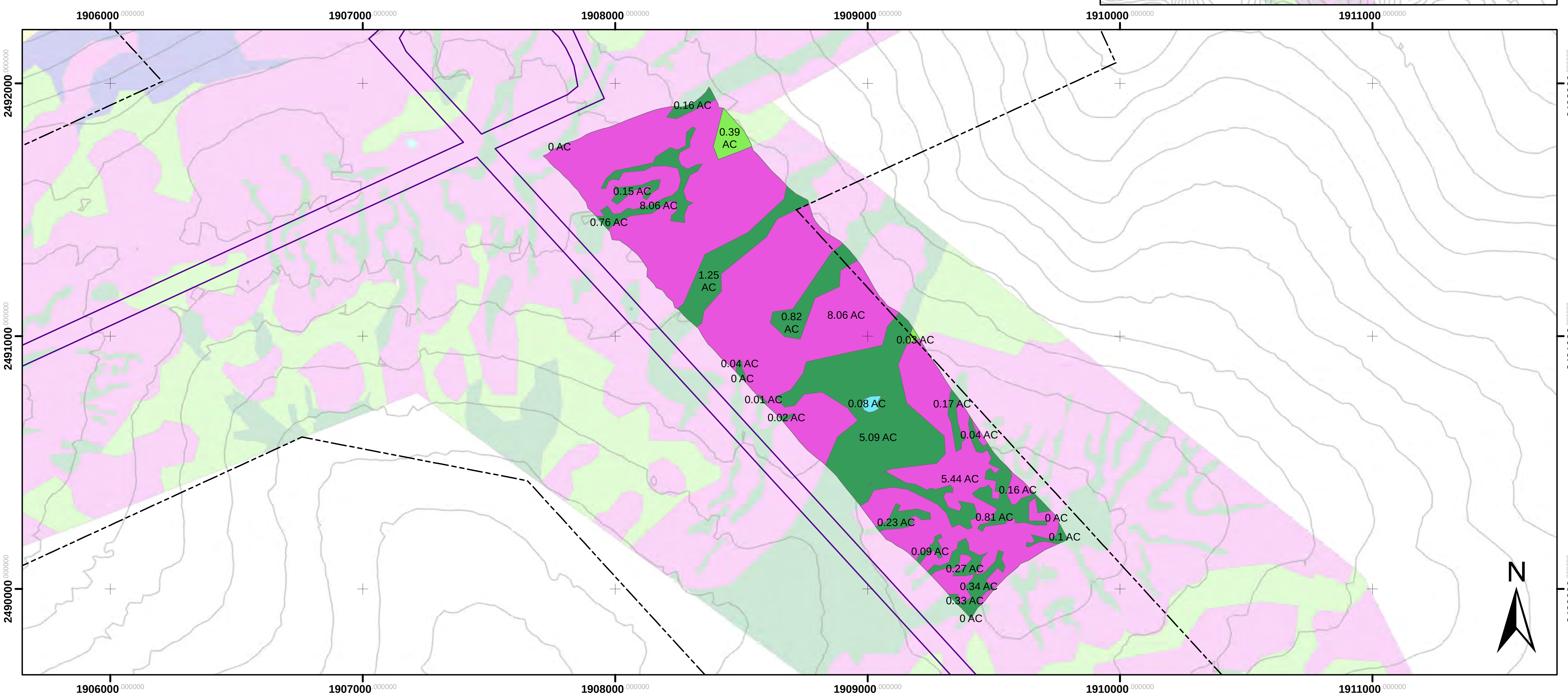


Extent: disposal site 2

0 287.5 575 1,150 Feet

1 inch = 380 feet



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Mertarvik Airport Construction Boundaries Wetlands Delineation

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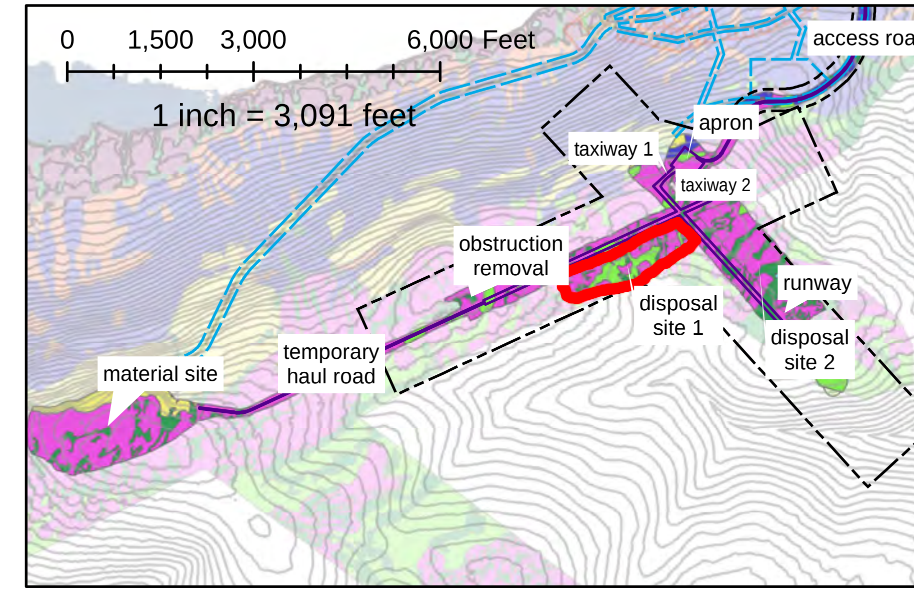
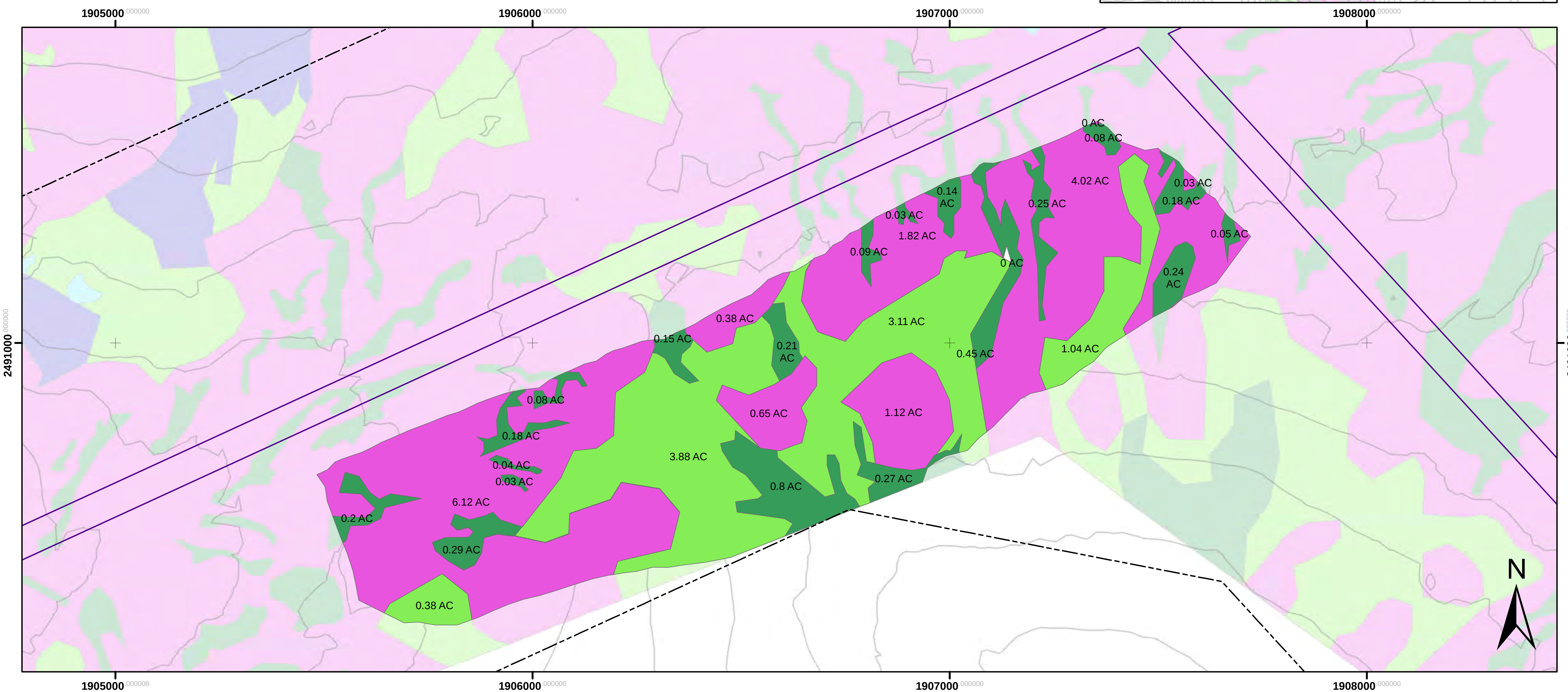


Extent: disposal site 1

0 175 350 700 Feet

1 inch = 230 feet



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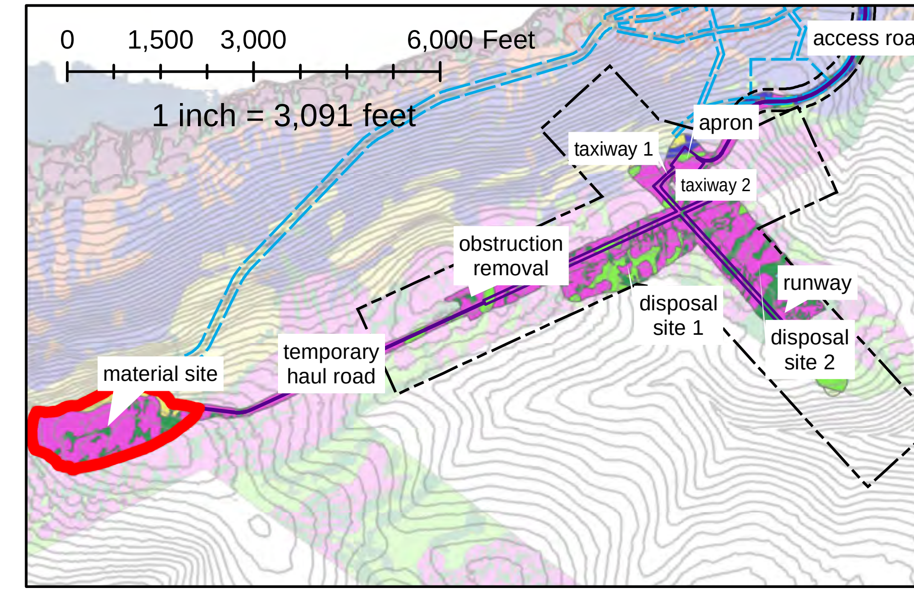
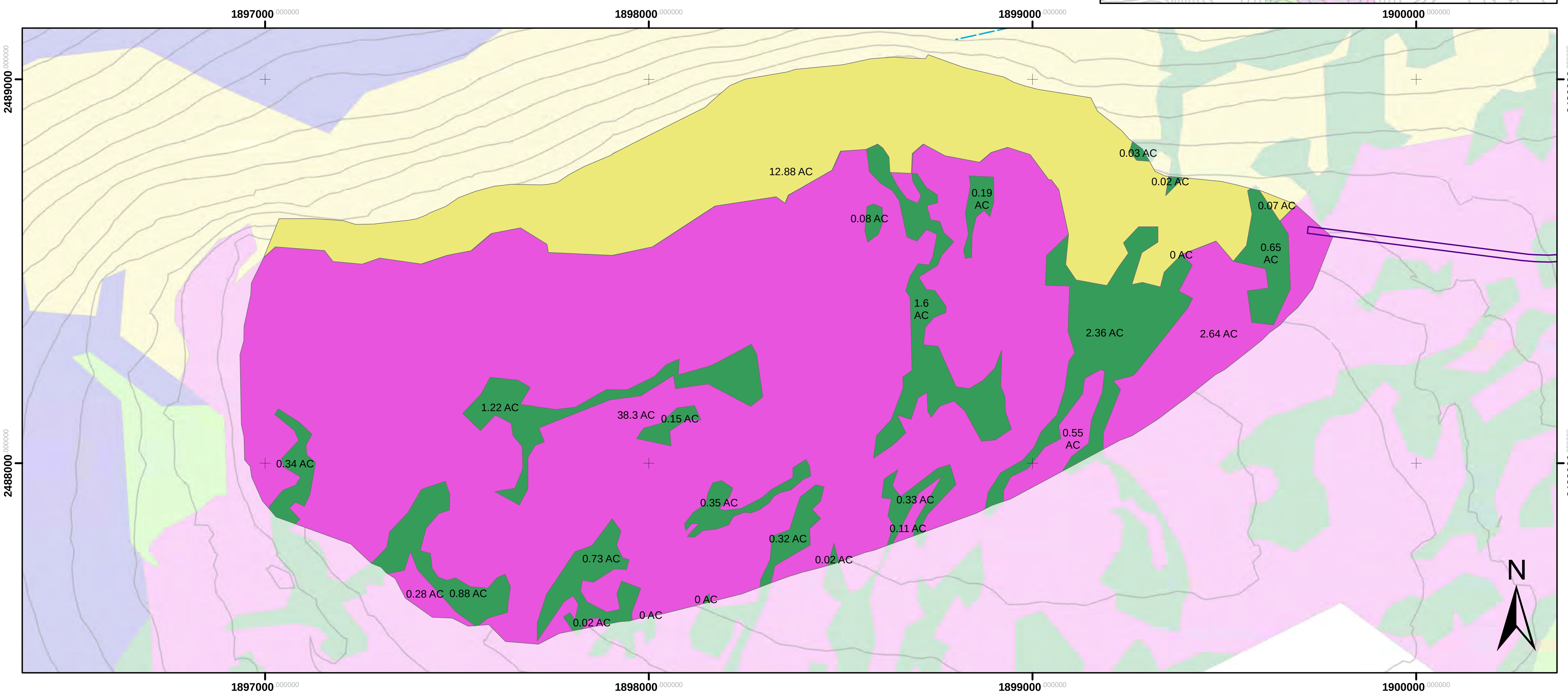


Extent: material site

0 190 380 760 Feet

1 inch = 250 feet



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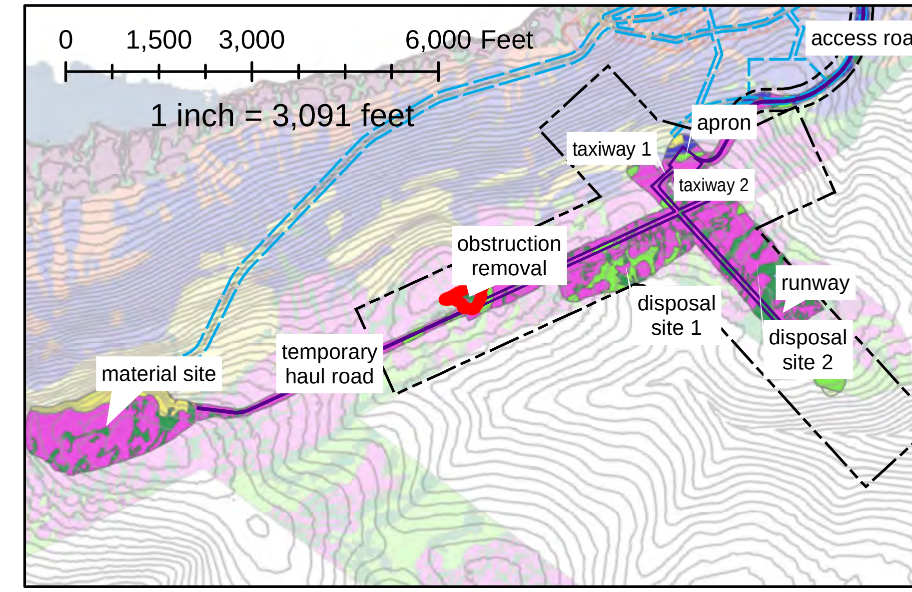
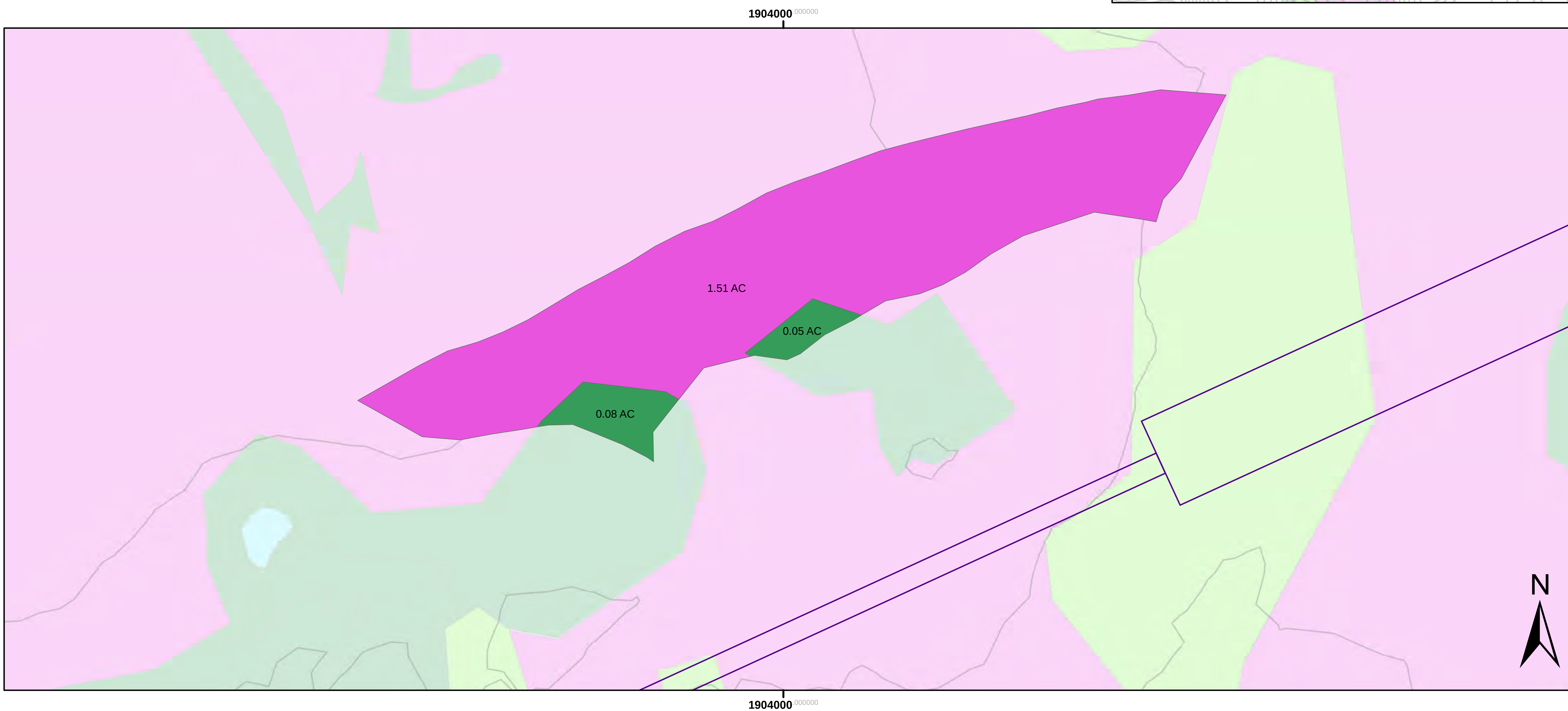


Extent: obstruction removal

0 60 120 240 Feet

1 inch = 80 feet



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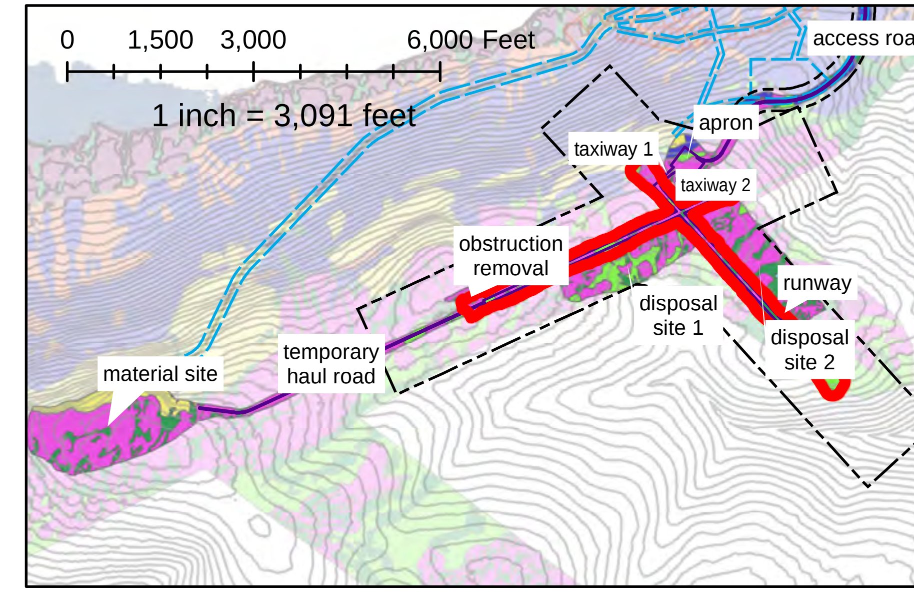
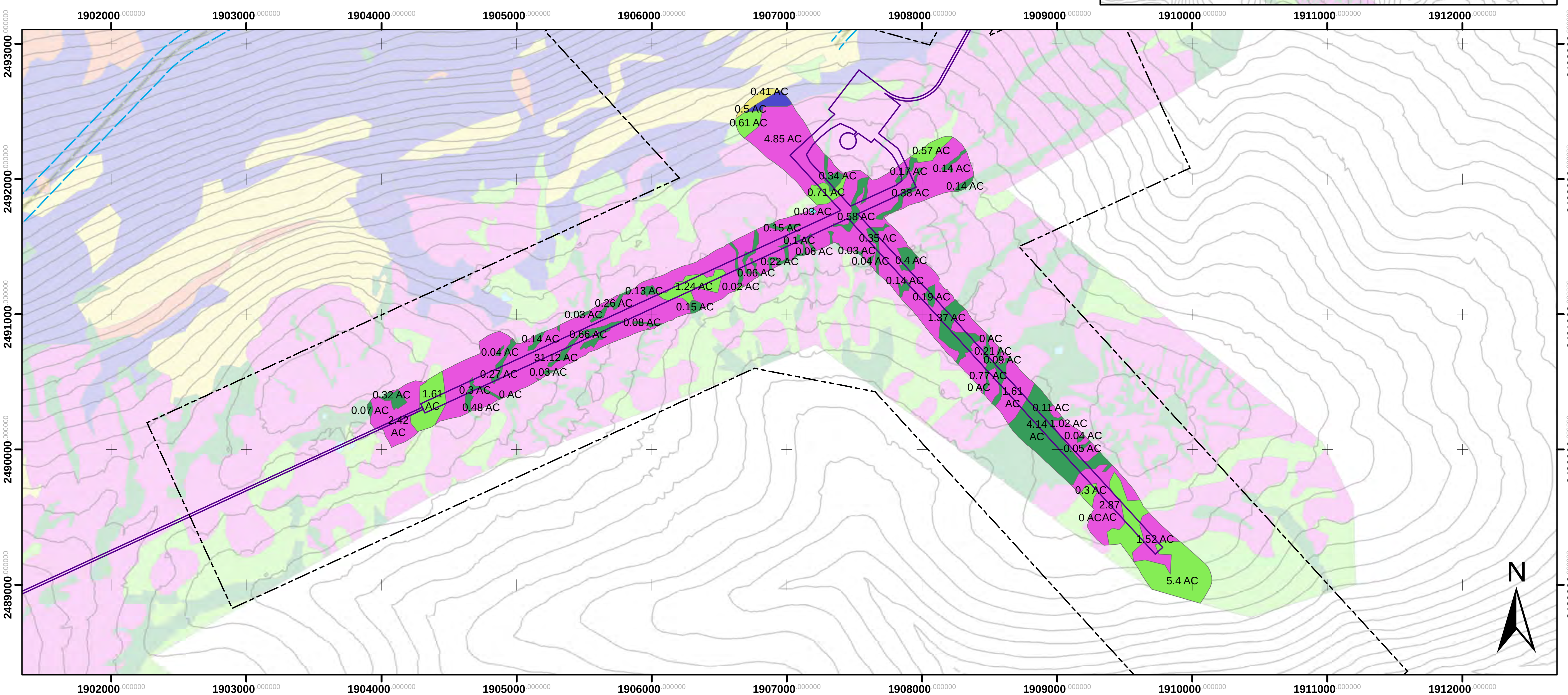


Extent: runway

0 500 1,000 2,000 Feet

1 inch = 710 feet



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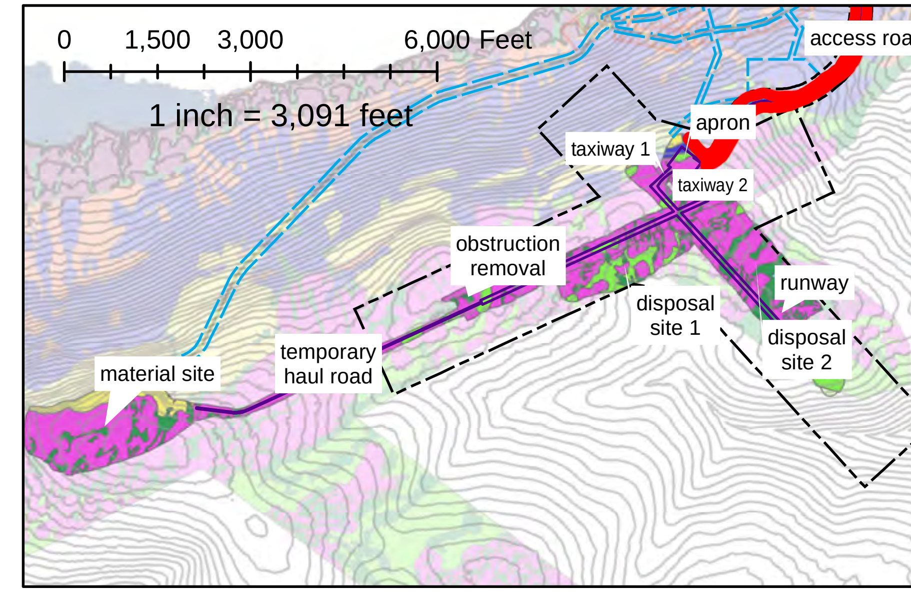
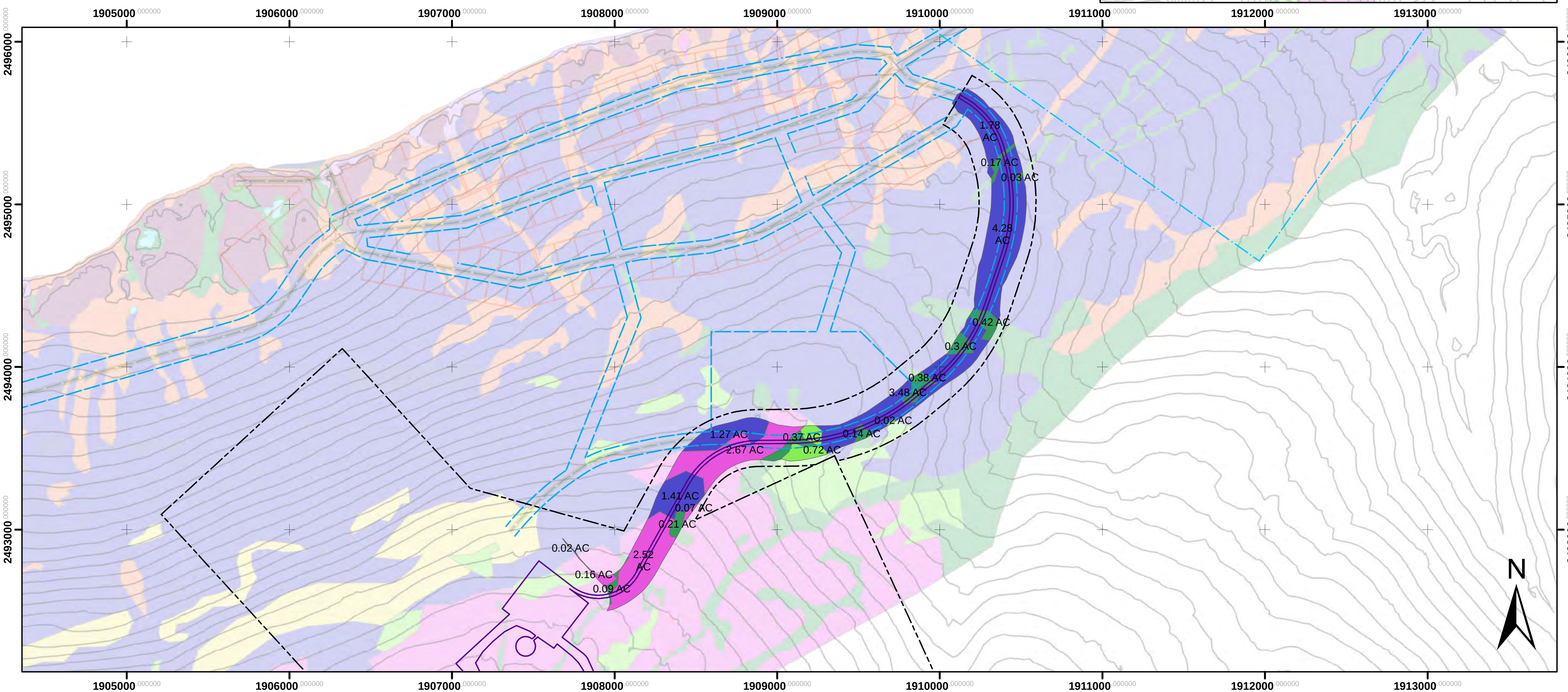


Extent: access road

0 450 900 1,800 Feet

1 inch = 590 feet



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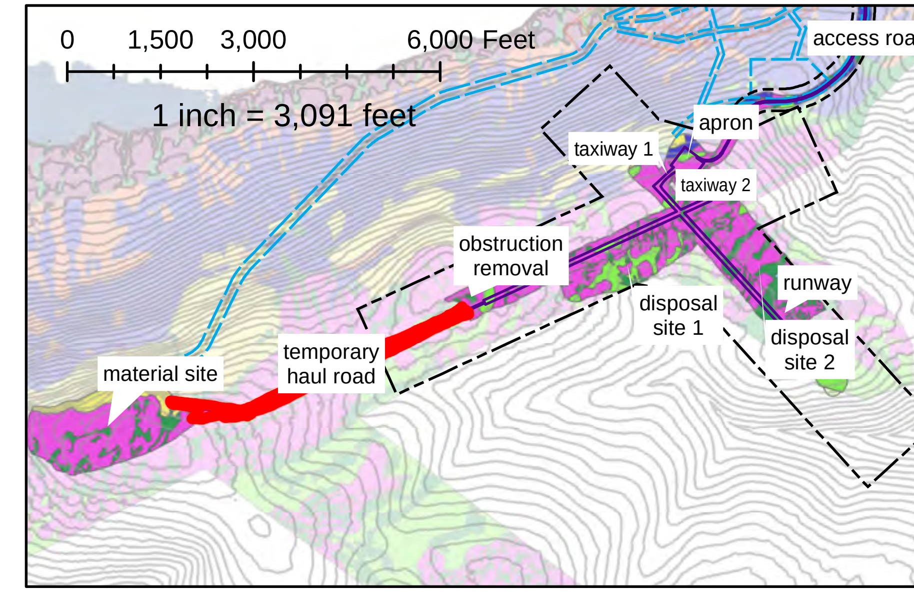
Mertarvik Airport Construction Boundaries Wetlands Delineation



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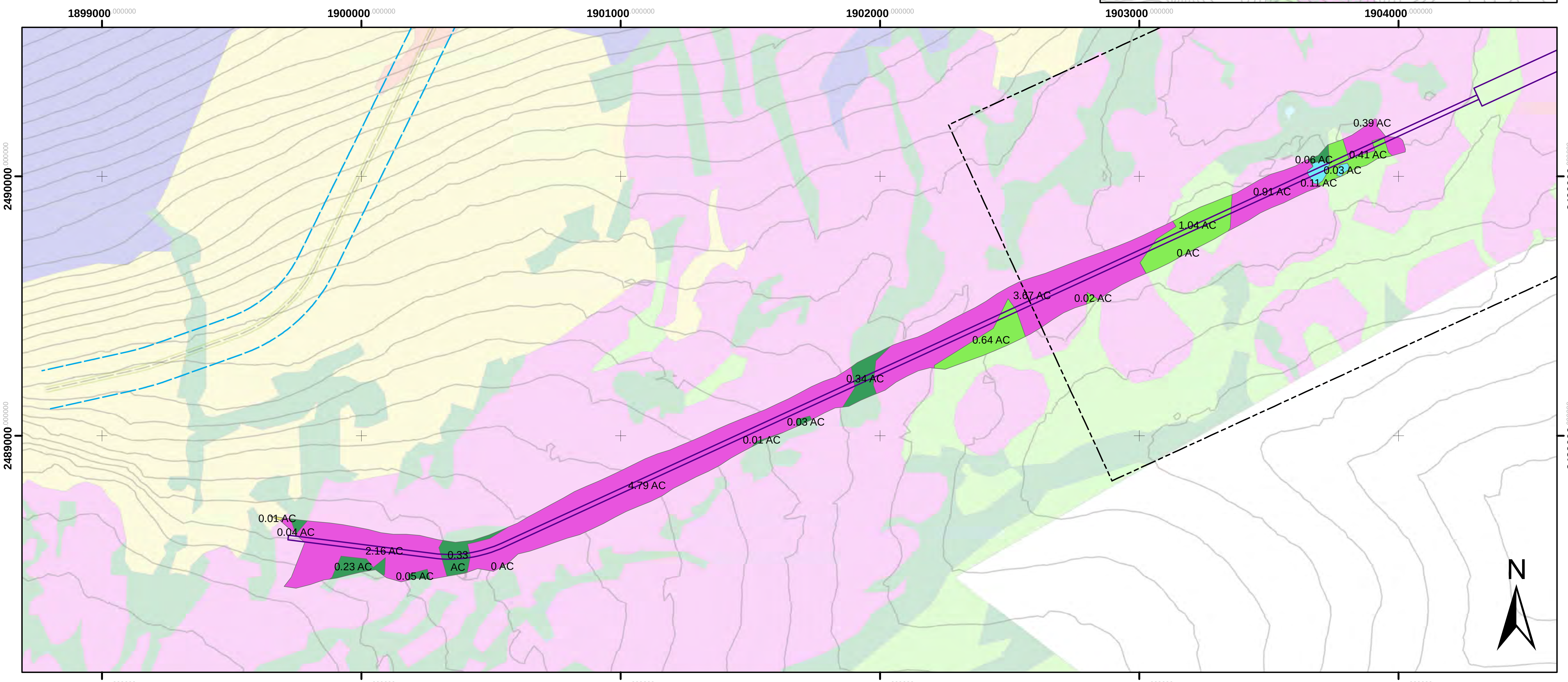
- Upland
- Upland-Alpine

Extent: temporary haul road

0 280 560 1,120 Feet

1 inch = 370 feet

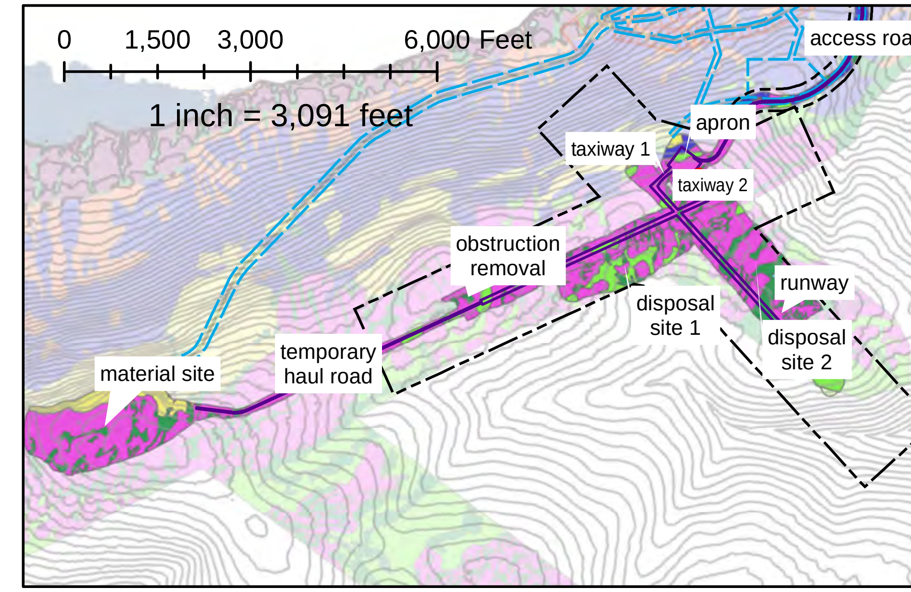


Date: 8/29/2017

Mertarvik Airport Construction Boundaries Wetlands Delineation

Legend

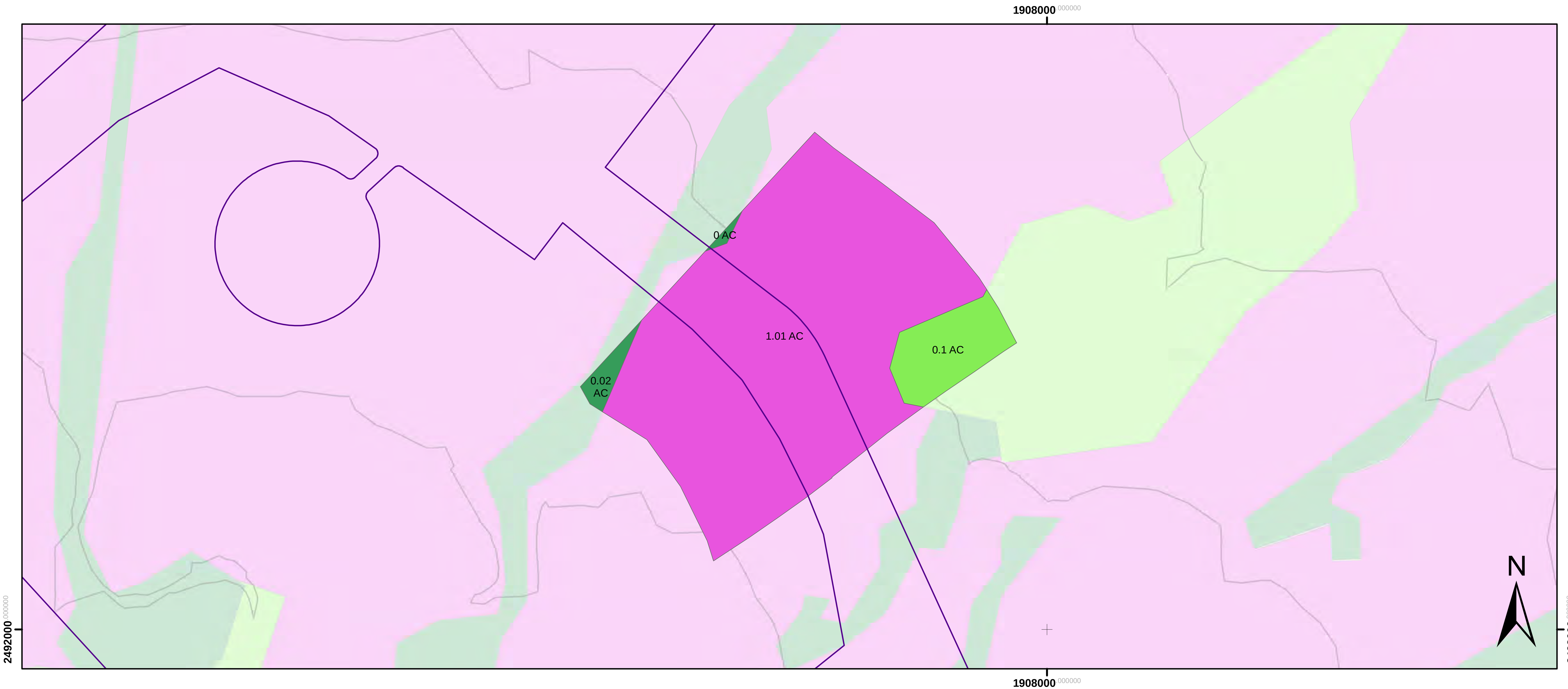
- Estuarine Emergent Persistent
- Lacustrine Litoral Unconsolidated Bottom
- Palustrine Emergent NonPersistent
- Palustrine Emergent Persistent
- Palustrine Emergent Persistent/Scrub-shrub Deciduous
- Palustrine Emergent Persistent/Scrub-shrub evergreen/Moss peat
- Palustrine Scrub-shrub/Moss peat
- Palustrine scrub-shrub broad-leaved deciduous
- Palustrine scrub-shrub evergreen
- Upland
- Upland-Alpine



Extent: taxiway 2

0 50 100 200 Feet

1 inch = 70 feet



Date: 8/29/2017

Mertarvik Airport Construction Boundaries Wetlands Delineation

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- Estuarine Emergent Persistent
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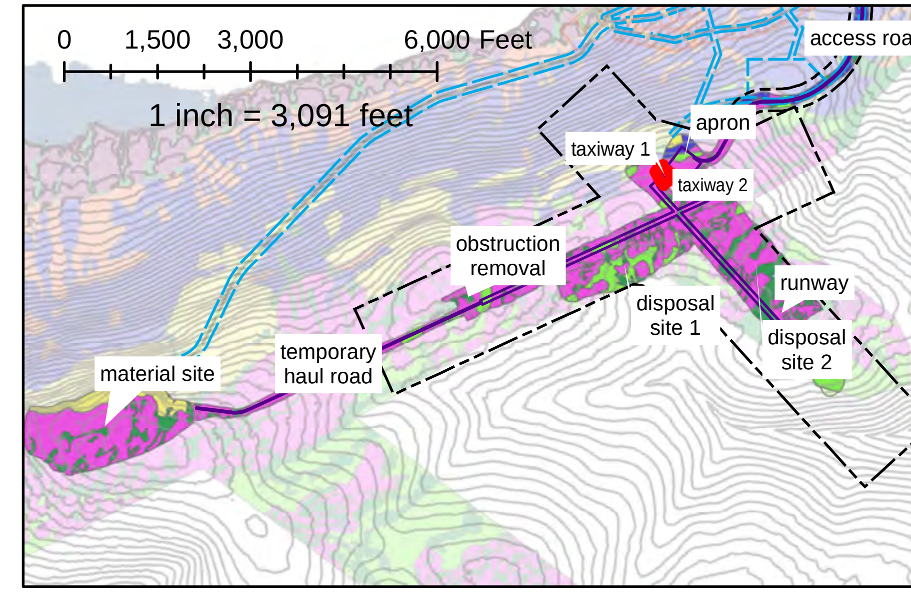

Extent: taxiway 1

0 45 90 180 Feet

1 inch = 60 feet