CHAPTER XIV

WETLANDS EVALUATION

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ADDENDA

EXECUTIVE SUMMARY

This Chapter discusses the studies that have been completed to evaluate the Wishbone Hill mine permit area for the presence of wetland areas that may be subject to the jurisdiction of the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act. The evaluation that follows, is based on the detailed vegetation inventory and soil survey work that was completed on the entire mine permit area in 1988. These vegetation and soil studies were previously discussed in Chapters VIII and XI, respectively. The methods used for the wetlands evaluation followed the technical standards outlined in the USACE's wetlands delineation manual published in 1987. The evaluation concluded that no jurisdictional wetland areas were present within the proposed permit area for the Wishbone Hill coal project. In October 1989, the USACE completed a technical review of the evaluation along with a site inspection and also concluded that there were no jurisdictional wetlands present within the study area.

With the passage of time, the quality and availability of source data for wetland evaluations on the Wishbone Hill permit area have increased. Several orthorectified aerial images of high resolution have been produced for the project area along with a detailed topographic survey. In addition, other wetland and soil studies, applicable to the study area, have been completed and published.

Recognizing the availability of this new source data and the changes that have occurred in regulatory interpretations and guidelines for wetlands determination, a new office based preliminary jurisdictional determination (PJD) was completed in January 2009 and is presented in Addendum 1. This PJD was initiated under a phased approach and focused on the southern and western portions of the permit area. Areas that were evaluated, included the access road corridors, surface facilities, topsoil and overburden stockpiles, and the western portion of the mining area. Studies pertaining to the remaining portion of the mining area are in progress and will be included in this Chapter upon completion.

The results of this PJD indicated that the wetland areas identified were very small and isolated and not connected to any other wetland or regulated water. It was concluded that the mapped wetlands identified in the study would most likely be classified as non-jurisdictional.

WISHBONE HILL COAL PROJECT
WETLANDS EVALUATION

1.0 INTRODUCTION

Wetland studies became necessary following the passage of the Clean Water Act in 1977. Implicit in Section 404 of the Clean Water Act is the required responsibility of all parties to predetermine for any contemplated action whether dredge and fill activities will occur in navigable waters or wetlands of the United States. Dredge material is that which is excavated or dredged from water or wetlands. Fill is material used for the primary purpose of replacing an aquatic area with dry land or for changing the bottom elevation of a water body.

This report evaluates the Wishbone Hill Coal Project study area for the presence of wetland areas that may come under the jurisdiction of the U.S. Army Corps of Engineers Section 404 wetland permitting program. A brief study site description will be followed by a discussion of wetlands evaluation procedures, a consideration of wetland soil issues, and a consideration of wetland vegetation issues.

2.0 THE WISHBONE HILL PROJECT AREA

The Wishbone Hill area is a prominent topographic upland within the lower Matanuska Valley. It is separated from the Talkeetna Mountains to the north by a broad valley drained by tributaries of Moose and Eska Creeks. Sharply incised valleys of Moose and Eska Creeks comprise the west and east sides of Wishbone Hill. On the south, it is flanked by a broad undulating sand and gravel glacial outwash surface about 700 to 800 feet in altitude. The main

Wishbone Hill upland is underlain by very gravelly, sandy loam glacial till. A surface mantle of wind deposited loess overlies both the glacial outwash and till surfaces. This silt loam material, about 18 inches thick, is derived primarily from fluvial deposits within the upper Matanuska River Valley. The surface mantle also contains a small admixture of volcanic ash.

The convex upland position of Wishbone Hill and the very thick, very coarse glacial deposits both contribute to well drained conditions on the study area. Buffalo Creek is the main drainage way on the upland and is narrow and generally without bordering low land areas.

3.0 WETLANDS EVALUATION PROCEDURES

The U. S. Army Corps of Engineers (COE) has responsibility for determining whether jurisdictional wetlands could be affected by dredge and fill activities regulated under Section 404 of the Clean Water Act. The U.S. Environmental Protection Agency (EPA) also plays a cooperative role in the wetland permitting process. EPA's Section 404 responsibilities in Alaska include commenting on permit applications and providing oversight and enforcement support to the COE permit program (Sumner 1986).

The evaluation of wetlands status for the Wishbone Hill Project study area can be performed in accordance with technical standards defined by the COE in its wetlands delineation manual (Environmental Laboratory 1987).

The COE defines a wetland as: "Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (Federal Register, Vol. 42, p. 37128).

In its delineation manual, the COE employs three diagnostic environmental characteristics to determine the presence of wetlands. These are soil, vegetation and hydrology. As a consequence, the site must meet the following criteria:

1. Soil. Soils are present and have been classified as hydric, or they possess characteristics that are associated with anaerobic soil conditions.

2. Vegetation. The prevalent vegetation consists of macrophytes that are typically adapted to habitats having the hydrologic and soil conditions described in the wetlands definition. Wetland plant species, due to morphological, physiological, and/or reproductive adaptation(s), have the ability to grow, effectively compete, and/or persist in anaerobic soil conditions.

3. Hydrology. The soil is inundated either permanently or periodically at mean water depths less than or equal to 2 m, or the soil is saturated to the surface at sometime during the growing season of the prevalent vegetation.

Vegetation, soil and hydrological indicators have been described by Huffman and Sanders (1982) and methods for identifying and delineating wetlands have been described in the COE wetlands manual (Environmental Laboratory 1987). When wetland indicators of all three parameters are present, the area is considered to be a wetland. When indicators of any of the three parameters are absent, the area is considered to be either non-wetland or an atypical situation.

3.1 Wetland Soils

3.1.1 Methods

The COE wetlands delineation manual (Environmental Laboratory 1987) and Soil Conservation Service documents (SCS 1985) were the primary sources of information for the definition of a wetland or "Hydric" soil. The COE document outlines specific criteria that can be evaluated in the field for the presence of wetland soils. These criteria are described in the following sections. It also provides a list of soil series and subgroups that the SCS has determined to be hydric.

The Soil Conservation Service (SCS 1985) defines hydric conditions as when the soil in its undrained condition is saturated, flooded, or ponded long enough during the growing (frost-free) season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation. Features frequently associated with hydric conditions include:

1. Aquic moisture regime, as defined in Soil Taxonomy,

2. A deficiency of oxygen at or near the surface during much of the growing season, or

3. Flooding or ponding of long duration during the growing season.

The SCS distinguishes between soils that consistently display hydric conditions and those that may exhibit hydric conditions. The COE defines wetland soils as those soils that are either on the SCS list of hydric soils (SCS 1985) or display hydric conditions upon field examination.

Wetland soils are classified into either organic or mineral groups. Organic soils are called Histosols and develop under conditions of nearly continuous saturation and/or inundation. For this study area, all organic soils are considered to be wetland soils.

Organic wetland soils are commonly known as peats and mucks. Organic matter requirements vary with taxonomic category. Generally speaking, Histosols must have between 20 and 30 percent organic matter in the surface 8 to 24 inches (depending on clay content).

Organic soils are classified, in part, according to their state of decomposition. Both physical and chemical approaches are used. In the physical approach, the fiber content remaining after handrubbing is determined. Most fibric materials are sphagnum mosses. In the chemical approach, the solubility of organic materials in a saturated solution of sodium pyrophosphate is determined.

Three categories of organic soils are subdivided in soil taxonomy (SCS 1975) as follows:

1. Sapric (Oa) - less than 17 percent rubbed fiber, dark pyrophosphate colors, and are the most decomposed organic soils. Shallow (terric) organics tend to be sapric.

2. Hemic (Oe) - fail to meet requirements for sapric or fibric. Some appear highly fibrous but fibers disintegrate when rubbed.

3. Fibric (Oi) - greater than 75 percent rubbed fiber, or greater than 40 percent rubbed fiber and light pyrophosphate color.

Once the organic soil materials for each layer are classified by state of decomposition, then thickness of each kind of material is assessed for placement at the proper subgroup level.

Limnic materials are commonly associated with peat materials. Some limnic materials are chiefly organic (coprogenous earth) and others are chiefly mineral, such as marl and diatomaceous earth. Coprogenous materials and sapric materials can be confused. Both are low in fiber. However, limnic materials yield a light pyrophosphate color, whereas sapric materials yield a dark color.

Soil classification distinguishes two family reaction classes in Histosols. Dysic families have a pH less than 4.5 in all parts of the organic materials in the control section. Euic families have a pH greater than 4.5 in some part of the organic materials in the control section.

All wetland soils other than Histosols are mineral soils. Mineral soils range from clayey to sandy and vary in color from gray to red. Mineral wetland soils are those periodically saturated for a sufficient duration to significantly impact soil chemical and physical properties. They are usually gray, mottled immediately below the surface horizon, or have thick, dark-colored surface layers overlying gray or mottled subsurface horizons (Environmental Laboratory 1987).

The Wetlands Delineation Manual (Environmental Laboratory 1987) describes several indicators that may be used to determine whether wetland soils are present in a given area. Any of the indicators may be used for a positive determination. A brief description of these indicators follows.

1. Hydric Soils. Hydric soils have reducing conditions for a significant period of the growing (frost-free) season in a major portion of the root zone and are frequently saturated within 10 inches of the soil surface. Lists of hydric soils and soils that may have hydric conditions are presented in Appendix B of the Wetlands Delineation Manual.

2. Organic Soils. Organic soils have more than 50 percent, by volume, of the upper 32 inches of soil composed of organic soil material, or organic material of any thickness resting on bedrock.

3. Histic Epipedon. A histic epipedon is an 8 to 16 inch soil layer at or near the surface that is saturated with water for 30 consecutive days in most years and contains a minimum of 20 percent organic matter when no clay is present or a minimum of 30 percent organic matter when 60 percent or greater clay is present. Decomposition of the organic surface is prevented by inundation or saturation by water, and soils with histic epipedons are wetland soils.

4. Soil Gleying. Gray soil colors are produced by chemical reduction of iron, manganese, and other elements under anaerobic soil conditions. These soils become "water-logged". Iron is converted from the oxidized (ferric) state to the reduced (ferrous) state, which results in the bluish, greenish or grayish colors associated with gleying. Gleying immediately below the surface layer indicates saturation and/or inundation for long periods, and gleyed soils are considered to be wetland soils.

5. Soil Mottling. Mottles are spots of contrasting color. The predominant soil color is called the matrix. Wetland

soils usually have one of the following color features in the horizon immediately below the A horizon:

a. Matrix chroma of 2 or less in moist mineral soils with low or moderate organic matter content when the soil is mottled.
b. Matrix chroma of 1 in moist mineral soils when the soil is not mottled.
c. Matrix chroma of less than 2 in moist mineral soils when organic matter is high (but less than that associated with organic soils).

Soils having the above color characteristics are normally saturated for some period of significant duration during the growing season.

6. Aquic or Peraquic Moisture Regimes. An aquic moisture regime indicates the presence of a reducing regime that is virtually free of dissolved oxygen because the soil is saturated by groundwater.

7. Iron and Manganese Concretions. During the oxidation-reduction process, iron and manganese in suspension are sometimes segregated into concretions or soft mosses of iron and manganese oxides. These accumulations are usually black or dark brown.

8. Sulfidic Material. Water logged mineral or organic soils sometime contain 0.75 percent or more sulfur and have less than 3 times as much carbonate as sulfur. These soils usually have sulfidic material near the mineral soil surface and are permanently saturated at or within a few centimeters of the surface. This can be detected by the rotten egg or hydrogen sulfide odor.

9. High n Values. The n value of a soil refers to the relationship between percent of water under field conditions and percent of inorganic clay and humus in mineral soils. Wetland soils have an n-value of >0.7 in a horizon that is more than 4 inches thick and has an upper boundary within 59 inches of the surface. A field test can be used to approximate this n value of 0.7. When soil flows between the fingers with difficulty, the n value is between 0.7 and 1.0. When soil flows easily, the value is 1.0 or more. Most permanently saturated mineral soils have n values of 1.0 or greater.

Additional soil features are used when sandy soils are encountered. High organic matter content in the surface horizon, organic pans, and streaking of subsurface horizons by organic matter are all special indicators for sandy soils.

3.1.2 Results

Soils were characterized in the field during the detailed Order 1/2 Wishbone Hill Soil Survey (See Chapter XI). A soils map of the project area is included (See Plate XI-1). Three soils meet criteria for wetland soil status:

* Terric Cryosaprists (Map Unit D)
* Lucile (a component of Map Units F and I)
* Torpedo Lake Variant (a component of Map Unit B)

Terric Cryosaprist was not classified to the soil series level because SCS has not set up series names for these soils. Terric Cryosaprists are hydric soils because they meet the criteria for Histosols, organic soils indicative of wet conditions. Lucile (Sideric Cryaquod) and Torpedo Lake Variant (Humic Cryaquept) are hydric soils because they have "aquic" moisture regimes which indicate the presence of a reducing regime that is virtually free of dissolved oxygen because the soil is saturated by water.

Although all three soils are hydric soils, only Terric Cryosaprists appear in this situation to be indicators of potential jurisdictional wetlands. One small area (less than 9 acres) of Terric Cryosaprist soils exists within the proposed Wishbone Hill Coal Project permit area (see Chapter XI, Plate XI-1). This area consists of a narrow zone immediately adjacent to Buffalo Creek.

Both Lucile and Torpedo Lake Variant (TLV) meet hydric soil status for atypical reasons, and do not support vegetation unique to wetland areas. Lucile soils have a surface mantle of about 18 inches of wind deposited loess (with a small admixture of volcanic ash) over very gravelly glacial out wash. The upper two feet of the soil profile freezes during the winter and then thaws from the surface downward during May or as soon as weather permits. As the thaw progresses downward, the saturated zone above cannot drain and becomes a seasonal reduced zone due to a perched saturated condition. The Lucile soils are found in kettle positions within the large eskers found in the S 1/2 of Section 27, and in most of Sections 34 and 35, T19N, R2E. Soil mottling is found close to the surface and meets criteria for hydric status. As soon as the thaw is complete, the soil water freely drains through the coarse sand and gravel substrate, and the soil becomes well drained for the remainder of the frost-free season. The soil is not saturated long enough to provide conditions favorable for unique wetland plants. The kettles do not support wetlands even though Sideric Cryaquods are hydric soils.

SCS soil scientist, Mr. Mark Clark, (Project Leader - Matanuska Area Soil Survey, Palmer, Alaska) and Mr. Jim Nyenhuis (Soil Scientist for the Wishbone Hill Project) spent one day in the field in June, 1988, reviewing principal soils on the project area. The typical location for Lucile (WH-62) was visited and an additional auger hole was dug about 10 feet away from the previously described and sampled soil at WH-62. Mr. Clark verified the taxonomic classification, and also believes the kettle holes do not have unique wetland plants and should not be considered true wetlands (Clark 1988). He also concurred on the genesis of soil mottling due to a seasonally perched saturated zone.

The Torpedo Lake Variant soil has a similar thickness of loess at the surface but the substratum is a dense gravelly sandy loam till rather than glacial out wash. This soil also has mottling near the surface that meets criteria for hydric soils. The dense, compact till is acting as the impermeable zone and a saturated zone is perching above the till for a period of time during snowmelt. Again, unique wetland plants are not found in these areas and they should not be considered wetlands. The TLV soil is found in scattered spots on the upland till surface upslope from the glacial out wash areas and is mapped in complex with the Talkeetna soil which is well drained.

The Niklason taxadjunct soil, mapped on terraces of Moose Creek, is well drained with no mottling and is not a hydric soil. Also, Typic Cryumbrepts which are mapped in swales and small drainage way positions on the upland till surface are also well drained and have no soil mottling or other indicators of hydric soils.

3.2 Wetland Vegetation

3.2.1 Methods

Two areas within the proposed permit boundary were discussed as possible wetlands based on soils characteristics (see above):

an area adjacent to Buffalo Creek on Terric Cryosaprist soils and several sites in kettle bottoms on Lucile soils. Data for each of these potential wetlands was analyzed by calculating a weighted average for prevalence of hydrophytic species (Wentworth and Johnson 1986, Reed 1988). The vegetation analysis is based on a study of the Wishbone Hill area by Helm (1988) and the vegetation map produced by that study (See Chapter VIII & Plate VIII-1). The wetland indicator status for each species in these potential wetland stands within the permit area (Numbers 10 and 22 on Plate VIII-1) or potential wetland types (lowland meadow) was determined from Reed (1988). The indicator status is based on the frequency with which regional reviewers observed (in course of other work, not actually a study for this purpose) a species to occur in wetlands naturally without being planted (Reed 1988). Frequency refers to the approximate percentage of time that an observer saw the species in a wetland situation. The weights for each category occur in the last column.

Code	Name	Frequency	Value
OBL	Obligate	> 99% frequency-Always	1
FACW	Facultative wetland	67-99% frequency-Usually	2
FAC	Facultative	34-66% frequency-Sometimes	3
FACU	Facultative upland	1-33% frequency-Seldom	4
UPL	Upland	< 1% frequency-Not wet	5

The method of Wentworth and Johnson (1986) was used to calculate a prevalence index (PI) for hydrophytic vegetation. The cover values for each species were multiplied by their respective weight for their wetland status, then these numbers were summed (WTSUM). The cover values were also summed (COVSUM). Note that this sum of cover values does not correspond to total vascular plant species cover because of species overlap. The weighted sum (WTSUM) was then divided by the sum of cover values (COVSUM) to calculate PI. If PI < 3, there was a prevalence of hydrophytic vegetation.

3.2.2 Results

Three potential stands or vegetation types within the proposed permit area could have been considered for wetland status based on soils data. Two stands dominated by bluejoint and fireweed abut Buffalo Creek in the Terric Cryosaprist soil type. The third potential type includes the lowland meadow communities in the depressions between the eskers (Lucile soil).

The majority of species in the two sites along Buffalo Creek were FAC or FACU (Tables 1 and 2). There were occasional small strips of vegetation along the drainage that contained FACW species such as Carex spp. or Salix spp. The actual above-ground drainages were generally considerably less than 1 m across. The Salix cover was too small to be encountered by any transects. The dominant species on these sites were Calamagrostis canadensis (bluejoint) (FAC) and Epilobium angustifolium (fireweed) (FACU), which are species characteristic of disturbed sites and are found throughout the study area, especially on areas that have been burned or were influenced by old mining activities.

Bluejoint is sometimes found in wetland situations, but the vast majority of bluejoint stands in southcentral Alaska occur on more upland sites. The FAC indicator only means that it is found in wetland situations 34 to 66% of the time. Bluejoint is frequently grazed in natural meadows or grown for hay on managed lands (Mitchell and Evans 1966). The Buffalo Creek sites should be considered the non-wetland type of bluejoint occurrence. The vegetation was identified as Calamagrostis canadensis / Epilobium angustifolium, a mesic graminoid-forb type, according to Viereck et al. (1986). Bluejoint may dominate some wet graminoid types in Viereck et al. (1986), but the species composition in question puts these stands in the mesic category.

The kettle areas were covered by the mesic graminoid bluejoint - herb vegetation called Calamagrostis canadensis - Epilobium angustifolium of the Alaskan classification (Viereck et al. 1986) (Table 3). These sites were very diverse within each stand. Several sites graded from moister pockets containing sedges to well-drained higher areas. These pockets were too small to map separately. This diversity of microtopography partially accounts for the range in indicators for wetland species from OBL to UPL. The same arguments hold for the dominant bluejoint and fireweed in this type as in the previous stands.

Except for Sanguisorba stipulata and Urtica dioica, no OBL or FACW species provided more than 2% cover. Urtica's indicator status has varied from FACU to FACW nationwide, but no consensus has been reached in Alaska. Of species providing 5% or more cover, six are listed as FACU or UPL, three as FAC, and two as no consensus in Alaska. Hence these sites should not be considered as wetlands according to vegetation composition.

4.0 CONCLUSIONS

Based on the combined results of the soils and vegetation studies, no jurisdictional wetland areas exist within the proposed permit boundary for the Wishbone Hill Coal Project.

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GLOSSARY OF TERMS USED IN DEFINING HYDRIC SOILS

anaerobic: a situation in which molecular oxygen is absent from the environment.

drained: a condition in which ground or surface water has been removed by artificial means.

flooded: a condition in which the soil surface is temporarily covered with flowing water from any source, such as streams overflowing their banks, runoff from adjacent or surrounding slopes, inflow from high tides, or any combination of sources.

frequently flooded: a class of flooding in which flooding is likely to occur often under usual weather conditions (more than 50 percent chance of flooding in any year, or more than 50 times in 100 years).

growing season: the portion of the year when soil temperatures are above biologic zero (5 degrees C), as defined by Soil Taxonomy. The following growing season months are assumed for each of the soil temperature regimes:

Isohyperthermic:	January-December
Hyperthermic:	February-December
Isothermic:	January-December
Thermic:	March-October
Isomesic:	January-December
Mesic:	April-October
Frigid:	June-September
Cryic:	June-August
Pergelic:	July-August

hydrophytic vegetation: plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.

long duration (flooding): a duration class in which inundation for a single event ranges from 7 days to 1 month.

permeability: the quality of the soil that enables water to move downward through the profile, measured as the number of inches per hour that water moves downward through the saturated soil.

phase, soil: a subdivision of a soil series based on features (e.g. slope, surface texture, stoniness, and thickness).

ponded: a condition in which water stands in a closed depression. The water is removed only by percolation, evaporation, or transpiration.

poorly drained: water is removed from the soil so slowly that the soil is saturated periodically during the growing season or remains wet for long periods.

saturated: a condition in which all voids (pores) between soil particles are filled with water.

soil series: a group of soils having horizons similar in differentiating characteristics and arrangements in the soil profile, except for texture of the surface layer.

somewhat poorly drained: water is removed slowly enough that the soil is wet for significant periods during the growing season.

very long duration (flooding): a duration class in which inundation for a single event is greater than 1 month.

very poorly drained: water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season.

water table: the zone of saturation at the highest average depth during the wettest season. It is at least six inches thick and persists in the soil for more than a few weeks.

Table 1. Cover values and wetland indicator status for lower portion of Buffalo Creek area (St 10).

CATEGORY (N = 3)	$\bar{X}$	$S_{\bar{X}}$	S^2	N	NHAT	Wetland Indicator
GROUND	100.	0.	0.	3	1	
LITTER	100.	0.	0.	3	1	
HERBACEOUS	92.	4.	40.	3	1	
NON-FLOWERING	6.	2.	15.	3	73	
Gymnocarpium dryopteris	1.	1.	2.	3		FACU
Fern spp.	1.	1.	2.	3		
Equisetum pratense	4.	3.	27.	3		FACW
FORBS	23.	17.	890.	3	277	
Aconitum delphinifolium	1.	1.	2.	3		FAC
Epilobium angustifolium	19.	13.	515.	3		FACU
Geranium erianthum	1.	1.	2.	3		not listed
Heracleum lanata	1.	1.	2.	3		FACU
Mertensia paniculata	2.	2.	8.	3		FACU
Thalictrum sparsiflorum	1.	1.	2.	3		FAC
GRAMINOIDS	86.	2.	15.	3	1	
Calamagrostis canadensis	80.	3.	25.	3		FAC
Carex spp.	10.	4.	56.	3		FACW
WOODY	8.	4.	44.	3	132	
TALL SHRUBS	6.	3.	27.	3	135	
Alnus sinuata	6.	3.	27.	3		FAC
TREES	2.	2.	8.	3	507	
Betula papyrifera	2.	2.	8.	3		FACU+ (NC in AK)
TOTAL VASCULAR	92.	4.	40.	3	1	

Table 2. Cover values and wetland indicator status for upper portion of Buffalo Creek area (St 22).

CATEGORY (N = 3)	$\bar{X}$	$S_{\bar{X}}$	S^2	N	NHAT	Wetland Indicator
GROUND	99.	1.	2.	3	1	
LITTER	99.	1.	2.	3	1	
HERBACEOUS	100.	0.	0.	3	1	
NON-FLOWERING	42.	22.	1465.	3	143	
Dryopteris dilatata	7.	5.	90.	3		FACU
Fern spp.	27.	27.	2133.	3		
Equisetum pratense	2.	2.	8.	3		FACW
Equisetum spp.	11.	2.	15.	3		
FORBS	42.	21.	1315.	3	128	
Aconitum delphinifolium	1.	1.	2.	3		FAC
Epilobium angustifolium	23.	11.	340.	3		FACU
Heracleum lanata	9.	5.	65.	3		FACU
Mertensia paniculata	15.	11.	394.	3		FACU
Sanguisorba stipulata	2.	2.	8.	3		FACW (NC in AK)
Thalictrum sparsiflorum	2.	1.	2.	3		FAC
Urtica dioica	7.	7.	133.	3		FACU-FACW (NC in AK)
GRAMINOIDS	74.	12.	465.	3	15	
Calamagrostis canadensis	74.	12.	465.	3		FAC
TOTAL VASCULAR	100.	0.	0.	3	1	
OTHER						
Bare Ground	1.	1.	2.	3		

Table 3. Cover values and wetland indicator status for vegetation in kettles.

CATEGORY (N = 15)	$\bar{X}$	$S_{\bar{X}}$	S^2	N	NHAT	Wetland Indicator
GROUND	97.	1.	11.	15	1	
MOSS	12.	5.	316.	15	372	
Polytrichum	2.	1.	12.	15		
Feather moss	1.	1.	5.	15		
Dicranum	0.	0.	0.	15		
Moss spp.	9.	4.	247.	15		
LICHEN	6.	2.	63.	15	267	
Nephroma	3.	2.	52.	15		
Peltigera	2.	1.	19.	15		
Lichen spp.	2.	1.	15.	15		
LITTER	91.	4.	184.	15	4	
HERBACEOUS	90.	2.	63.	15	2	
NON-FLOWERING	2.	1.	17.	15	607	
Dryopteris dilatata	1.	1.	15.	15		FACU
Gymnocarpium dryopteris	0.	0.	0.	15		FACU
Equisetum pratense	1.	0.	3.	15		FACW
Equisetum silvaticum	0.	0.	0.	15		FACU
FORBS	69.	5.	412.	15	15	
Achillea boreale	0.	0.	2.	15		NL
Aconitum delphinifolium	3.	3.	104.	15		FAC
Caltha	0.	0.	0.	15		OBL
Cornus canadensis	8.	2.	92.	15		FACU
Epilobium angustifolium	29.	5.	407.	15		FACU
Geranium erianthum	11.	3.	153.	15		not listed
Geum macrophyllum	0.	0.	0.	15		FACW
Heracleum lanata	6.	4.	194.	15		FACU
Linnaea borealis	0.	0.	0.	15		UPL
Mertensia paniculata	9.	2.	49.	15		FACU
Polemonium acutiflorum	2.	0.	3.	15		FACU
Potentilla palustris	1.	1.	4.	15		OBL
Pyrola sp.	1.	1.	7.	15		FAC
Rubus arcticus	8.	2.	66.	15		FAC
Rubus spp. (or Aruncus)	0.	0.	2.	15		not listed
Sanguisorba stipulata	13.	2.	84.	15		FACW+ (NC in AK)
Taraxacum	2.	1.	12.	15		FACU
Thalictrum	1.	0.	1.	15		FAC
Urtica	5.	4.	242.	15		FACU-FACW (NC in AK)

TABLE 3 (Continued)

GRAMINOIDS	47.	6.	547.	15	42	
Calamagrostis canadensis	35.	6.	563.	15		FAC
Festuca altaica	12.	5.	315.	15		FAC
Phleum alpinum	1.	0.	2.	15		FACU
Carex - most areas	1.	1.	4.	15		FACW
Carex aquatilis	2.	1.	25.	15		FACW
Luzula	0.	0.	0.	15		FAC
WOODY	20.	4.	203.	15	85	
LOW SHRUBS	11.	2.	92.	15	129	
Echinopanax horridum	0.	0.	0.	15		FACU
Ledum groenlandicum	2.	1.	21.	15		FACW
Rosa acicularis	3.	1.	26.	15		FACU
Salix novae-angliae	0.	0.	2.	15		not listed
Salix planifolia	0.	0.	1.	15		FACW
Sorbus	3.	2.	36.	15		not listed
Spiraea beauverdiana	0.	0.	0.	15		FACU
Vaccinium uliginosum	2.	1.	7.	15		FAC
Viburnum edule	1.	1.	6.	15		FACU
TREES	10.	4.	190.	15	332	
Betula papyrifera	1.	1.	4.	15		FACU+ (NC in AK)
Populus tremuloides	2.	1.	13.	15		UPL
Picea glauca	7.	3.	168.	15		FACU
TOTAL VASCULAR	96.	1.	18.	15	1	

ADDENDA

ADDENDUM 1

OFFICE-BASED PRELIMINARY JURISDICTIONAL DETERMINATION FOR THE WISHBONE HILL SURFACE COAL MINING PROJECT

Office-Based Preliminary Jurisdictional Determination
Wishbone Hill Project
Sutton, AK

January 2009

Prepared for:

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1.0 Introduction and Purpose

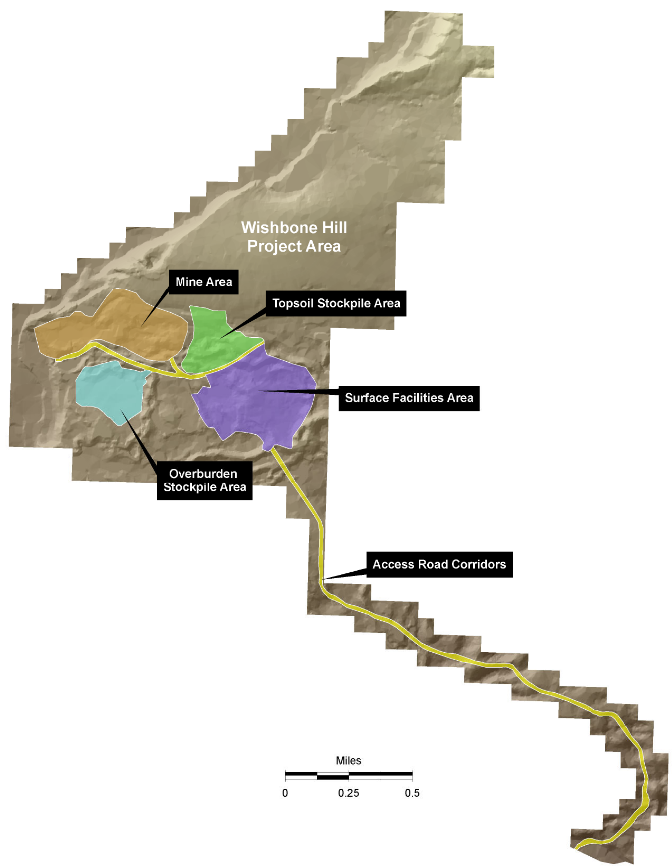
Usibelli Coal Mine, Inc. is currently evaluating alternatives to begin mining coal at the Wishbone Hill Project, a historic coal mining area located north of the Glenn Highway approximately 12 miles northeast of Palmer, Alaska within the Matanuska Valley (Figure 1). The Wishbone Hill mining lease area (Graphic 1) encompasses approximately 1,356 acres and is within the following land survey sections: Sections 22, 23, 26-28, and 34-36 of Township 19N, Range 2E and Section 1 of Township 18N, Range 2E, Seward Meridian. North of the project area are the Talkeetna Mountains; east is Moose Creek, and south is the Matanuska River. Most of the area is covered by undeveloped mixed birch/spruce forests and open graminoid/forb meadows. Disturbed areas, including stockpiles of mining spoils, cleared forest, and several unimproved gravel roads are intermixed across the central portion of the lease area.

A consideration for siting and selection of new mining facilities is the presence of wetlands and other regulated waters. This report describes locations within five proposed development areas (Graphic 1) that are preliminarily determined to be wetlands. Wetlands are subject to the jurisdiction of the U.S. Army Corps of Engineers (USACE) under authority of Section 404 of the Clean Water Act. By federal law (Clean Water Act) and associated policy, it is necessary to avoid project impacts to wetlands wherever practicable, minimize impact where impact is not avoidable, and in some cases compensate for the impact.

This preliminary jurisdictional determination (PJD) is an office-based study. No formal field verification was conducted. Off-site identification of wetlands and other regulated waters was completed using readily available aerial photographs, natural resource mapping, and existing documentation. Wetlands identified within each of the five proposed developments are discussed in Section 3 of this report. These five areas are shown on Graphic 1 and include the following:

- Surface Facilities Area (80.9 acres)
- Topsoil Stockpile Area (29.4 acres)
- Mine Area (64.0 acres)
- Overburden Stockpile Area (31.8)
- Access Road Corridors (35.6 acres)

Wetlands were originally evaluated for the Wishbone Hill Project in a 1989 study (Nyenhuis and Helm 1989). By circumstance of age, the findings presented in that study are outdated and inaccuracies may exist due to the quality of available source data during that time. Since the completion of that study, several orthorectified aerial images of much higher resolution have been produced for the project area, a detailed topographic survey has been completed, and other wetland and soil studies have been published. The purpose of this PJD is to update the 1989 study, identify recent datasets, and reevaluate the presence of wetlands or other regulated waters using the newly gathered information.



Graphic 1. Proposed Development Areas Evaluated for this PJD

The focus of this PJD is on identification of wetlands and other regulated waters; project design and impacts are not discussed in this report. Wetlands, waters of the U.S., and uplands (non-wetlands), as referenced in this report, are defined as:

> Wetlands: "Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 Code of Federal Regulations [CFR] Part 328.3(b)). Wetlands are a subset of "waters of the U.S." Note that the "wetlands" definition does not include unvegetated areas such as streams and ponds.
>
> As described in the 1987 Wetlands Delineation Manual and in the Alaska Regional Supplement to the 1987 Wetland Delineation Manual (USACE 1987, USACE 2007), wetlands must possess the following three characteristics: (1) a vegetation community dominated by plant species that are typically adapted for life in saturated soils, (2) inundation or saturation of the soil during the growing season, and (3) soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions.
>
> Waters of the U.S.: Waters of the U.S. include other waterbodies regulated by the USACE, including navigable waters, lakes, ponds, and streams, in addition to wetlands.
>
> Uplands: Non-water and non-wetland areas are called uplands.

In addition to a site being wetland, it can also be classified as either a jurisdictional or non-jurisdictional wetland depending on its connectivity to other regulated waters. Recent court decisions have attempted to clarify the USACE regulatory authority over wetlands without a direct surface water connection or those without a significant nexus to other regulated waters. As stated in recent 2008 guidance, the USACE will assert jurisdiction, without the need for a significant nexus finding, over all traditional navigable waters (TNW), wetlands adjacent to a TNW, non-navigable tributaries to a TNW that are relatively permanent, and wetlands that directly abut such tributaries. The USACE will also assert jurisdiction over non-navigable, not relatively permanent tributaries and their adjacent wetlands where such tributaries and wetlands have a significant nexus to a TNW. These include the following types of waters when they have a significant nexus with a traditional navigable water: (1) non-navigable tributaries that are not relatively permanent, (2) wetlands adjacent to non-navigable tributaries that are not relatively permanent, and (3) wetlands adjacent to, but not directly abutting, a relatively permanent tributary (e.g., separated from it by uplands, a berm, dike or similar feature). The USACE will assess the flow characteristics and functions of the tributary itself, together with the functions performed by any wetlands adjacent to that tributary, to determine whether collectively they have a significant nexus with traditional navigable waters (EPA and USACE 2008). Wetlands without a significant nexus to a TNW would be classified non-jurisdictional.

2.0 Methods

This PJD is office-based with no field verification. Readily available aerial photographs, natural resource mapping, and existing documentation were reviewed to determine the presence or absence of wetlands; no formal field sampling (using routine wetland determination data forms) of wetland areas was conducted. The following datasets were reviewed to identify potential wetlands and non-wetland "waters of the U.S." occurring in each of the five mapping areas:

- Color digital orthophoto taken on October 11, 2004 with a ground resolution of 0.6 meter pixel.
- Color digital orthophoto taken on October 18, 2004 with a ground resolution of 0.6 meter pixel.
- Color digital orthophoto taken on October 9, 2005 with a ground resolution of 1 meter pixel.

- U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) mapping for USGS topographic map Anchorage C-6 (Figure 2).
- Stream mapping from the Matanuska-Susitna Borough GIS department (Figure 2).
- Soil survey mapping from 1998 *Soil Survey of the Matanuska-Susitna Valley Area, Alaska*, produced by the Natural Resource Conservation Service (NRCS) (Figure 3).
- Topographic mapping (10-foot contour intervals) prepared for the Wishbone Hill Project (Figure 4).

Many of the above datasets were combined into a Geographic Information Systems (GIS) database and analyzed to identify probable wetlands or other regulated waters occurring at each five mapping areas. Delineating wetlands from aerial photography includes looking for vegetation clues, evidence of soil saturation, and evaluating topographic features. On aerial photography, scientists look for saturation-adapted vegetation communities, low plant height, open canopy structure, and presence of hydrophytic plant species. A common example is the presence of stunted spruce trees, which are indicative of a limitation to growth such as excessively wet soils. Visible evidence of wetland hydrology is also sought, including surface water and darker areas of photos indicating surface saturation. A site's proximity to streams, open water habitat, and marshes can be indicative of shallow subsurface water. Lastly, evidence of topographic high points and sloped surfaces that would allow soils to drain is used to support classifying those areas as upland. Topographic depressions, toes of slopes, and flat topography serve as indicators of potentially poor soil drainage.

In addition to examining aerial photograph features, natural resource mapping, including NWI wetland mapping and soil survey data was reviewed for this office-based study. NWI mapping is generally an effective tool for large-scale planning and analysis of wetlands but not suitable for smaller site-specific projects such as needed for this study. NWI mapping is primarily based on high altitude aerial photographic interpretation with limited ground truthing, and therefore wetland boundaries tend to be oversimplified with many smaller wetlands not included in the mapping. According to the NWI, no wetlands are identified within the mapping limits of this office-based PJD (USFWS 1996) (Figure 2). NRCS mapped soil types within each proposed development area are described in detail below (Section 3). Soils from the *Matanuska-Susitna Valley Area Soil Survey* (NRCS 1998) overlaid on the Wishbone Hill Project boundary are shown on Figure 3.

A GIS-based terrain analysis was completed for each of the five mapping areas to determine whether any topographic features exist that would promote or inhibit wetlands from occurring. Using topographic contours (10-foot contour intervals), a digital elevation model (DEM) was interpolated. From that DEM, slope angles were calculated, flow direction and flow accumulation patterns reviewed, and topographic features examined for indicators of wetland hydrology (i.e., depressions, rivulets, swales, etc.). Hillshade surface models developed from the DEM for each five mapping areas are shown in conjunction with aerial photography below on Graphics 2 through 5. Depressions, hillslope, drainage features, and other notable topographic features for the entire Wishbone Hill mining area are shown on Figure 4.

Lastly, all available datasets were reviewed collectively to complete digitizing of wetland-upland boundaries using GIS. GIS polygons were attributed with NWI mapping codes based on the USFWS *Classification of Wetlands and Deepwater Habitats of the U.S.* (Cowardin *et al.* 1979). A map of wetland boundaries overlaid on the 2005 aerial photograph base is shown on Figure 5. Descriptions of each mapped wetland type, their jurisdictional status, and acreage are included below in Section 3.

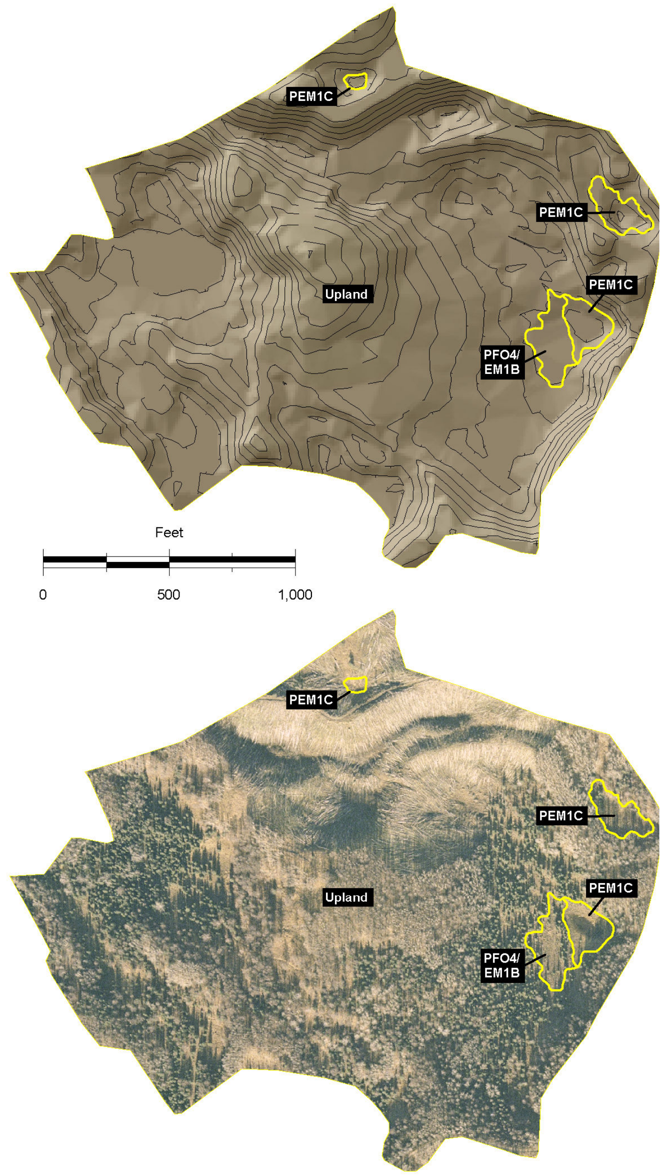
3.0 Project Area Descriptions

3.1 Surface Facilities Area

The Surface Facilities Area (SFA) (approximately 81 acres) is located in the central portion of the Wishbone Hill Project Area (Figure 1). Elevations within the SFA range from 810 feet to over 940 feet above sea level. Both undeveloped vegetated areas and disturbed cleared areas cover the site. At lower elevations, undisturbed areas are dominated by a cover of needleleaf forest; most likely consisting of mature white spruce (*Picea glauca* – FACU). Within the broad area of needleleaf forest are two forest openings dominated by forb and graminoid species. These two areas are located within kettle depressions. Across the higher elevations are dense forests of broadleaf trees, most likely comprised of paper birch (*Betula papyrifera* – FACU), balsam poplar (*Populus balsamifera* – FACU), or quaking aspen (*Populus tremuloides* – FACU).

Along the northern boundary of the SFA are barren areas of historic mining spoils. A single, closed depression dominated by graminoid and forb species occurs between the spoils at the northern tip of the SFA.

According to the soil survey, two soil types underlie the SFA (Figure 3). Higher elevations are mapped as Kichatna silt loam; lower elevations as Kashwitna silt loam. Both soils are not hydric, but may have 15 percent or less hydric inclusions within them (NRCS 1998).

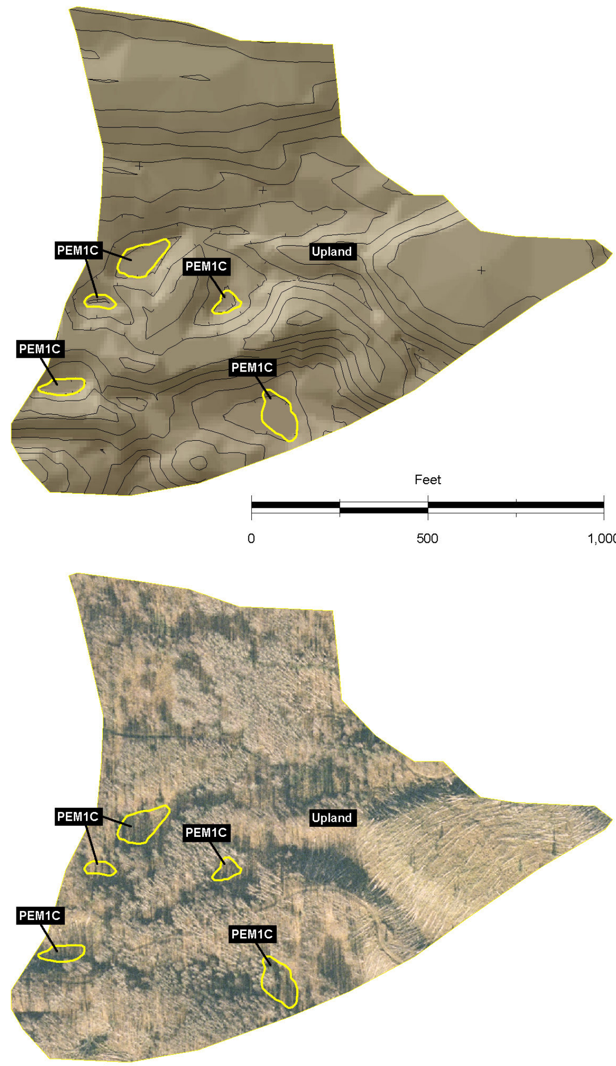


Graphics 2a and 2b. Surface Facilities Area Topography, Aerial Photography, and Wetland Mapping

Surface water is clearly visible within in the lowest-lying areas of the largest kettle depression near the eastern boundary (Graphic 2b). Darker color signatures on aerial photographs indicate saturated soils occur within all three kettle depressions. These areas are determined to be wetland (Figure 5). The two northernmost depressions appear to be seasonally flooded emergent wetlands (NWI mapping code PEM1C); the southern depression has both an area of PEM1C and a slightly higher area of saturated needleleaved forest/emergent wetlands (PFO4/EM1B). These wetlands cover approximately 2.4 acres of the mapped 81 acre area (Table 1). Topographically, all three mapped wetlands are located within closed basins, isolated from other wetlands or streams. Uplands appear to dominate the remaining areas, encompassing approximately 78.5 acres, or 97 percent of the mapped area (Table 1). These areas would not be subject to USACE jurisdiction.

3.2 Topsoil Stockpile Area

The Topsoil Stockpile Area (TSA) is located immediately northwest of the SFA. Elevations range from 850 feet to 970 feet within the 29-acre mapped area. Similar to the SFA, both undisturbed vegetated areas and unvegetated mining spoils cover the site. Undisturbed vegetated areas are dominated by dense canopies of mature broadleaf forest. Numerous forest openings are scattered across the site; these are likely dominated by a mix of graminoid and forb species. Five of the non-forested meadow communities are located within kettle depressions (Graphic 3a).



Graphics 3a and 3b. Topsoil Stockpile Area Topography, Aerial Photography, and Wetland Mapping

Areas along the eastern boundary are covered by historical mining spoils. No indicators of wetland are seen across these disturbed areas.

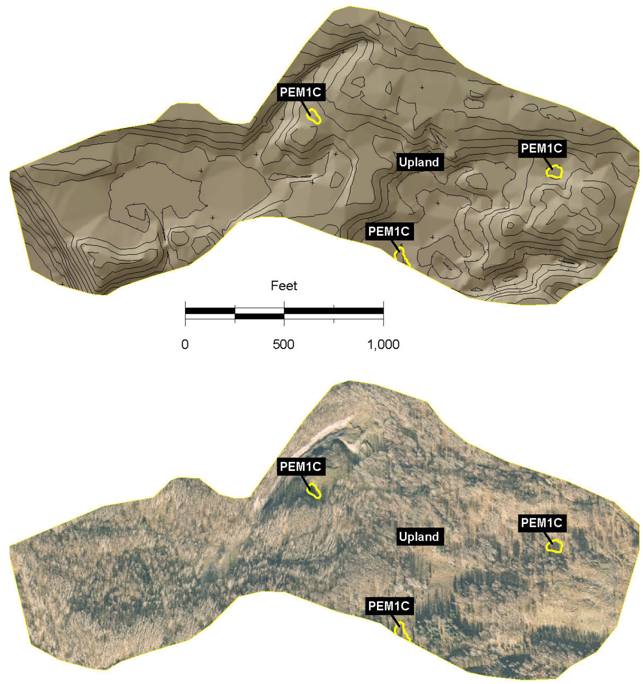
The soil survey identified two mapped soil types within the TSA (Figure 3). The majority of the site is mapped as Kichatna silt loam. Along the northern portion of the TSA, is the beginning of a large hill that extends northward across much of the Wishbone Hill Project Area. Across this hillslope, soils are mapped as Talkeetna/Warm-Talkeetna thick surface soil. Both of these soil types are predominantly non-hydric (NRCS 1998).

Evidence of soil saturation (darker coloration within non-forested meadow communities) is visible on aerial photographs within all five kettle depressions. These depressions are most likely seasonally flooded emergent wetlands (PEM1C) (Graphics 3a, 3b and Figure 5). The five wetland polygons cover approximately 0.7 acres (Table 1). Similar to the wetlands mapped in the SFA, these wetlands are within closed basins, isolated from any other wetland or drainage. These kettle depression wetlands likely meet the USACE definition as wetland but may be non-jurisdictional because they lack connection to other regulated waters.

Uplands appear to cover the remaining 78.5 acres, or 97 percent of the mapped area (Table 1). These areas lack vegetation communities typical of wetlands and are situated across topographic features (ridges, hillslopes, and convex landforms) that typically inhibit wetland formation. These areas would not be subject to USACE jurisdiction.

3.3 Mine Area

The Mine Area (MA), located west of the TSA, encompasses 64 acres. Elevations within the MA range from 790 feet to 980 feet. Nearly the entire MA remains undeveloped and covered with broadleaf forest, sparsely intermixed with spruce. Two previously disturbed areas occur along the eastern and central portions of the MA. These areas are mostly barren mounds of historical mining spoils. A small, gravel road parallels the northernmost disturbed area.



Graphics 4a and 4b. Mine Area Topography, Aerial Photography, and Wetland Mapping

Three small, non-forested depressions occur within the eastern half of the MA (Graphics 4a and 4b). The westernmost depression is surrounded by mining spoils, indicating the area may be man-made. The two eastern depressions appear to be natural kettles surrounded by mature forest communities.

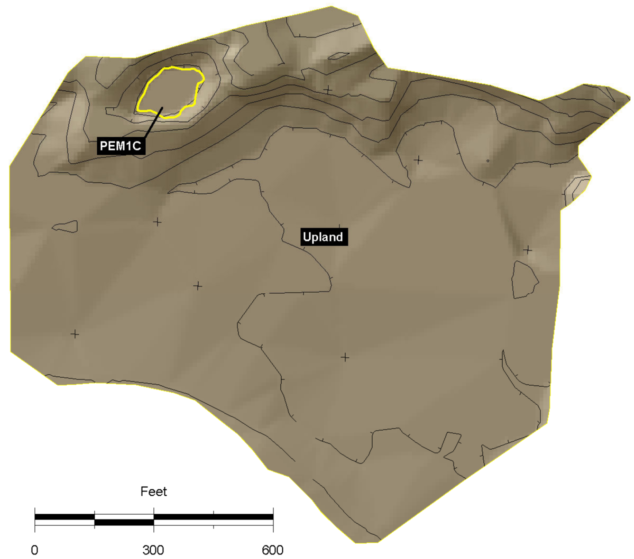
Four soil types are mapped in the MA (Figure 3). Kichatna silt loam underlies the majority of the site. Along the higher elevations near the northeastern boundary is small area of mapped Talkeetna/Warm-Talkeetna thick surface complex. Areas along the western boundary are underlain by Cryods and Cryochrepts. Lastly, the developed portions of the MA along the northern boundary are mapped as mine spoils. All four of these mapped soil types are non-hydric (NRCS 1998).

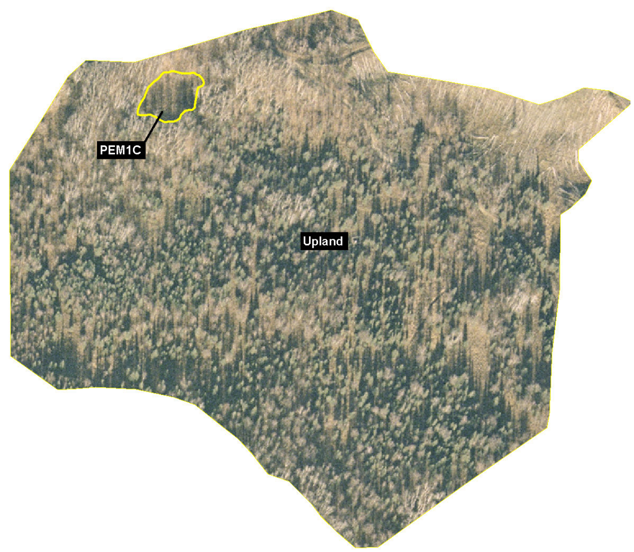
Surface water is visible on aerial photography within the northernmost topographic depression. This depression is likely a man-made impoundment of water, surrounded by barren, graded mounds of mine spoils. Areas of soil saturation are also visible within the other two kettle depressions. All three areas likely receive water from precipitation and runoff from surrounding areas. Each is likely to be inundated in the spring after snowmelt or during wetter times of the year, indicating a wetland type code of seasonally flooded emergent wetlands (PEM1C). These wetlands cover a 0.2-acre area of the MA (Table 1). All three mapped wetlands are within closed basins, isolated from any other wetland or drainage.

Uplands dominate the MA, covering approximately 63.8 acres, more than 99 percent of the mapped area (Table 1). Vegetation signatures on aerial photography indicated mature, forested communities dominated by bon-hydrophytic plant communities. Mapped non-hydric soil types and topographic features further indicate non-wetlands cover the majority of the MA. These areas would not be subject to USACE jurisdiction.

3.2 Overburden Stockpile Area

The Overburden Stockpile Area (OSA) encompasses 32 acres. Most of the OSA is flat with little topographic relief (Graphic 5a). Elevations range from 840 feet to 900 feet, with most elevation change occurring along the northern boundary. Mixed needleleaf and broadleaf forest dominate the broad, flat portions of the OSA. Along the northern border, three cover types are observed; these include broadleaf forest, graminoid/forb meadow, and a barren area of historic mining spoils. The graminoid/forb meadow area, similar to other mapping areas, is located within a kettle depression.





Graphics 5a and 5b. Overburden Stockpile Area Topography, Aerial Photography, and Wetland Mapping

Two soil types are mapped in the OSA, Kichatna silt loam and Depressional Cryaquepts (Figure 3). The expansive flat area covering the majority of the OSA is mapped as Depressional Cryaquepts. This soil type is hydric (NRCS 1998). Contrary to the mapped soil type, the vegetation community covering this area comprises mature white spruce intermixed with broadleaf trees (most likely paper birch or balsam poplar), indicating a non-hydrophytic plant community. Furthermore, no areas of soil saturation or topographic features (depressions or drainage features) indicate the presence of hydric soils. Kitchatna silt loam, a non-hydric soil type, covers the hillier portions along the northern boundary of the OSA.

Some evidence of saturated soils (darker photo signatures) is observed within the single kettle depression near the northwestern boundary. No other indicators of wetland hydrology are seen on aerial photographs. It is expected that this 0.3-acre depression is a seasonally flooded emergent wetland (PEM1C) (Table 1). Like all other mapped low-lying PEM1C wetlands within the Wishbone Hill Project Area, this wetland is located within a hydrologically closed basin, isolated from other wetlands or streams.

Uplands appear to dominate the remaining 31.5 acres of the OSA (Table 1). Although the soil survey indicates much of the area is underlain by hydric soil, lack of vegetation and hydrology indicators suggest the broad, flat area is non-wetland. These areas would not be subject to USACE jurisdiction.

3.2 Access Road Corridors

Two separated areas of proposed access road corridor exist within the mapping extent of this PJD. The longest corridor begins at the Glenn Highway and extends northward for approximately 2.6 miles (Figure 1). This proposed road would provide the primary access to the mine area. A nearly 500-foot elevation gain from the highway to the SFA exists along this route. A second set of access roads would connect the four larger mining facilities (SFA, TSA, MA, and OSA) near the central portion of the Wishbone Hill Project Area. Approximately one mile of road would be situated within these corridors.

The access road corridors traverse across all of the same cover types described above; including broadleaf forest, needleleaf forest, mixed broadleaf/needleleaf forest, graminoid/forb meadows, and barren areas of historic mining spoils. Six mapped soil types are intersected by the road corridors (Figure 3). All six types are non-hydric (NRCS 1998).

Similar to the other four mapping areas, indicators of wetland are seen exclusively in kettle depressions. Four small kettle depressions partially intersect the southernmost section of the proposed road corridor linking the mining areas to the Glenn Highway (Figure 5). These depressions encompass less than a 0.1-acre area (Table 1). Like other mapped wetlands, each of these depressions is covered by a graminoid/forb meadow community and soils appear saturated on aerial photographs. These four areas are determined to be seasonally flooded emergent wetlands (PEM1C). All are located within closed basins, isolated from any other wetland or regulated water.

No indicators of wetland are present within any other access road corridor area. These remaining areas, 35.5 acres in all (Table 1), appear to be upland and would not be subject to USACE jurisdiction.

4.0 Mapping and Classification Results

In summary, two wetland types are mapped in this office-based PJD; seasonally-flooded emergent wetlands (PEM1C) and saturated needleleaved forest/emergent wetlands (PFO4/EM1B). Areas mapped as seasonally flooded emergent wetlands on Figure 5 are generally locations where surface water or soil saturation (darker areas), or both, and non-forested plant communities are visible on aerial photographs. All of these mapped PEM1C wetlands are within kettle depressions or man-made impoundments that are likely conducive to retaining water. Approximately 2.8 acres of PEM1C wetlands were identified in this office-based study (Table 1).

A PFO4/EM1B wetland is mapped within a single low-lying area (0.9 acre) at the eastern boundary of the SFA. This mapped wetland type is dominated by a sparse canopy of needleleaf forest. The area borders a PEM1C wetland where surface water is clearly seen in aerial photographs. The open forest community is situated at nearly the same elevation as the PEM1C wetland within the broad kettle depression. The combination of nearby surface water and a modest elevation gain indicates a shallow water table within the depression. That shallow water table likely results in stunted spruce growth and sparse cover, both characteristics seen on aerial photography. A breakdown of mapped wetland acreage within each of the five proposed development areas is shown in Table 1.

It is clear from aerial photography and the terrain analysis using the DEM that all wetlands identified in this PJD are not connected to any other wetland or regulated water. Moose Creek is the closest relatively permanent tributary to the Matanuska River, a navigable water subject to Section 10 jurisdiction (USACE 1995). The closest wetland to Moose Creek mapped in this PJD is nearly 2,000 feet away; none of the mapped wetlands appear to have a surface water connection to the stream. However, due to the proximity to Moose Creek and Section 10 waters (Matanuska River), approximately 2 miles away from most mining features (Figure 1), the USACE would need to conduct a significant nexus test to determine if the wetlands described in this report would be subject to jurisdiction under Section 404. Based on information reviewed for this PJD, it is likely all mapped wetlands would be non-jurisdictional.

The remainder of the mapped area, approximately 238 acres (98 percent of the mapped area) appears to lack characteristics to support classifying those areas as wetland. These areas would not be subject to jurisdiction under Section 404, upon confirmation of the USACE.

Table 1. Mapping Summary

Mapping Code	Description	Surface Facilities Area	Topsoil Stockpile Area	Mine Area	Overburden Stockpile Area	Access Road Corridors	Total Mapped Acres
PEM1C	Seasonally flooded emergent wetland	1.5	0.7	0.2	0.3	0.1	2.8
PFO4/EM1B	Saturated needleleaved forest/emergent wetland	0.9	-	-	-	-	0.9
	Total Wetlands and Other Waters of the U.S.	***2.4***	***0.7***	***0.2***	***0.3***	***0.1***	***3.7***
U	Upland (non-wetland)	78.5	28.7	63.8	31.5	35.5	238.0
	Total Mapped Area	80.9	29.4	64.0	31.8	35.6	241.7

5.0 Determination Made By:

Jeff Schively, PWS #1813
Professional Wetland Scientist
HDR Alaska, Inc.
Date: January 2009

<u>*Attachments:*</u>
Figure 1. Vicinity Map
Figure 2. National Wetland Inventory Mapping
Figure 3. NRCS Soil Survey Mapping
Figure 4. Topographic Features
Figure 5. Office-Based Wetland Mapping

6.0 References Cited

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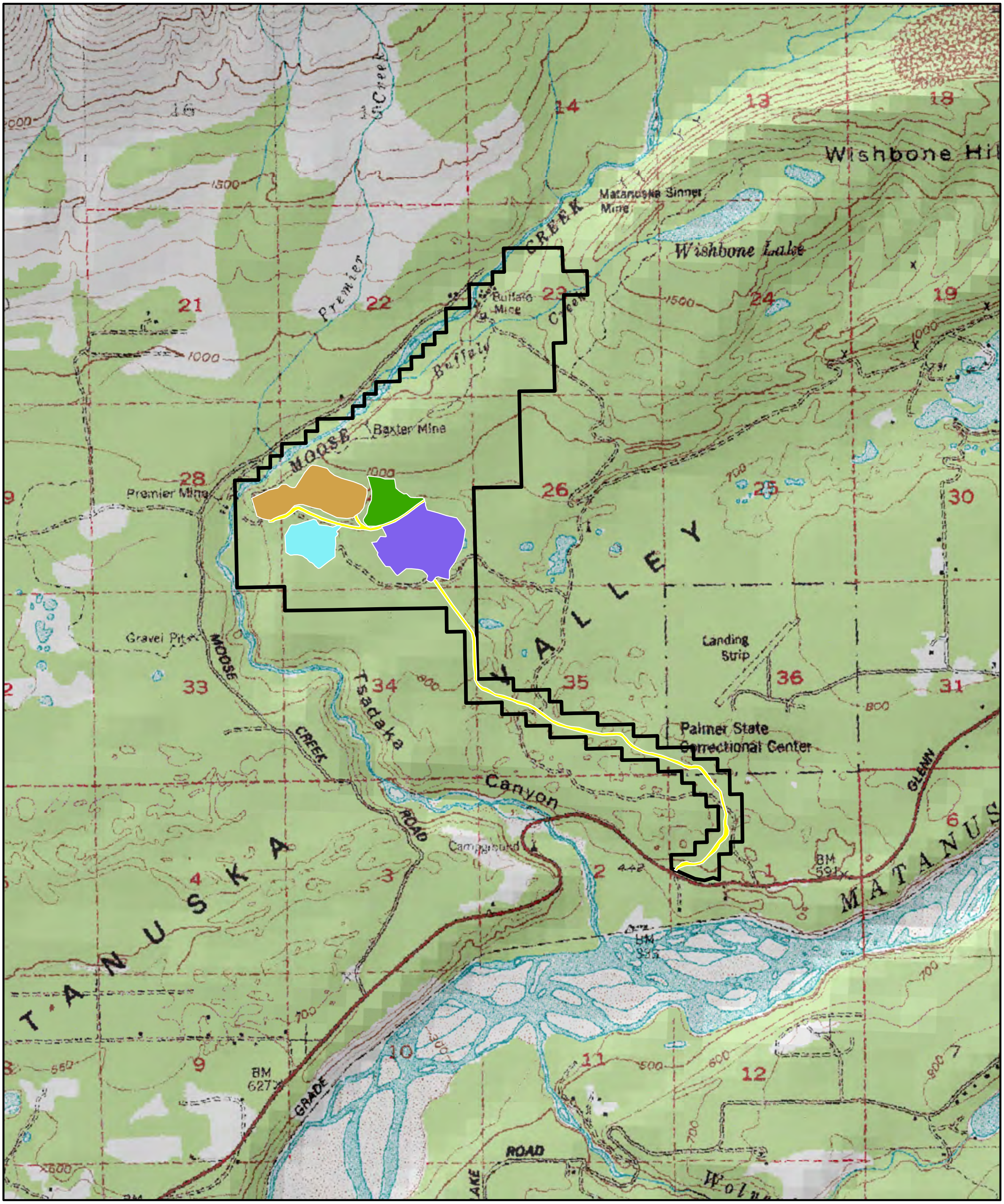
U.S. Fish and Wildlife Service (USFWS). 1996. National Wetland Inventory Mapping for USGS Quadrangles Anchorage C-6. Available online at: http://enterprise.nwi.fws.gov/shapedata/alaska/



N

MAP NOTES:
1. USGS topographic map Anchorage C-6 shown as base map.

Miles

0 0.25 0.5 1

LEGEND

Wishbone Hill Project Area

Areas Included in this Office-Based PJD

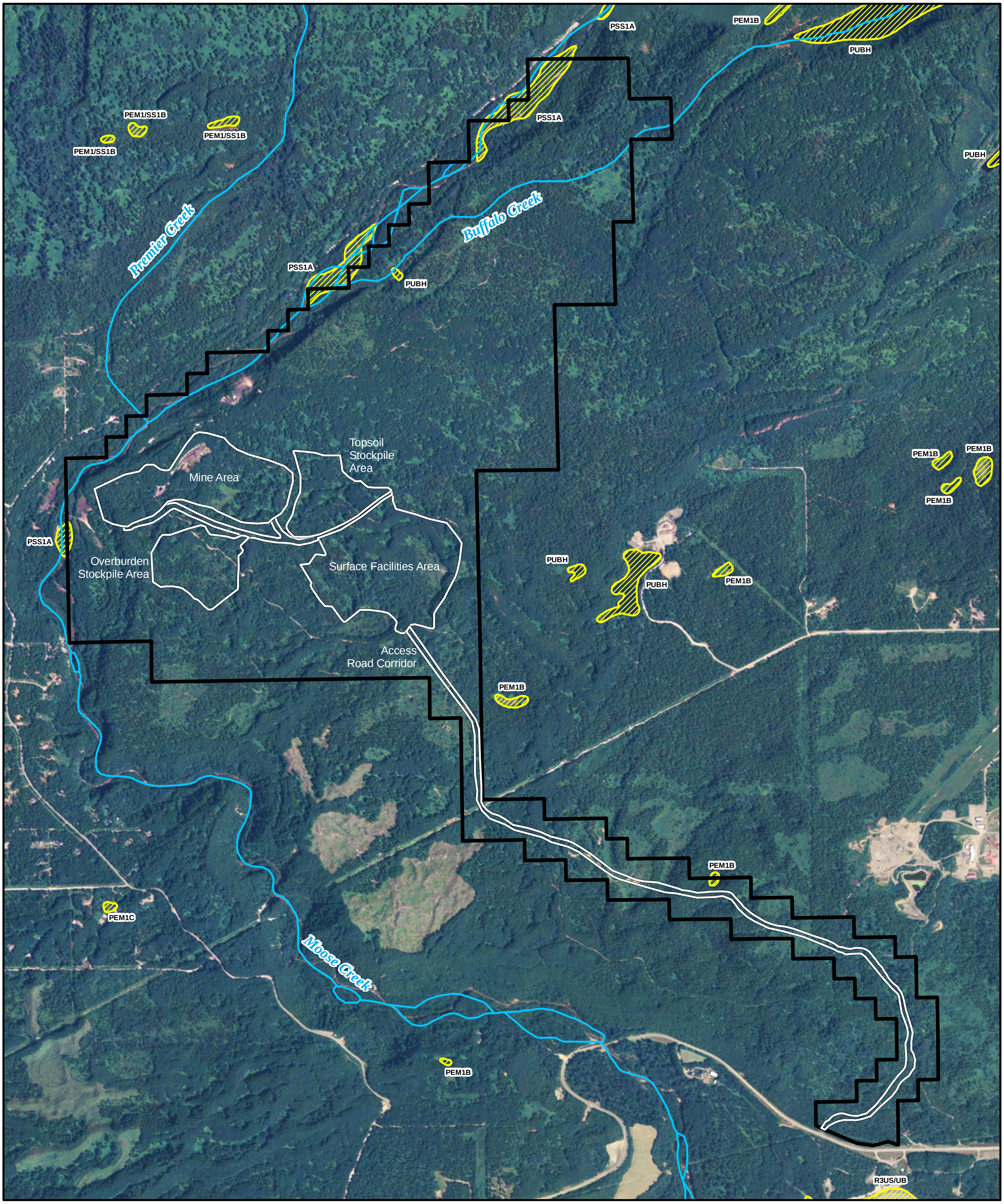
- Access Road Corridors
- Mine Area
- Overburden Stockpile Area
- Surface Facilities Area
- Topsoil Stockpile Area

Vicinity Map

Wishbone Hill Project

Preliminary Jurisdictional Determination

Figure 1



N

MAP NOTES:
1. Wetland mapping for USGS topographic map Anchorage C-6 completed by the U.S. Fish and Wildlife Service in 1996.

Feet

0 1,000 2,000 4,000

LEGEND

Wishbone Hill Project Area

Areas Included in this Office-Based PJD

Stream (MSB)

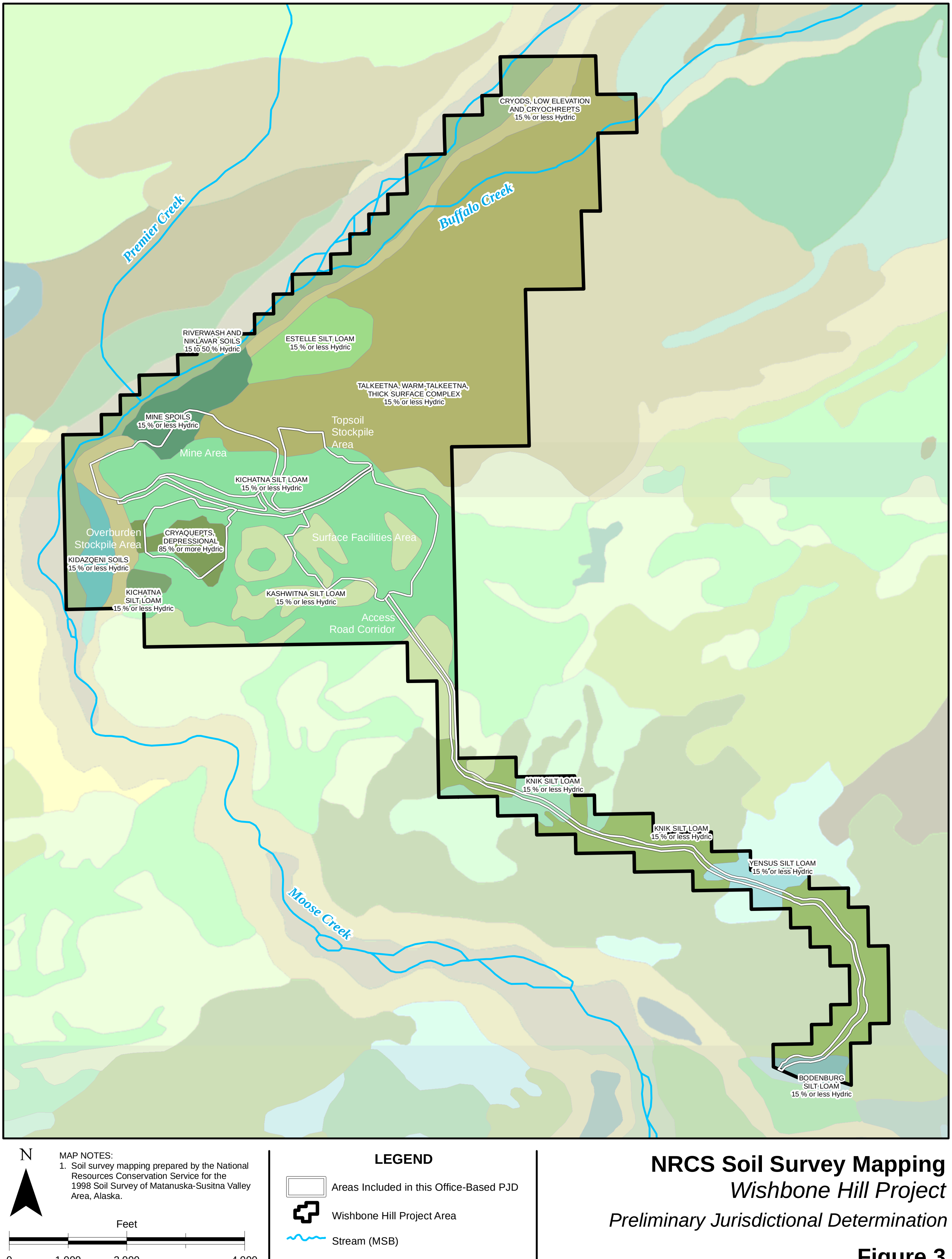
NWI Mapped Wetland

National Wetland Inventory Mapping

Wishbone Hill Project

Preliminary Jurisdictional Determination

Figure 2



MAP NOTES:

1. Soil survey mapping prepared by the National Resources Conservation Service for the 1998 Soil Survey of Matanuska-Susitna Valley Area, Alaska.

LEGEND

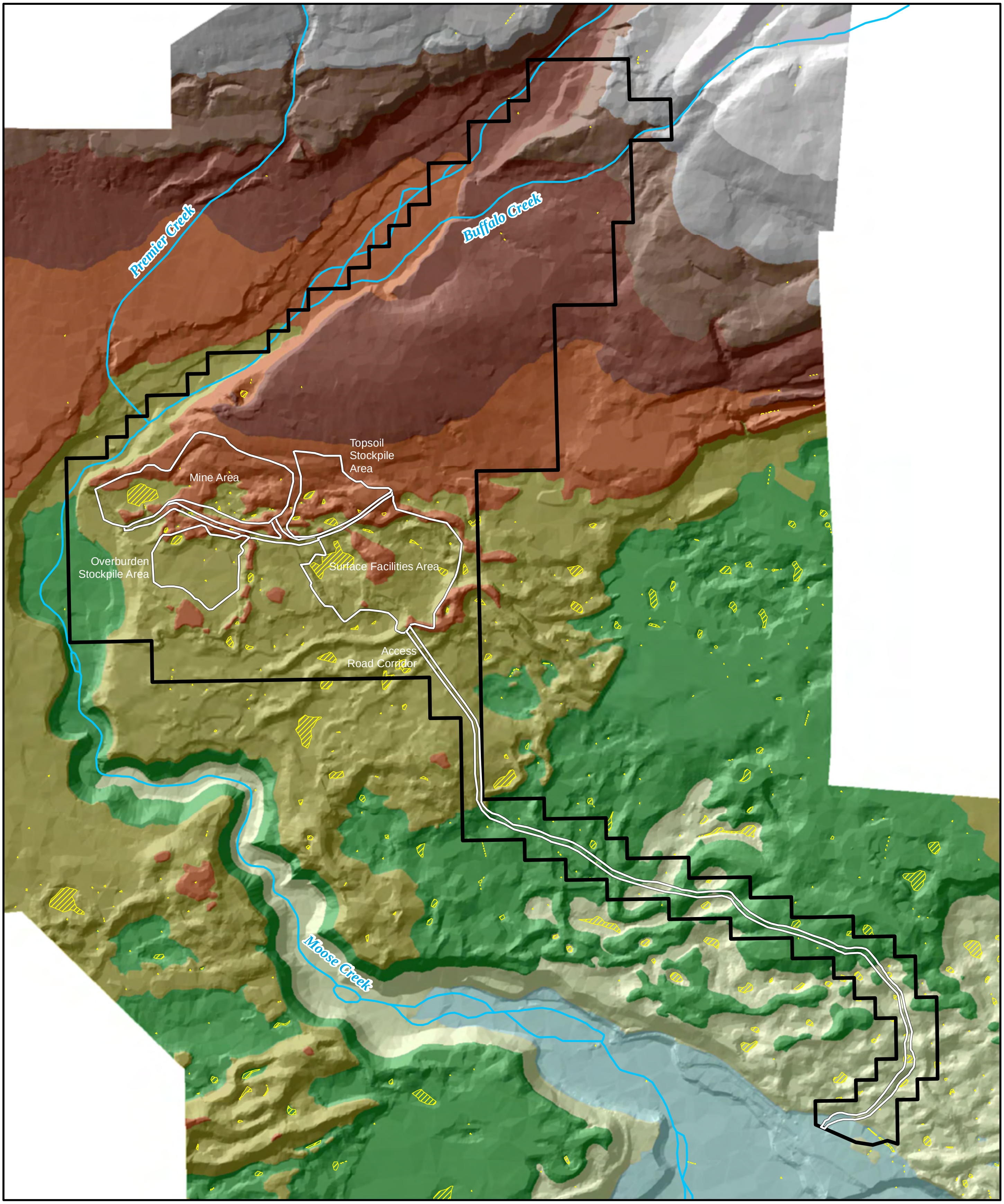
- Areas Included in this Office-Based PJD
- Wishbone Hill Project Area
- Stream (MSB)

NRCS Soil Survey Mapping

Wishbone Hill Project

Preliminary Jurisdictional Determination

Figure 3



N

MAP NOTES:
1. Digital Elevation Model data acquired from Usibelli Coal Mine, Inc.
2. Topographic depressions calculated using GIS "sink" tool.

Feet

0 1,000 2,000 4,000

LEGEND

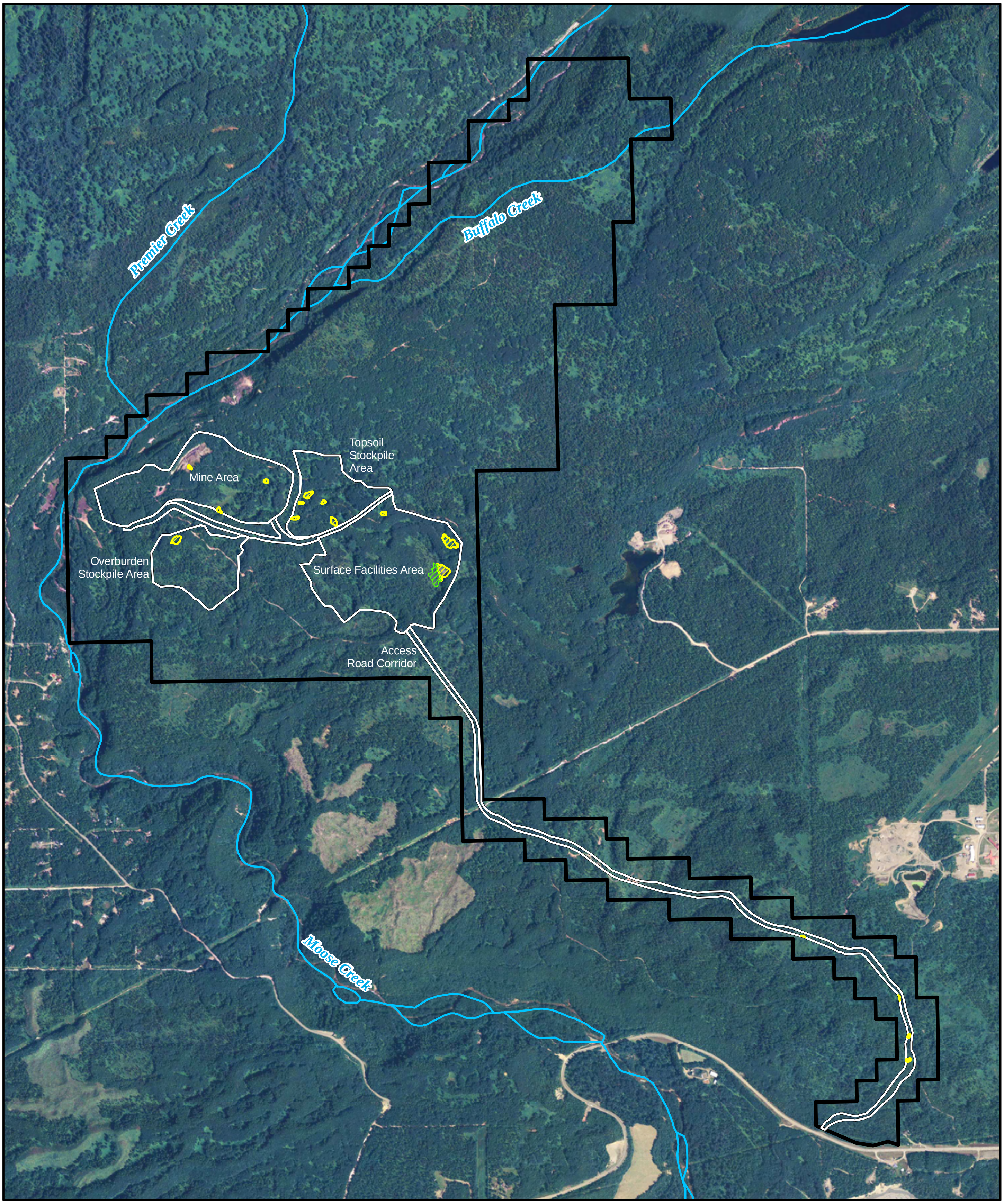
- Areas Included in this Office-Based PJD
- Wishbone Hill Project Area
- Depressions (calculated closed basins)
- Stream (MSB)

Topographic Features

Wishbone Hill Project

Preliminary Jurisdictional Determination

Figure 4



N

MAP NOTES:
1. Wetland mapping based on a review of aerial photographs, available resource mapping and reports, and topographic information. No fieldwork has been conducted to verify boundaries.

Feet

0 1,000 2,000 4,000

LEGEND

Areas Included in this Office-Based PJD

Wishbone Hill Project Area

Wetland Mapping

Seasonally Flooded Emergent Wetland

Saturated Needleleaf Forest/Emergent Wetland

Stream (MSB)

Office-Based Wetland Mapping

Wishbone Hill Project

Preliminary Jurisdictional Determination

Figure 5