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Travis/Peterson
Environmental Consulting, Inc.

August 31, 2017
1308-10

Department of the Army
U.S. Army District, Alaska
Regulatory Division
Westside Business Park
2175 University Avenue, Suite 201E
Fairbanks, Alaska 99709-4927

Attention: **Ellen Lyons**
Project Manager

Re: POA-2004-1227, Isabella Creek
Request for Permit Modification
Applicant Sponsored Mitigation Plan

Dear Ms. Lyons:

This letter contains the proposed applicant sponsored mitigation for the permit modification requested on December 19, 2016, and discussed in our meeting on February 3, 2017. The applicant appreciates you arranging the meeting and believes it was extremely helpful in clarifying the issues surrounding the proposed applicant sponsored mitigation requirements for the permit modification. The attached compensatory mitigation project plan was prepared in accordance with the provisions of 33 CFR 332.4 (c)(i). This mitigation plan includes the items described in 33 CFR 332.4 (c) paragraphs (c)(2) through (c)(14).

For simplicity, the revised modification requested by the applicant is:

> ***Modification 1*** – North Side Management, LLC requests a modification of the permit to replace the existing conservation area (Tract A and the 50 foot northern vegetation buffer) with a compensatory mitigation project located in the northwest subdivision corner. The conservation easement and buffer around Tract A would be .removed in exchange for the proposed compensatory mitigation project. The drainage easement located in Tract B would be given a functional lift by grading and emergent wetland vegetation establishment in the drainage swale bottom.
>
> North Side Management, LLC would like to utilize Tract A as deep open water pond that encompasses approximately the same footprint as Tract A. The pond would be connected to the CMP via twin 36-inch diameter culverts and a constructed drainage swale as shown in the attached plans.

The purpose and need for the permit modification was discussed extensively at the February 3, 2017 meetings. Generally there was broad agreement that because of public safety, some action with respect to Tract A is required, and that any action, including the clearing of vegetation, will require a modification of the permit conditions related to Tract A.

Tract A was part of the compensatory mitigation for wetlands impacted by the development of Northside Business Park:

> The purpose of the Tract A conservation buffer was to provide mitigation for wetland impacts associated with development of a commercial subdivision. The open water and emergent wetlands within Tract A were to provide habitat for migratory birds and local wildlife. Tract A made use of an existing pool of open water and surrounding wetlands. A forested buffer was to be maintained around the emergent wetlands to prevent their destruction.

If you have any questions or comments, please do not hesitate to contact me directly.

Sincerely,

Edmond C. Packee, Jr. PhD.
CPSSc., CPESC, CPSWQ, CESSWI
Senior Scientist

Attachment: Compensatory Mitigation Project Plan

COMPENSATORY MITIGATION PROJECT PLAN

FOR:

POA-2004-1227, ISABELLA CREEK

REQUEST FOR PERMIT MODIFICATION

Prepared for

NORTH SIDE MANAGEMENT, LLC
1080 Woodview Drive
Fairbanks, Alaska 99712

Prepared by:

TRAVIS/PETERSON ENVIRONMENTAL CONSULTING, INC.
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1308-10
August 2017

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1.0 INTRODUCTION

The following mitigation plan was prepared by Travis/Peterson Environmental Consulting, Inc. (TPECI) for North Side Management LLC, a management company representing the owner Northside Investors Limited Partnership, in accordance with the provisions of 33 CFR 332.4 (c)(i). This mitigation plan includes the items described in 33 CFR 332.4 (c) paragraphs (c)(2) through (c)(14).

The existing permit required a mix of *fee-in-lieu* mitigation and on-site and in-kind applicant sponsored mitigation. Due to circumstances largely beyond the control of the applicant, the areas of the project set aside under the applicant sponsored portion of the original permit mitigation have become threatened by unauthorized uses and future development beyond the control of North Side Management, LLC. Given the proximity of the site to Creamer's Field Migratory Waterfowl Refuge and a privately owned conservation area and the recognized value and use of on-site and in-kind applicant sponsored mitigation in the original permit, North Side Management LLC believes that in this case, permittee-responsible mitigation under a watershed approach is a superior approach to other forms of mitigation.

1.1 MODIFICATION REQUEST

North Side Management, LLC is proposing applicant sponsored mitigation. This mitigation plan describes the proposed applicant sponsored mitigation for Tract A. The modification requested by North Side Management, LLC is:

> ***Modification 1*** – North Side Management, LLC requests a modification of the permit to replace the existing conservation area (Tract A and the 50 foot northern vegetation buffer) with a compensatory mitigation project located in the northwest subdivision corner. The conservation easement and buffer around Tract A would be .removed in exchange for the proposed compensatory mitigation project. The drainage easement located in Tract B would be given a functional lift by grading and emergent wetland vegetation establishment in the drainage swale bottom.
>
> North Side Management, LLC would like to utilize Tract A as deep open water pond that encompasses approximately the same footprint as Tract A. The pond would be connected to the CMP via twin 36-inch diameter culverts and a constructed drainage swale as shown in the attached plans.

1.2 PURPOSE AND NEED FOR MODIFICATION

The purpose and need for the permit modification was discussed extensively at the February 3, 2017 meeting. Generally there was broad agreement that because of public safety, some action with respect to Tract A is required, and that any action, including the clearing of vegetation, will require a modification of the permit conditions related to Tract A. Tract A was part of the compensatory mitigation for wetlands impacted by the development of Northside Business Park.

The purpose of the Tract A conservation buffer was to provide mitigation for wetland impacts associated with development of a commercial subdivision. The open water and emergent wetlands within Tract A were to provide habitat for migratory birds and local wildlife. Tract A made use of an existing pool of open water and surrounding wetlands. A forested buffer was to

be maintained around the emergent wetlands to prevent their destruction. Due to circumstances beyond North Side Management, LLC.'s control, the conservation values which Tract A was intended to maintain cannot be met. The intent was to have a park like area that preserved the habitat values of the site and added beauty and green space to the subdivision.

1.2.1 Tract A is an Attractive Nuisance

Tract A has become an attractive nuisance and therefore a net negative for the subdivision. Tract A is uniquely situated so as to provide ease of access and proximity to ideal panhandling locations including:

- Johansen Expressway and Steese Expressway;
- Johansen Expressway and Old Steese Highway;
- Harold Bentley Drive and Johansen Expressway; and
- Merhar Avenue and Johansen Expressway.

Various existing pedestrian pathways and public roads provide direct access to the Farmers Loop East FNSB Transfer station (Dumpsters). The route from Tract A to the dumpsters is mostly below the line of sight of the adjoining Steese Expressway and activity cannot be easily monitored providing an almost 'hidden' thoroughfare.

Habitat and aesthetic values are not being maintained due to ongoing issues with transients who have taken up residence on Tract A. Human activity is scaring away the birds and the wildlife that Tract A was intended for. The homeless actually started a forest fire that resulted in the loss of screening vegetation on adjoining lots. The damage to the screening vegetation outside of the Tract A was so severe North Side Management was forced to remove the vegetation up to the boundary with Tract A. In addition to the impacts to the land and environment, the presence of the Tract A informal settlement has created a significant public safety issue as described below.

1.2.2 Nuisance Complaints and Criminal Activity

A large informal settlement has developed in the forested margin of Tract A between the Steese Expressway and the emergent wetlands. The homeless camp actually extends north into the wooded areas of Tract A. The Fairbanks Police Department and Alaska State Troopers have been called repeatedly to deal with transients who have taken up residence within and along the conservation easement.

The presence of the homeless settlement has created issues with use of the existing bicycle/pedestrian facilities along the Steese Expressway. Our understanding is that verbal harassment and sexually explicit abuse is directed towards primarily female users of the path as they pass through the settlement which has now grown to utilize both sides. This has created an environment where people are afraid to use the bike path and has generated a number of complaints to the Fairbanks Police Department and Alaska State Troopers.

The ongoing abuse of alcohol and illicit drugs by the homeless within the camp has resulted in numerous criminal complaints and repeated visits to Tract A by the Fairbanks City Police and the Alaska State Troopers. Although normally responding to reports of drug uses, assault, and other property crimes, at least once, human remains have been recovered from Tract A. Tract A

also has been 'featured' on the Discovery Channel television show *Alaska State Troopers*, much to the dismay of North Side Management, LLC.

The presence of the homeless camp has resulted in significant environmental degradation of Tract A. Aside from the ubiquitous drug paraphernalia including discarded needles, sanitary waste is everywhere including in the water body on Tract A. In addition, the 'residents' of the homeless camp have brought hazardous materials, including petroleum products and illicit drug making equipment onto Tract A. The solid waste issues, combined with the biohazard and hazardous waste issues that currently exist, have led North Side Management, LLC to contemplate hiring a hazardous waste firm to come and clean up the site.

As owners of Tract A, North Side Management, LLC, has made numerous attempts to prevent the establishment of the homeless camp. Efforts have included periodic removal of camps from the area, increased patrols by North Side personnel to discourage settlement, and working with local authorities including having the Alaska Department of Transportation and Publci Faiclities (ADOT&PF) clear to the edge of the right of way and testifying to the Fairbanks City Council regarding the situation. Nothing has proven successful.

1.2.3 Steese Expressway Expansion

The ADOT&PF is in the process of developing plans for an overpass connection between the Steese and Johansen Expressways to replace the existing intersection, which is a major accident area. Although very early in the planning process, we have been advised that the eastern edge of the Northside subdivision is considered the most likely location for the overpass due to the presence of a cemetery and churches on the east side of the Steese Expressway and the existing Steese Expressway right of way north of Northside Business Park. Although the exact size and scope of the new interchange is still in design, any new construction will further degrade the conservation area on Tract A and may result in a loss of the eastern third of the conservation area if additional lanes and pedestrian facilities are added. At the very least, the existing informal buffer will be reduced or eliminated leaving Tract A more exposed and isolated from other wildlife and avian habitat areas. Again, the intent of preserving Tract A was to create a park like area that preserved the habitat values of the site and added beauty and green space to the subdivision. The plans for a new interchange will undoubtedly negatively affect Tract A's value as wildlife habitat and reduce the existing acreage.

1.3 ADVANTAGES OF RELOCATING THE CONSERVATION EASEMENT

The creation of a wetlands area in the northwest corner of the subdivision on Lots 28 through 33 is advantageous over the current Tract A in that:

- The northwest corner of the site is relatively inaccessible and therefore not attractive to the transient population;
- The site is outside any planned or known development by others; and
- The mitigation area will adjoin two similar conservation areas (Creamer's Field and Fountainhead's private conservation area.

North Side Management, LLC believes the proposed modification is consistent with the intent and purpose of Tract A and enhances the mitigation requirement that was part of the permit

agreement. It is unfortunate that a modification must be requested for Tract A but there really does not appear to be an acceptable alternative given the existing circumstances, and future development plans for both the lots proposed for trade and ADOT&PF right of way. Ideally, this modification would be approved as soon as possible so that plat can be changed to reflect the new conservation area allowing habit values to be improved through work before ADOT&PF moves forward with right of way acquisition.

2.0 OBJECTIVES

The following sections provide a description of the resource type(s) and amount(s) that will be provided, the method of compensation (i.e., restoration, establishment, enhancement, and/or preservation), and the manner in which the resource functions of the compensatory mitigation project (CMP) will address the needs of the watershed, ecoregion, physiographic province, and/or other geographic area of interest.

2.1 RESOURCE TYPE AND AMOUNT OF MITIGATION

North Side Management, LLC proposes to replace Tract A with a constructed wetland and pond system to be located in the northwest corner of the subdivision (Figure 1, Attachment A). The acreage and functions of the existing Tract A conservation area are provided in Table 1.

2.2 PROPOSED METHOD OF COMPENSATION

North Side Management, LLC is proposing a permittee-responsible mitigation under a watershed approach (33 CFR 332.2). North Side Management, LLC proposes to undertake a CMP that will manipulate the physical, chemical, and biological characteristics of an aquatic resource to heighten, intensify, and/or improve a specific aquatic resource function(s).

Pursuant to 33 CFR 332.2, enhancement may result in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). The existing functional conditions and functions provided by Tract A are provided in Table 1. The expected functional conditions following CMP establishment are discussed in Section 2.3.

2.3 LANDSCAPE VALUE OF THE COMPENSATORY MITIGATION PROJECT

Once completed, the CMP will replace the values of Tract A and provide a functional lift to Tract A. The functions and expected functional conditions that the CMP is expected to provide following establishment are detailed in Table 2.

3.0 BASELINE INFORMATION USED FOR SITE SELECTION

The original Tract A was set aside as a conservation area based on the habitat values it provided[1]. The site selected (Figure 1, Attachment A) for the CMP offers numerous advantages relative to the existing conservation area. A review of site selection criteria are provided in the following sections.

[1] Seim, 2008. Email from Ms. S. Seim, U.S. Army Corps of Engineers, Alaska District, Fairbanks Field Office, to Mr. J. Whipple, Stutzman Engineering and Ms. J. Kuchle, Alaska Law, LLC. dated May 23, 2008.

Table 1: Existing Tract A Resource Types and Functions

Resource Type	Resource Size	Functions	Functional Condition
Shallow Open Water	2.056 acres	Groundwater Recharge	Function Not Present
		Groundwater Discharge	Function Not Present
		Flood flow Alteration	High
		Sediment Stabilization	Function Not Present
		Sediment/Toxicant Retention	High
		Nutrient Removal/Transformation	High
		Production Export	Function Not Present
		Aquatic Diversity/Abundance	High
		Wildlife Diversity/Abundance	High
		Recreation	Low
		Uniqueness/Heritage	Function Not Present
Emergent	6.201 acres	Groundwater Recharge	Function Not Present
		Groundwater Discharge	Function Not Present
		Flood flow Alteration	High
		Sediment Stabilization	Low
		Sediment/Toxicant Retention	High
		Nutrient Removal/Transformation	High
		Production Export	Function Not Present
		Aquatic Diversity/Abundance	High
		Wildlife Diversity/Abundance	High
		Recreation	Low
		Uniqueness/Heritage	Function Not Present
Shrub scrub	0.417 acres	Groundwater Recharge	Function Not Present
		Groundwater Discharge	Function Not Present
		Flood flow Alteration	High
		Sediment Stabilization	Function Not Present
		Sediment/Toxicant Retention	High
		Nutrient Removal/Transformation	High
		Production Export	Function Not Present
		Aquatic Diversity/Abundance	Low
		Wildlife Diversity/Abundance	High
		Recreation	Low
		Uniqueness/Heritage	Function Not Present
Upland forest	0.984 acres	Groundwater Recharge	Moderate
		Groundwater Discharge	Function Not Present
		Flood flow Alteration	High
		Sediment Stabilization	Function Not Present
		Sediment/Toxicant Retention	High
		Nutrient Removal/Transformation	Low
		Production Export	Function Not Present
		Aquatic Diversity/Abundance	Function Not Present
		Wildlife Diversity/Abundance	High
		Recreation	Low
		Uniqueness/Heritage	Function Not Present
Shoreline (shallow water)	1,641 linear feet		

Table 2: Expected Compensatory Mitigation Project Resource Types and Functions

Resource Type	Resource Size	Functions	Functional Condition
Shallow Open Water	2.474 acres	Groundwater Recharge	Function Not Present
		Groundwater Discharge	Function Not Present
		Flood flow Alteration	High
		Sediment Stabilization	Function Not Present
		Sediment/Toxicant Retention	Moderate to High
		Nutrient Removal/Transformation	High
		Production Export	Function Not Present
		Aquatic Diversity/Abundance	Moderate to High
		Wildlife Diversity/Abundance	High
		Recreation	Moderate to High
		Uniqueness/Heritage	Function Not Present
Emergent	7.930 acres	Groundwater Recharge	Function Not Present
		Groundwater Discharge	Function Not Present
		Flood flow Alteration	High
		Sediment Stabilization	Low
		Sediment/Toxicant Retention	Moderate to High
		Nutrient Removal/Transformation	High
		Production Export	Function Not Present
		Aquatic Diversity/Abundance	Moderate to High
		Wildlife Diversity/Abundance	High
		Recreation	Moderate to High
		Uniqueness/Heritage	Function Not Present
Shrub scrub	0.537 acres	Groundwater Recharge	Function Not Present
		Groundwater Discharge	Function Not Present
		Flood flow Alteration	High
		Sediment Stabilization	Function Not Present
		Sediment/Toxicant Retention	High
		Nutrient Removal/Transformation	High
		Production Export	Function Not Present
		Aquatic Diversity/Abundance	High
		Wildlife Diversity/Abundance	High
		Recreation	Moderate to High
		Uniqueness/Heritage	Function Not Present
Upland forest	0.954 acres	Groundwater Recharge	Moderate
		Groundwater Discharge	Function Not Present
		Flood flow Alteration	High
		Sediment Stabilization	Function Not Present
		Sediment/Toxicant Retention	High
		Nutrient Removal/Transformation	Low
		Production Export	Function Not Present
		Aquatic Diversity/Abundance	Function Not Present
		Wildlife Diversity/Abundance	High
		Recreation	Moderate to High
		Uniqueness/Heritage	Function Not Present
Deep Water	1.490 acres	Groundwater Recharge	Moderate
		Groundwater Discharge	Low
		Flood flow Alteration	High
		Sediment Stabilization	Function Not Present
		Sediment/Toxicant Retention	High
		Nutrient Removal/Transformation	High
		Production Export	Function Not Present
		Aquatic Diversity/Abundance	High

		Wildlife Diversity/Abundance Recreation Uniqueness/Heritage	High Moderate to High Function Not Present
Shoreline (Shallow Water)	2,386 linear feet		
Shoreline (Deep Water)	774 linear feet		

3.1 HYDROLOGIC CONDITIONS

3.1.1 Historic Surface Hydrologic Information

A review of historical information indicates that the hydrology of Tract A and the area proposed for the CMP had been modified by human activity as early as 1938. Based on historic aerial photography (Attachment B), it is likely that the entire area north of the Johansen Expressway drained west to Noyes Slough prior to human activity. Due to basin modification that blocked drainage to the west and the presence of the Steese Highway (1938 and 1949) to the east, a slough channel is readily apparent that leads to the southeast. The west end of the slough channel is blocked by agricultural activity and there is no apparent drainage across the plowed fields toward Noyes Slough. Aside from the Birch Hill cemetery and the development of the Birch Hill tank farm between 1938 and 1949, there is no apparent development in the watershed above Tract A. The USDA Soil Conservation Service[2] identifies surface runoff direction to the west south of what is now Tract A.

The next readily available aerial photograph is from 1996 and shows a four lane divided highway with pedestrian path had been constructed along the eastern margin. The 1996 aerial photograph also shows a road had been constructed south of Tract A and the CMP project area. This road effectively cut off surface drainage to the slough channel apparent in the 1949 aerial photograph. The construction of structures and fill east of the Steese Expressway has cut the surface hydrologic connection between Tract A and the slough channel flowing to the southeast. The agricultural fields to the west have been replaced with gravel pits and no drainage from Tract A or the CMP project area is apparent. The net result of human activity on Tract A has been to create a non free draining pond and wetland area.

Based on a review of the available aerial photographs, the pool of open water appears to be shrinking over time resulting in an expansion of the emergent wetland fringe. The photographs from 1938, 2002, and 2003 show a 'big pool' condition in which the open water area has expanded to what appears to be its maximum extent and the emergent wetland fringe is at its smallest extent. This 'big pool' condition contrasts markedly with the 'small pool' conditions shown in the 1949, 2007, 2008, and 2012 aerial photography. The 'small pool' condition appears to represent the maximum extent of the emergent wetland fringe and the minimization of the open water. The project proponent's desire is to utilize the 'small pool' condition as a basis for design to maximize wildlife, specifically avian, habitat. The acreage values for the existing open water and emergent wetland fringe (Table 1) represent a 'small pool' condition based on available aerial photography.

[2] USDA, 1963. *Soil Survey Fairbanks Area, Alaska*. United States Department of Agriculture, Soil Conservation Service, Washington D.C. 66 pages.

3.1.2 Existing Surface Hydrology

Neither the Tract A wetlands nor the CMP project area wetlands provide any meaningful flood control or protection functions at this time. Historic human activity has resulted in the hydrologic isolation of Tract A from downstream waters. The lack of a discharge point has been compounded by the development of residential neighborhoods on Birch Hill and the subsequent channelization of storm water from these subdivisions through a single large diameter culvert west of Fairhill Church. The channelization of water through a single culvert near 0.25 mile Farmer's Loop Road, the lack of drainage to the east through Fort Wainwright, and the lack of drainage from the retail area south of the Johansen Expressway has disrupted natural drainage resulting in spring flooding of adjoining upland areas.

Currently, storm water runoff from upslope areas collect in Tract A and to a limited degree in the CMP project area. Following collection in Tract A, runoff then flows to the west once the water rises after encountering the embankments of Harold Bentley Avenue and Northside Boulevard. Fill placed historically on adjoining properties west of Northside Business Park, directs flow north and west through the CMP into the Creamer's Refuge.

3.1.3 Surface Water Quality

TPECI[3] collected surface water quality samples at two locations near Tract A on April 25, 2008. Surface water quality samples were collected from the culvert outfall near Birch Hill Cemetery north of Lazelle Road between City Lights Boulevard and the Steese Expressway (S-1). Sample S-2 was collected from the culvert outfall south of Lazelle Estates between Joyce Drive and the Steese Expressway. Identified contaminants in the discharge from the Steese Expressway included petroleum products and metals. The results of sampling are presented in Table 3.

Table 3: Surface Effluent Sample Results near Tract A.

Sample ID	Date	DRO (mg/L)	RRO (mg/L)	GRO (mg/L)	Barium (mg/L)	Chromium (mg/L)	Lead (mg/L)
S-1	4/25/2008	0.497	1.3	ND	0.172	0.0139	0.0807
S-2	4/25/2008	0.502	0.894	ND	0.0153	ND	ND

Based on the aerial photograph review, the wetlands in Tract A have experienced contaminant loading from road runoff since at least 1938.

Tract A currently is not connected to downstream waters under normal conditions and due to the limited storage capacity did not provide any meaningful flood control functions at the time of permit issuance. The proposed CMP location was selected to establish connectivity between the constructed wetlands and downstream waters. Additionally, the site selected will allow the created wetlands to filter and sequester contaminants including heavy metals before water is discharged from the site.

[3] TPECI, 2008. Letter Report from Dr. E.C. Packee, TPECI to MV Investments LLC summarizing the results of water quality samples collected from roadside ditches and culverts that drain onto Lazelle Estates.

3.2 SUBSURFACE HYDROLOGY

3.2.1 Site Soils

Site soils were first described by the USDA Soil Conservation Service in 1963[4]. The open water on Tract A was identified and mapped. The remainder of the Northside Business Park including the area of the CMP, was within Mapping Unit GtA (Goldstream Silt Loam, 0 – 3 percent slopes). According to the USDA[5] "the Goldstream series consist of poorly drained soils with perennially frozen subsoil." The pedon description indicates that the depth to permafrost ranges from 10 to 24 inches and that "the soils above permafrost is always semifluid."

More recent mapping by the USDA[6] has divided the onsite soils into five series:

- Bolio Peat;
- Lameta Peat;
- Typic Cryaquent, Histic Cryaquept, and Terric Cryofibrist Soils;
- Typic Cryorthents, pit spoil; and
- Urban land.

The soils within Tract A consist of Typic Cryaquent, Histic Cryaquepts and Terric Cryofibrist soils surrounded by Bolio Peat. The soils of the CMP consist primarily of Bolio Peat. Soil borings have been advanced on the property that confirms the USDA mapping. Available soils information is provided in Attachment C.

Available Water Supply
Both the Bolio Peat and the Lameta Peat have relatively low available water storage in the top 100 centimeters (cm) of material (8.96 cm and 7.99 cm, respectively). The soils of Tract A have 30.6 cm of available water supply in the upper 100 cm. Additionally, while the organic matter content of the Bolio and Lameta Peats are in excess of 80 percent, the soils within Tract A have less than 10 percent organic matter.

Soil Drainage Class
The soils within Tract A are poorly drained while those of the rest of the site including the CMP area are very poorly drained. The soils of Tract A, Lameta Peat, and Bolio Peat all belong to hydrologic soil group D. Group D soils have a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a clay pan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission. The restrictive layer in the Lameta Peat and Bolio Peat is permafrost. The silt mantle that underlies Tract A is the impermeable layer and the underlying gravels are unfrozen.

[4] USDA, 1963. *Soil Survey Fairbanks Area, Alaska*. United States Department of Agriculture, Soil Conservation Service, Washington D.C. 66 pages.
[5] *Ibid.*
[6] USDA, 2017. *Web Soil Survey* online mapping tool and database accessed y Dr. E.C. Packee, TPECI on March 20, 2017. https://websoilsurvey.nrcs.usda.gov

The web soil survey information is corroborated by empirical observations made during excavation of peat on site. Namely that the peat of the CMP area is thawed to a depth of less than 3 feet on average and that surface water movement into the aquifer is severely restricted. The gravel beneath the soils of Tract A is unfrozen. However, the vertical movement of water is restricted by the presence of fine grained soils.

3.2.2 Groundwater Information

The onsite soils are underlain by permafrost. As noted by Kane[7]:

"The groundwater flow system [In Fairbanks] does not differ much from most groundwater systems. The following general rules can be made:

1. Recharge of the groundwater system occurs on permafrost-free hillslopes.
2. Permafrost acts as a confining layer and generally blocks any recharge.
3. Lakes and rivers, especially larger ones, can represent points of groundwater discharge. If permafrost is present under the water body, no discharge of subpermafrost groundwater will occur."

The surface water in the gravel pits located to the west of Northside Business Park indicates that the subpermafrost groundwater aquifer is between 15 and 20 feet below ground surface. Regional groundwater flow is to the west-northwest[8].

3.3 WATERSHED SCALE FEATURES

Based on available information[9], North Side Management, LLC considered the following watershed attributes when selecting the site for the CMP:

- Aquatic habitat diversity;
- Habitat connectivity; and
- Hydrologic connectivity.

Each of these attributes is described in the following sections.

3.3.1 Aquatic Habitat Diversity

Tract A has high habitat diversity. Four ecotypes are known to be present within the confines of Tract A:

- Shallow open water pool;
- Emergent wetland fringe;
- Shrub scrub palustrine wetland; and
- Broad leaved deciduous upland areas.

---

[7] Kane, D.L., 1980. Ground Water Recharge in Cold Regions. *The Northern Engineer, Vol. 13, No. 3.* Pages 28-33.
[8] Glass, et. al. 1996. *Groudn-Water Levels in an Alluvial Plain Between the Tanana and Chena Rivers Near Fairbanks, Alaska 1986-1993.* U.S. Geological Survey, Water Resources Investigations Report 96-4060. 125 pages.
[9] Seim, 2008. Email from Ms. S. Seim, U.S. Army Corps of Engineers, Alaska District, Fairbanks Field Office, to Mr. J. Whipple, Stutzman Engineering and Ms. J. Kuchle, Alaska Law, LLC. dated May 23, 2008.

The habitat diversity is something that North Side Management, LLC will retain as part of the CMP.

The CMP area has low habitat diversity and consists of shrub-scrub palustrine wetlands bordered by an upland forest to the west.

3.3.2 Habitat Connectivity

Tract A has low habitat connectivity due to historic human activity. Tract A has been isolated from downstream habitat by agricultural activity, industrial sand and gravel mining, commercial and residential subdivisions, and road development. As early as 1938, habitat connectivity had been lost due to the construction of the Steese Highway and agricultural activities to the west. Significant fragmentation occurred during the TAPS construction when the area south of North Side Business Park was cleared and filled. Even at the north end of Tract A, wildlife access is restricted due to the clearing of vegetation and road and home/business construction. The habitat value is further degraded by road noise from the Steese Expressway as all of Tract A is within 1,000 feet of the road surface. The overall habitat condition of Tract A, despite high diversity, is reduced due fragmentation from other wildlife habitat including Creamers Field Wildlife Refuge and high human presence along the east property boundary pedestrian path and highway.

The site of the CMP is contiguous with areas under management for wildlife and waterfowl habitat. The constructed mitigation wetlands will have high habitat connectivity.

3.3.3 Hydrologic Connectivity

Tract A currently is not connected to downstream waters. The limited storage capacity did not provide any meaningful flood control functions at the time of permit issuance. Based on discussions with local landowners, the lack of connectivity due to manmade barriers that severed the connection to downstream waters is a major cause of flooding. The proposed CMP area was selected to establish hydrologic connectivity between the constructed wetlands and downstream waters.

3.4 COMPATIBILITY WITH ADJACENT LAND USES AND WATERSHED MANAGEMENT PLANS

Tract A is adjacent to the Steese Expressway and north of commercial subdivision lots. Tract A is not compatible with the permitted land uses and the habitat will become more isolated as development continues. The proposed location of the CMP adjoins a private waterfowl/wildlife conservation area owned and managed by Fountainhead Development and the Creamer's Field Wildlife Refuge owned by the Alaska Department of Natural Resources and managed by the Alaska Department of Fish and Game. North Side Management, LLC had previously tried to donate Tract A to the State of Alaska to become part of Creamer's Field Wildlife Refuge but the offer was refused because Tract A did not adjoin the refuge boundaries. The fact that the two managed tracts west and northwest adjoin the site selected for the compensatory mitigation was crucial to that location being selected.

3.5 EFFECTS OF THE PROPOSED MITIGATION PROJECT

The successful completion of the CMP will provide connected habitat and hydrologic functions and will be compatible with and enhance adjoining land uses. North Side Management, LLC does not believe the CMP will have any negative reasonably foreseeable effects on ecologically important aquatic or terrestrial resources, cultural sites, or habitat for federally listed threatened and endangered species.

3.6 OTHER RELEVANT FACTORS

The Alaska Department of Transportation and Public Facilities (ADOT&PF) is in the process of developing plans for an overpass connection between the Steese and Johansen Expressways to replace the existing intersection, which is a major traffic congestion and accident area. Although very early in the planning process, we have been advised that the eastern edge of the Northside subdivision is considered the most likely location for the overpass due to the presence of a cemetery and churches on the east side of the Steese Expressway and the existing Steese Expressway right of way north of Northside Business Park. Although the exact size and scope of the new interchange is still in design, any new construction will likely degrade the conservation area on Tract A and may result in a loss of the eastern third of the conservation area if additional lanes and pedestrian facilities are added. At the very least, the existing informal buffer will be reduced or eliminated leaving Tract A more exposed and isolated from other wildlife and avian habitat areas. Again, the original intent of preserving Tract A was to create a park like area that preserved the habitat values of the site and added beauty and green space to the subdivision. The plans for a new interchange will undoubtedly negatively affect Tract A's value as wildlife habitat and reduce the existing acreage.

4.0 SITE PROTECTION INSTRUMENT

North Side Management, LLC intends to set aside the completed compensatory mitigation project as a conservation easement. Initially, the CMP area will be recorded on the deed and plat for Northside Business Park once approved. Initially North Side Management, LLC will be the owner of the conservation easement. Ultimately, North Side Management, LLC would like to turn the conservation easement over to the State of Alaska for inclusion within the Creamers Field Wildlife Refuge.

5.0 BASELINE INFORMATION FOR THE PROPOSED PROJECT

Existing baseline information for Northside Business Park has been evaluated during the preparation of this plan. Information includes:

- Historic aerial photography;
- Functional evaluation of Tract A performed as part of the original agency action for POA 2004-1227, Isabella Creek[10];
- Bird nesting survey of Tract A performed by ABR, Inc[11];
- Jurisdictional determination and wetland mapping; and

[10] Siem, S. 2008. Email correspondence with Mr. J. Whipple, Stutzman Engineering, and J. Kuchle, Cook, Schuman & Groseclose, Inc., dated May 23, 2008.

[11] ABR, Inc. 2008. *Bird Surveys at the Northside Business Park, May 2008.* Unpublished Consultancy report prepared for Cook, Schuman & Groseclose, Inc.

- Functional assessment method and results for the CMP.

All baseline information used is referenced or attached to this plan.

6.0 DETERMINATION OF CREDITS

Following establishment, the CMP will maintain the existing functions of Tract A. The creation of a wetlands area in the northwest corner of the subdivision on Lots 28 through 33 is advantageous over the current Tract A in that:

- The northwest corner of the site is relatively inaccessible and therefore not attractive to the transient population;
- The site is outside any planned or known development by others;
- The mitigation area will adjoin two similar conservation areas (Creamer's Field Wildlife Refuge and Fountainhead's private conservation area);
- The proposed site will provide habitat connectivity; and
- The proposed site will provide hydraulic connectivity with downstream waters.

North Side Management, LLC believes the proposed modification is consistent with the intent and purpose of Tract A and enhances the mitigation requirement that was part of the original permit agreement. The proposed CMP will provide equivalent or greater functions than Tract A A. Unless noted otherwise, the mitigation credits described in the following sections are provided based on full establishment of the CMP. Anticipated lag times between construction and full establishment are also provided in the followings sections.

Fee-in-lieu compensation was provided for the subdivision lots on which the CMP project is proposed to occur. Since mitigation has been provided for these lots, the functional value of the CMP area has not been assessed as part of the functional assessment.

6.1 FUNCTIONAL ASSESSMENT PROTOCOL

Wetland Evaluation Technique (WET)[12] is a broad approach to understanding and evaluating wetlands. It is based on information about correlative predictors of wetland functions. WET is most commonly used to allow regulators, and planners to predict the probability of a wetlands capability to perform specific functions. WET addresses 11 functions and values of wetlands:

- Groundwater recharge (GWR);
- Groundwater discharge (GWD);
- Floodflow alteration (FFA);
- Sediment stabilization (SS);
- Sediment/toxicant retention (S/TR);
- Nutrient removal/transformation (NR/T);
- Production export (PE);
- Aquatic diversity/abundance (AD/A);

[12] Adamus, P.R., L.T. Stockwell, E.J. Clairain, M.E. Morrow, L.D. Rozas, and R.D. Smith. 1991. Wetland Evaluation Technique (WET), Volume I; Literature Review and Evaluation Rationale. Technical Report WRP-DE-2, U.S. Department of the Army, Waterways Experiment Station, Vicksburg, Mississippi. 287 pp.

- Wildlife diversity/abundance (WD/A);
- Recreation (R); and
- Uniqueness/heritage (U/H).

For the purposes of this section, the WET functions are assessed using the following functional assessment score matrix (Table 4):

Table 4: Functional Condition Scores and Rationale

Functional Condition Score	Rationale
0	Function absent
0.25	Function is present and low value
0.5	Function is present and moderate value
1.00	Function is present and high value

Each function and value is addressed in the following sections.

6.2 GROUNDWATER RECHARGE AND DISCHARGE

Groundwater recharge is defined as the movement of surface water into the groundwater system. There are three factors that affect groundwater movement in wetlands: groundwater flow rates and storage capacity, direction and location of ground water movement, and evapotranspiration.

6.2.1 Groundwater Recharge (GWR)

Shallow recharge and minor groundwater discharges are sometimes termed leakage or seepage. When discharge to streams occurs during dry seasons, it is termed low (or base) flow augmentation. This assessment does not differentiate between shallow, lateral, and deep recharge. Shallow and lateral recharge are local phenomena of direct value to fewer water users than deep recharge, which is more pertinent to regional ground water systems.

6.2.2 Tract A Functional Assessment

The Palustrine shrub scrub wetlands of Tract A and the CMP area are underlain by frozen peat[13, 14, 15, 16, and 17]. The open water and emergent wetlands on Tract A are underlain by an impermeable layer of silt up to 200 cm thick. The depth to a restrictive layer (ice rich organic soils) in the Bolio Peat and Lemeta Peat is 40 cm and 50 cm, respectively. The saturated hydraulic conductivity (Ksat) of the frozen peat is 0.00 micrometers per second (μm/sec). The

[13] USDA, 1963. *Soil Survey Fairbanks Area, Alaska*. United States Department of Agriculture, Soil Conservation Service, Washington D.C. 66 pages.
[14] USDA, 2017. *Web Soil Survey* online mapping tool and database accessed y Dr. E.C. Packee, TPECI on March 20, 2017. https://websoilsurvey.nrcs.usda.gov.
[15] Soils Alaska P.C. 2008. *Preliminary Subsurface Soil Investigation: Tract C Bentley Trust North Subdivision(Preliminary Plat for Northside Business Park) Sec 02 T-1S, R1W, F.M. Fairbanks, Alaska.* Unpublished consultancy report prepared for Northside Investments dated June 10, 2008.
[16] Soils Alaska P.C. 2007. *Preliminary Subsurface Soil Investigation: Tract C Bentley Trust North Subdivision(Preliminary Plat for Northside Business Park) Sec 02 T-1S, R1W, F.M. Fairbanks, Alaska.* Unpublished consultancy report prepared for Northside Investments dated January 31, 2007.
[17] Soils Alaska P.C. 2008. *Preliminary Subsurface Soil Investigation: Tract C Bentley Trust North Subdivision Sec 02 T-1S, R1W, F.M. Fairbanks, Alaska.* Unpublished consultancy report prepared for Mr. Dave Dillard Northside Investments dated February 21, 2008.

silt mantle beneath the open water and emergent wetland on Tract A has a Ksat of 4.00 µm/sec. Based on available soils data, the wetlands of Tract A and the CMP area, are hydraulically isolated from the regional groundwater aquifer and all water present above the restrictive layer is precipitation/runoff derived. Based on the similar soil types (cryorthents/pit spoil) the KSat of the thawed gravel is 45 µm/sec and the upland area of Tract A is connected to the aquifer[18].

6.2.3 Proposed Compensatory Mitigation Project Functional Assessment

The 1.49 acres of deep water habitat will be connected to the regional groundwater aquifer. The anticipated water surface within the deep water habitat area will be at the regional aquifer surface. Based on the similar soil types (cryorthents/pit spoil) the KSat of the thawed gravel is 45 µm/sec[19].

Table 5: GWR Functional Condition Scores for Groundwater Recharge

Function	Tract A Wetlands	Compensatory Mitigation Project
GWR – Regional Aquifer	0 – no connectivity to aquifer	0.5 – deepwater habitat connected to regional aquifer
Associated Functions	GWR function absent No associated functions	Flood flow alteration; Sediment/Toxicant Retention

6.2.3.1 Mitigation Evaluation

The CMP is replacing the groundwater recharge functions of Tract A at a 2.48 to 1.00 ratio. The functional debits and credits for groundwater recharge are presented in the Table 6.

Table 6: Mitigation Credit and Debit Score for Groundwater Recharge

Habitat Type	Acres	Functional Condition Score†	‡Total score
Tract A Conservation Area			
Shallow open water	2.056	0.0	0.0
Emergent wetlands	6.201	0.0	0.0
Shrub scrub wetlands	0.417	0.0	0.0
Upland forest	0.984	0.5	0.492
		Total Functional Debit	**0.492**
Compensatory Mitigation Project			
Shallow open water	2.474	0.0	0.0
Emergent wetlands	7.930	0.0	0.0
Shrub scrub wetlands	0.537	0.0	0.0
Deep open water	1.490	0.5	0.745
Upland forest	0.954	0.5	0.477
		Total Functional Credit	**1.222**

† Established previously in preceding table.

‡ Total Score is calculated by multiplying habitat type acreage and functional score. Total score is a summation of the habitat type scores for each area.

[18] USDA, 2017. *Web Soil Survey* online mapping tool and database accessed y Dr. E.C. Packee, TPECI on March 20, 2017. https://websoilsurvey.nrcs.usda.gov.

[19] *Ibid.*

6.2.4 Groundwater Discharge (GRD)

Groundwater discharge is the movement of groundwater into surface water. In an email dated May 23, 2008, the Alaska District indicated the wetlands within the Northside Business Park had a groundwater discharge function[20]. Based on the WET model, groundwater discharge does not occur in the wetlands of the Northside Business Park[21]:

> "Both ground water discharge and ground water recharge occur when the water table intersects the surface water of a wetland. When the wetland is perched above the water table, only ground water recharge is possible."

Existing data indicates that soils beneath the entire subdivision, including Tract A, hydraulically isolate the wetlands from the groundwater system. The lateral transmission of surface water through the wetlands is discussed under flood flow alteration (Section 9.2).

6.2.5 Tract A Functional Assessment

Existing data indicates that soils beneath the entire subdivision, including Tract A and the CMP area, hydraulically isolate the wetlands from the groundwater system. This function is absent based on available data.

6.2.6 Proposed Compensatory Mitigation Project Functional Assessment

The 1.49 acres of deep water habitat will be connected to the regional groundwater aquifer. The anticipated water surface will be at the regional aquifer surface. It is anticipated that groundwater discharge to the compensatory mitigation project will only be apparent/occur during seasonal dry periods (September) and drought conditions. Hence, the functional condition score is low as indicted in Table 7.

Table 7: Functional Condition Scores for Groundwater Discharge

Function	Tract A Wetlands	Compensatory Mitigation Project
GWD– Regional Aquifer	0 – no connectivity to aquifer	0.25 – deepwater habitat connected to regional aquifer – seasonal/drought transient condition
Associated Functions	GRD function absent No associated functions	Sediment/Toxicant Retention Nutrient Removal/Transformation Production Export Wildlife Diversity/Abundance

6.2.7 GRD Mitigation Evaluation

The CMP is providing groundwater discharge function that does not currently exist on Tract A. The functional debits and credits for groundwater discharge are presented in Table 8.

[20] Siem, S. 2008. Email correspondence with Mr. J. Whipple, Stutzman Engineering, and J. Kuchle, Cook, Schuman & Groseclose, Inc., dated May 23, 2008.

[21] Adamus, P.R., L.T. Stockwell, E.J. Clairain, M.E. Morrow, L.D. Rozas, and R.D. Smith. 1991. Wetland Evaluation Technique (WET), Volume I; Literature Review and Evaluation Rationale. Technical Report WRP-DE-2, U.S. Department of the Army, Waterways Experiment Station, Vicksburg, Mississippi. 287 pp.

Table 8: Mitigation Credit and Debit Score for Ground Water Discharge

Habitat Type	Acres	Functional Condition Score†	‡Total score
Tract A Conservation Area			
Shallow open water	2.056	0.0	0.0
Emergent wetlands	6.201	0.0	0.0
Shrub scrub wetlands	0.417	0.0	0.0
Upland forest	0.984	0.0	0.0
		Total Functional Debit	**0.0**
Compensatory Mitigation Project			
Shallow open water	2.474	0.0	0.0
Emergent wetlands	7.930	0.0	0.0
Shrub scrub wetlands	0.537	0.0	0.0
Deep open water	1.490	0.25	0.373
Upland forest	0.954	0.0	0.0
		Total Functional Credit	**0.373**

† Established previously in preceding table.

‡ Total Score is calculated by multiplying habitat type acreage and functional score. Total score is a summation of the habitat type scores for each area.

6.3 FLOOD FLOW ALTERATION

Flood flow alteration is defined as the process by which peak flows from run-off, surface flow, groundwater interflow and discharge, and precipitation enter a wetland and are stored or delayed in their down slope journey. Major factors that affect flood flow alteration are:

- Magnitude and duration of storms;
- Run-off from upslope areas;
- Above ground storage capacity; and
- Frictional resistance.

Flood flow alteration also includes flood flow desynchronization. Flood flow desynchronization is the process by which flood waters are stored in numerous wetlands within a watershed, and then gradually released in a staggered manner. Storage of water may be measured in seconds or months, peak flows can be measured in inches or in feet, and flooded areas can be measured in square feet or square miles. Any location within wetlands that has a depression of any size has the potential to store surface water and can be a source of flood flow alteration.

6.3.1 Magnitude and Duration of Storms

The magnitude and duration of storms has a large influence on a basins flood response. NOAA[22] probable maximum storm event probabilities for a variety of recurrence intervals are provided in the Table 9.

[22] NOAA, 2017. *Point Precipitation Frequency Estimates for Fairbanks, Alaska.* NOAA Atlas 14, Volume 7, Version 2. Online database accessed by Dr. E.C. Packee, Jr., TPECI on April 10, 2017. Http://hdsc.nws.noaa.gov/hdsc/pfds.

Table 9: Northside Business Park Subdivision Probable Maximum Storm Data

Recurrence Interval	5-year	10-year	25-year	50-year	100-year
Duration	**Rainfall amount (inches)**				
30 min	0.370	0.456	0.573	0.664	0.755
60 min	0.507	0.624	0.785	0.910	1.03
6 hour	0.893	1.10	1.38	1.60	1.82
12 hour	1.16	1.42	1.79	2.10	2.43
24 hour	1.50	1.82	2.30	2.73	3.21

Source: NOAA (2017) NOAA Atlas 14, Volume 7, Version 2, Location Name: Fairbanks Alaska, USA . http://hdsc.nws.noaa.gov/hdsc/pfds.

Only the 24-hour storm totals were used for the purposes of this compensatory mitigation project plan.

6.3.2 Basin Parameters

The Northside Business Park is located at the downstream end of a larger watershed that is bounded by Isabella Creek on its western margin, the Johanssen expressway on it southern margin, and the Steese Expressway on its eastern margin. The northern watershed boundary is a topographic high between the Old Steese Highway and Farmers Loop Road. The total basin area is 276 acres. For the purposes of flood flow analysis, the basin has been divided into 6 subareas (Attachment D). Sub-basin data inputs for the TR-55 model are provided in Table 10.

Table 10: Basin Parameters Used for TR-55 Small Watershed Hydrology Model

Basin Sub Area	*Area (acres)*	*Curve Number*	*Time of Concentration (hours)*	*Reach Name*	*Downstream Reach*
I	41.95	77	0.878	A	B
II	109.51	83	1.869	B	Outlet
III	22.97	61	1.546	C	B
IV	2.5	73	5.018	D	Outlet
V	100	77	5.018	D	Outlet

6.3.3 Calculated Runoff from Upslope Areas

WinTR-55 Small Watershed Hydrology modeling[23] was performed to determine the volume of runoff under natural conditions existing prior to development and those existing following full development. Based on available data[24], the outlet for Northside Business Park is in the extreme northwest corner of the lot. It was assumed that following build out, Northside Business Park would be 90 percent paved excluding Tract A. The results of the TR-55 modeling are provided in Table 11.

[23] NRCS, 2009. *WinTR-55 Small Watershed Hydrology.* Program and Users Guide. Natural Resources Conservation Service, Conservation Engineering Division. 126 pages.
[24] Refer to Section 3.1.2.

Table 11: Calculated Peak Flows for Northside Business Park Subdivision

Recurrence Interval	5-year (ft^3/sec)	10-year (ft^3/sec)	25 year (ft^3/sec)	50-year (ft^3/sec)	100-year (ft^3/sec)
Undeveloped	7.62	13.73	24.86	36.52	50.63
Developed	26.33	36.94	54.59	71.26	90.32
Developed with mitigation project	No discharge	No discharge	No discharge	No discharge	No discharge

As envisioned under the original permit, an increased flow rate of 100 percent was anticipated at the outlet. The addition of the compensatory mitigation project results in no flood discharges following development.

6.3.4 Calculated Storm Event Runoff Volumes

The estimated runoff volume for the storm events were calculated for existing and fully developed conditions. Runoff depth was estimated based on the SCS curve number and storm precipitation volume. The data presented in Table 12 assume that no water can be discharged from Northside Business Park and represents a worst case storage scenario.

Table 12: Estimated Flood Volumes for 24-hour Duration Precipitation Events

Recurrence Interval	5-year (acre-feet)	10-year (acre-feet)	25-year (acre-feet)	50-year (acre-feet)	100-year (acre-feet)
Undeveloped	6.06	8.20	10.29	17.48	25.26
Developed	13.64	16.53	19.46	28.40	37.68

6.3.5 Flood Flow Desynchronization

The timing of peak flow through the watershed under the preexisting conditions, original permit conditions, and with the compensatory mitigation project was estimated using WinTR-55. The CMP will result in no discharge from the site for the range of design storms used in the WinTR-55 modeling (Table 13).

Table 13: Timing of Peak Flows for 24-hour Duration Precipitation Events

Recurrence Interval	5-year (hours)	10-year (hours)	25-year (hours)	50-year (hours)	100-year (hours)
Undeveloped	18.68	18.18	17.59	17.29	17.16
Developed	14.30	14.37	14.29	14.28	14.33
Developed with mitigation project	No discharge	No discharge	No discharge	No discharge	No discharge

6.3.6 Tract A Functional Assessment

The Palustrine shrub scrub wetlands of Tract A are underlain by frozen peat[25]. The open water and emergent wetlands on Tract A are underlain by an impermeable layer of silt up to 200 cm thick. The depth to a restrictive layer (ice rich organic soils) in the Bolio Peat and Lemeta Peat

[25] Refer to Section 3.2.1 and Section 6.2.

is is 40 cm and 50 cm, respectively. The saturated hydraulic conductivity of the frozen peat is 0.00 micrometers per second (μm/sec). The silt mantle beneath the open water and emergent wetland on Tract has a Ksat of 4.00 μm/sec. Based on available soils data, the wetlands of Tract A, are hydraulically isolated from the regional groundwater aquifer and all water present above the restrictive layer is precipitation/runoff derived. The estimated surface storage volume for each of the habitat types presented in Table 14.

Table 14: Flood Flow Functional Assessment for Tract A Wetland.

Habitat Type	Acres	Available Storage Depth (feet)	Total Capacity (acre-feet)
Tract A Conservation Area			
Shallow open water	2.056	6.0	12.34
Emergent wetlands	6.201	3.0	18.60
Shrub scrub wetlands	0.417	1.5 (active layer)	0.63
Upland forest	0.984	0.0	0.0
Total Functional Storage (acre-feet)			**31.57**

6.3.7 Compensatory Mitigation Project Functional Assessment

The compensatory mitigation project will have similar hydrologic attributes as the existing Tract A. The estimated surface storage volume for each of the habitat types to be created is provided in Table 15.

Table 15: Flood Flow Functional Assessment for Compensatory Mitigation Project

Habitat Type	Acres	Available Storage Depth (feet)	Total Capacity (acre-feet)
Shallow open water	2.474	6.0	14.84
Emergent wetlands	7.930	3.0	23.79
Shrub scrub wetlands	0.537	1.5 (active layer)	0.81
Deep open water	1.490	10	14.90
Upland forest	0.954	0.0	0.0
Total Functional Storage (acre-feet)			**54.34**

6.3.8 Flood Flow Mitigation Evaluation

The CMP is replacing the flood storage functions of Tract A at a 1.72 to 1.00 ratio. The functional debits and credits for flood storage are presented Table 16.

Table 16: Mitigation Credit and Debit Score for Flood Flow Alteration

Habitat Type	Acres	Flood Storage (acre-feet)	Functional Condition Score†	‡Total score
Tract A Conservation Area				
Shallow open water	2.056	12.34	1.0	12.34
Emergent wetlands	6.201	18.60	1.0	18.60
Shrub scrub wetlands	0.417	0.63	1.0	0.63
Upland forest	0.984	0.0	1.0	0.0
			Total Functional Debit	**31.57**
Compensatory Mitigation Project				
Shallow open water	2.474	14.84	1.0	14.84
Emergent wetlands	7.930	23.79	1.0	23.79
Shrub scrub wetlands	0.537	0.81	1.0	0.81
Deep open water	1.490	14.90	1.0	14.90
Upland forest	0.954	0.0	1.0	0.0
			Total Functional Credit	**54.34**

† Established based on storage capacity in acre-feet.

‡ Total Score is calculated by multiplying habitat flood storage capacity and functional score. Total score is a summation of the habitat type scores for each area.

The WinTR-55 modeling results indicate that the compensatory mitigation project will retain storm water discharge for the existing conditions and the anticipated build out conditions of 90 percent paved/impervious surfaces for all modeled storm events.

6.4 SEDIMENT STABILIZATION

Sediment stabilization consists of both shoreline anchoring and dissipation of erosive forces. Shoreline anchoring is the stabilization of soils at the water's edge or in shallow water by roots and other plant parts. Dissipation of erosive forces is the lessening of energy associated with waves, currents, ice, water-level fluctuations, or ground water flow. This includes any wetland causing decrease in erosive energy or an increase of shoreline anchoring. The following processes affect sediment stabilization; energy associated with erosive forces, frictional resistance offered by the wetland, position of the wetland relative to the upland and incoming erosive forces, ability of wetland plants to anchor the soil, and erodibility of uplands being protected.

The existing wetland shoreline is stabilized with emergent vegetation. The proposed CMP shoreline will grade into emergent vegetation similar to the existing conditions. The relatively small area of surface water relative to the emergent wetlands in both the existing and fully developed CMP conditions minimizes wave action and the potential for shoreline erosion is minimal.

This wetland function was not identified in the initial permitting documentation for Tract A nor is this function likely to be created in any meaningful way in the compensatory mitigation project. The upslope areas under the undeveloped and the developed scenarios are stabilized either with vegetation or impervious surfaces.

Table 17: Sediment Stabilization Functional Assessment

Function	Tract A Wetlands	Compensatory Mitigation Project
Sediment Stabilization	0.25 – function present	0.25 function is planned
Associated Functions	None	None

6.5 SEDIMENT/TOXICANT RETENTION

Sediment/toxicant retention is defined as the process by which suspended solids and chemical contaminants such as pesticides and heavy metals adsorbed to them are retained and deposited within a wetland. It may also involve retention of run-off-borne contaminates before they move into the deep water of a wetland or groundwater aquifers. Most wetlands that have heavy vegetation are excellent sediment traps. The length and time sediments and toxicants are retained depends on the hydrologic and chemical characteristics of the specific wetland. The following factors affect sediment/toxicant retention:

- Amount of incoming sediment;
- Particle size and density of suspended sediment;
- Difference in energy levels of suspending forces within the wetland versus up current areas;
- Vertical layering caused by salinity and temperature in waters bearing the sediment;
- Flocculation; agglomeration and precipitation;
- Bioturbation; and
- Mobilization, and storage capacity of the wetland.

6.5.1 Existing Pollutant Loading

Identified contaminants in the discharge from the Steese Expressway include petroleum products and metals. Using the results of sampling for station S-1 (Table 3) and the estimated volume of runoff for a 2-year 24-hour event from approximately 23 acres of drainage basin associated with Steese Highway (WinTR-55 model sub basin No. III, Table 10). A minimum annual mass pollutant load was calculated for the undeveloped condition (Table 18). Based on similar studies of runoff from urban areas with snowmelt the analytical results are within documented ranges for urban snowmelt runoff.

Table 18: Estimated Minimum Annual Pollutant Loading

Sample ID	2-year 24 hour event (Litres)	DRO (mg/yr)	RRO (mg/yr)	Barium (mg/yr)	Chromium (mg/yr)	Lead (mg/yr)
S-1	23,611	11,734	30,694	4,061	328	1,905

6.5.2 Metals Sequestration in Wetlands

The following mechanisms result in metals sequestration in natural and constructed wetlands[26]:

- Exchange of metals by an organic rich substrate;

[26] Wildeman, et. al. 1993. *Wetland Design for Mining Operations.* BiTech Publishers, Ltd., Richmond, British Columbia, Canada. 350 pages.

- Sulfate reduction with precipitation of iron and other sulfides;
- Precipitation of ferric and manganese hydroxides;
- Adsorption of metals by ferric hydroxides;
- Metals uptake by living plants;
- Filtration of suspended and colloidal material from water;
- Neutralization and precipitation through the generation of NH3 and HCO3- by bacterial decay of biologic matter; and
- Adsorbtion or exchange of metals onto algal materials.

Within natural and constructed wetlands, temporary metal sequestration occurs in the portion of the substrate as it oscillates between aerobic and anaerobic conditions on a seasonal basis. The permanent sequestration of metals in wetlands is a result of the translocation of metals by precipitation or adsorption into a permanently anaerobic environment deeper on the substrate.

6.5.3 Functional Condition Score for Sediment/Toxicant Retention

The functional condition of Tract A prior to subdivision development and the anticipated functional condition of the compensatory mitigation project are described in the following sections.

6.5.3.1 Tract A Functional Assessment

The aerobic and anaerobic sequestration process in Tract A is natural and high functioning. The loading from adjoining road surfaces has been approximately 2.8 kilograms of petroleum products and 0.4 kilograms of metals since 1938.

6.5.3.2 Compensatory Mitigation Project Functional Assessment

The compensatory mitigation project will utilize the substrate from Tract A as the substrate in the shallow pond and the emergent wetland areas. Following placement, it is anticipated that while functions will be present, the functional capacity will be reduced until the aerobic and anaerobic processes reestablish. Empirical evidence suggest that these processes will become established rapidly (for example, the Alaska Regional Supplement notes that reduction occurs during spring snowmelt and may be difficult to distinguish from a permanent condition early in the growing season), this functional assessment allows for a 2-year establishment period of reduced functionality. The deep pond and shrub scrub areas will be functional immediately following construction. The pond by virtue of water column depth and the shrub scrub habitat is preserving existing vegetation and substrate.

Table 19: Functional Condition Scores for Sediment/Toxicant Sequestration

Function	Tract A Wetlands	Compensatory Mitigation Project
S/TR	1.0 – high functioning	0.5 initial condition developing to 1.0
Associated Functions	None	Nutrient Removal/Transformation Production Export

6.5.4 Functional Assessment Sediment/Toxicant Retention

The CMP is replacing the sediment/toxicant retention functions of Tract A at a 1.29 to 1.00 ratio. The functional debits and credits for sediment/toxicant retention are presented in Table 20.

Table 20: Mitigation Credit and Debit Score for Sediment/Toxicant Retention.

Habitat Type	Acres	Functional Condition Score†	‡Total score
Tract A Conservation Area			
Shallow open water	2.056	1.0	2.056
Emergent wetlands	6.201	1.0	6.201
Shrub scrub wetlands	0.417	1.0	0.417
Upland forest	0.984	0.0	0.0
		Total Functional Debit	**8.674**
Compensatory Mitigation Project (0-2 years post construction)			
Shallow open water	2.474	0.5	1.237
Emergent wetlands	7.930	0.5	3.965
Shrub scrub wetlands	0.537	1.0	0.537
Deep open water	1.490	1.0	1.490
Upland forest	0.954	0.0	0.0
		Total Functional Credit	**6.485**
Compensatory Mitigation Project (2 plus years post construction)			
Shallow open water	2.474	1.0	2.474
Emergent wetlands	7.930	1.0	7.930
Shrub scrub wetlands	0.537	1.0	0.537
Deep open water	1.490	1.0	1.490
Upland forest	0.954	0.0	0.0
		Total Functional Credit	**12.431**

† Established previously in preceding table.

‡ Total Score is calculated by multiplying habitat type acreage and functional score. Total score is a summation of the habitat type scores for each area.

6.6 NUTRIENT REMOVAL/TRANSFORMATION

Nutrient removal/transformation includes the storage of nutrients within the sediment or plant substrate, also known as the transformation of inorganic nutrients to their organic form. The processes include trapping the nutrients before they reach deep water, move downstream, or are transported to underlying aquifers. This can happen in a variety of ways; nutrients can be taken up and stored by wetland vegetation on a short-term basis, while on a long-term basis vegetation can effectively remove nutrients from biological cycling by burial below the zone of biological activity usually at depths greater than one meter. The following factors affect nutrient removal/transformation;

- Biological uptake and processing;
- Sedimentation and accumulation of organic matter in the substrate;
- Absorption and nutrient interactions with sediments; and
- Chemical and microbial processes including denitrification, nitrogen fixation, and ammonia volatilization.

6.6.1 Nutrient Translocation, Sequestration, and Export in Wetlands

The following mechanisms result in nutrient translocation, sequestration, and export processes occur in natural and constructed wetlands[27]:

- Filtration of suspended and colloidal material from water;
- Neutralization and precipitation through the generation of NH3 and HCO3- by bacterial decay of biologic matter;
- Uptake and storage of nutrients by wetland plants; and
- Adsorbtion or exchange of nutrients onto algal materials.

Within natural and constructed wetlands, temporary nutrient sequestration occurs in the portion of the substrate as it oscillates between aerobic and anaerobic conditions on a seasonal basis. Sequestration occurs for those nutrients that become buried in the substrate to a depth of more than one meter.

6.6.2 Functional Condition Score for Nutrient Removal/Transformation

The functional condition of Tract A and the anticipated functional condition of the CMP are described in the following sections.

6.6.2.1 Tract A Functional Assessment

The aerobic and anaerobic sequestration process in Tract A is natural and high functioning. The Tract A wetlands sequester nutrients because the downstream connection is typically broken during the thawed portion of the year and no export can/does occur.

6.6.2.2 Compensatory Mitigation Project Functional Assessment

Based on hydrologic modeling, all runoff will be retained within the compensatory mitigation project and no net export of nutrients will occur.

The compensatory mitigation project will utilize the substrate from Tract A as the substrate in the shallow pond and the emergent wetland areas. Following placement, it is anticipated that while functions will be present, the functional capacity will be reduced until the aerobic and anaerobic processes reestablish. Empirical evidence suggest that these processes will become established rapidly (for example, the Alaska Regional Supplement notes that reduction occurs during spring snowmelt and may be difficult to distinguish from a permanent condition early in the growing season), this functional assessment allows for a 2-year establishment period of reduced functionality. The deep pond and shrub scrub areas will be functional immediately following construction.

Table 21: Functional Condition Scores for Nutrient Removal/Transformation

Function	Tract A Wetlands	Compensatory Mitigation Project
S/TR	1.0 – Function exist	1.0
Associated Functions	None	Nutrient Removal/Transformation Production Export

[27] *Ibid.*

6.6.3 Functional Assessment Nutrient Removal/Transformation

The CMP is replacing the nutrient removal/transformation functions of Tract A at a 1.29 to 1.00 ratio. The functional debits and credits for nutrient removal/transformation are presented in Table 22.

Table 22: Mitigation Credit and Debit Score for Nutrient Removal/Transformation.

Habitat Type	Acres	Functional Condition Score†	‡Total score
Tract A Conservation Area			
Shallow open water	2.056	1.0	2.056
Emergent wetlands	6.201	1.0	6.201
Shrub scrub wetlands	0.417	1.0	0.417
Upland forest	0.984	0.25	0.246
		Total Functional Debit	**8.920**
Compensatory Mitigation Project			
Shallow open water	2.474	1.0	2.474
Emergent wetlands	7.930	1.0	7.930
Shrub scrub wetlands	0.537	1.0	0.537
Deep open water	1.490	1.0	1.490
Upland forest	0.954	0.25	0.239
		Total Functional Credit	**12.670**

† Established previously in preceding table.

‡ Total Score is calculated by multiplying habitat type acreage and functional score. Total score is a summation of the habitat type scores for each area.

6.7 PRODUCTION EXPORT

Production export is defined as the flushing of relatively large amounts of organic material from the wetland to downstream or adjacent deeper waters. The following factors affect production export:

- Productivity of potential food sources;
- Nitrogen-fixing ability of potential food sources; and
- Dispersal and cycling of potential food sources.

6.7.1 Functional Condition Score for Production Export

The functional condition of Tract A prior to subdivision development and the anticipated functional condition of the compensatory mitigation project are described in the following sections.

6.7.1.1 Tract A Functional Assessment

The aerobic and anaerobic sequestration and nutrient cycling processes in Tract A are natural and high functioning. The Tract A wetlands have no current production export functions because the downstream connection is typically broken during the thawed portion of the year.

6.7.1.2 Compensatory Mitigation Project Functional Assessment

Based on hydrologic modeling, all runoff will be retained within the compensatory mitigation project and no net export of nutrients will occur.

Table 23: Functional Condition Scores for Nutrient Removal/Transformation

Function	Tract A Wetlands	Compensatory Mitigation Project
S/TR	0.0 – Function does not exist	0.0 – Function not planned
Associated Functions	None	None

6.7.2 Functional Assessment Production Export

The production export function does not currently exist within Tract A nor is the production export function anticipated to be created as part of the compensatory mitigation project.

6.8 AQUATIC DIVERSITY/ABUNDANCE

Aquatic diversity/abundance is recognized as the notably great on-site diversity and/or abundance of fish or invertebrates that are mainly confined to the water and saturated soils. For the purpose of this wetland evaluation technique diversity and abundance are addressed as one function, although diverse aquatic communities are not always productive and vice versa. The following factors affect aquatic diversity and abundance: water quality (physical and chemical); water quantity (hydroperiod, flow, and depth); cover substrate and interspersion, and availability and quality of food sources.

The compensatory mitigation project will utilize the substrate from Tract A as the substrate in the shallow pond and the emergent wetland areas. Following placement, it is anticipated that while functions will be present, the functional capacity will be reduced until the invertebrate community reestablishes, this functional assessment allows for a 2-year establishment period of reduced functionality. The deep pond and shrub scrub areas will be functional immediately following construction. The pond by virtue of water column depth and the shrub scrub habitat is preserving existing vegetation and substrate.

6.8.1 Functional Condition Score for Aquatic Diversity/Abundance

The functional condition of Tract A prior to subdivision development and the anticipated functional condition of the compensatory mitigation project are described in the following sections.

6.8.1.1 Tract A

No aquatic invertebrate community surveys exist for Tract A. No aquatic vertebrates are known to be present within Tract A. For the purposes of this functional assessment, invertebrate communities are presumed to exist and be high functioning.

6.8.1.2 Compensatory Mitigation Project Functional Assessment

Following the 2 year establishment period, the aquatic diversity and abundance will be fully functional within the CMP.

Table 24: Functional Condition Scores for Aquatic Diversity/Abundance

Function	Tract A Wetlands	Compensatory Mitigation Project
AD/A	1.0 high functioning	1.0 high functioning after establishment
Associated Functions	None	Wildlife habitat

6.8.2 Functional Assessment Aquatic Diversity/Abundance

The CMP is replacing the aquatic diversity/abundance functions of Tract A at a 1.29 to 1.00 ratio. The functional debits and credits for aquatic diversity/abundance are presented in Table 25.

Table 25: Mitigation Credit and Debit Score for Diversity/Abundance.

Habitat Type	Acres	Functional Condition Score†	‡Total score
Tract A Conservation Area			
Shallow open water	2.056	1.0	2.056
Emergent wetlands	6.201	1.0	6.201
Shrub scrub wetlands	0.417	1.0	0.417
Upland forest	0.984	0.0	0.0
		Total Functional Debit	**8.674**
Compensatory Mitigation Project (0-2 years post construction)			
Shallow open water	2.474	0.5	1.237
Emergent wetlands	7.930	0.5	3.965
Shrub scrub wetlands	0.537	1.0	0.537
Deep open water	1.490	1.0	1.490
Upland forest	0.954	0.0	0.0
		Total Functional Credit	**6.485**
Compensatory Mitigation Project (2 plus years post construction)			
Shallow open water	2.474	1.0	2.474
Emergent wetlands	7.930	1.0	7.930
Shrub scrub wetlands	0.537	1.0	0.537
Deep open water	1.490	1.0	1.490
Upland forest	0.954	0.0	0.0
		Total Functional Credit	**12.431**

† Established previously in preceding table.

‡ Total Score is calculated by multiplying habitat type acreage and functional score. Total score is a summation of the habitat type scores for each area.

6.9 WILDLIFE DIVERSITY/ABUNDANCE

Wildlife diversity/abundance is recognized as the notably great on-site diversity and/or abundance of wetland-dependent birds. This does not reflect that the other wildlife is insignificant, just that for this evaluation technique the sole focus is on that of wetland-dependent birds. The following factors affect wildlife diversity and abundance; area size, availability of cover, availability of food, availability of specialized habitat needs, spatial and temporal arrangement of the above factors, isolation from disturbance, and absence of contaminants.

6.9.1 Existing Information

A bird survey was conducted by ABR for the Tract A in 2008. The 2008 bird survey documented species abundance within Tract A. As part of the bird survey, a detailed nest survey was conducted.

6.9.2 Functional Assessment for Wildlife Diversity/Abundance

The following methodology was used to establish the functional condition score for the Tract A wetlands in terms of wildlife/habitat diversity:

1. Identify important avian species utilizing Tract A:
    a. Avian species identified by ABR, Inc. in 2008 were compared to the State of Alaska Wildlife Plan. Species identified on Tract A and contained within the State of Alaska Wildlife Plan were carried forward for functional scoring.
    b. Identified nesting bird species in 2008 were carried forward for functional scoring.
2. A nesting density was calculated for Tract A using singing males as a proxy for breeding pairs.
    a. For species identified the point counts of birds representing singing males, was used a as a biologically reasonable proxy for territories used for breeding. The total number of species point counts was divided by the survey area (6.5 acres) to provide a nesting density.
    b. Nesting densities calculated under step 2 were compared with reasonably ascertainable scientific data for species nesting densities.
3. For species present in the nesting survey in 2008, the total number of nests identified was divided by the survey area within Tract A.

The results of the species specific functional assessment are provided Table 26.

6.9.3 Mitigation Credit/Debit Score

The singing male proxy for nesting pairs represents a maximum habitat value while the number of actual nests represents measured function[28]. For all species, except *Setophaga coronata* (Yellow-Rumped Warbler) listed in the State of Alaska Wildlife Plan, measured functional value is significantly less than potential habitat value. The actual counted nest density represents the minimum functional value that the compensatory mitigation project must achieve.

[28] Hagelin, J. PhD. 2017. Email correspondence between Dr. J. Hagelin, Regional Wildlife Biologist, Threatened, Endangered and Diversity Program, Alaska Department of Fish and Game and Dr. E. Packee, Jr., Senior Scientist, Travis/Peterson Environmental Consulting, Inc. dated April 14, 2017.

Table 26: Tract A Functional Assessment Wildlife Diversity/Abundance

Species	Median Nesting Density† (pairs/acre)	ABR 2008 Nesting Density (pairs/acre)	Actual counted nest density (nest/acre)	Functional Value	
				Nest	Singing male
Downy Woodpecker *Picoides pubescens glacialis*	0.12	0.15	0.00	0.00	1.28
Northern Flicker *Colaptes auratus luteus*	0.0394	0.15	0.00	0.00	3.90
Lesser Yellow Legs *Tringa flavipes*	0.94	3.69	0.00	0.00	3.93
Mew Gull *Larus canus brachyrhynchus*	0.248	2.77	0.00	0.00	11.1
Common Raven *Corvus corax Kamtschaticus*	Not breeding pair	Not breeding pair	Not breeding pair	Not breeding pair	Not breeding pair
Black-capped Chickadee *Poecile atricapillus*	0.2023	0.1538	0.00	0.00	0.76
Boreal Chickadee *Poecile hudsonicus*	0.2795	0.923	0.00	0.00	3.30
Ruby-crowned Kinglet *Regulus calendula grinnelli*	0.2525	0.4615	0.00	0.00	1.83
Yellow-rumped Warbler *Setophaga coronata*	0.144	0.1538	0.31	2.15	1.07
White-crowned Sparrow *Zonotrichia leucophrys*	0.4313	2.769	0.15	0.35	6.42
Lincoln's Sparrow *Melospiza lincolnii*	0.1161	2.615	0.00	0.00	22.5
Savannah Sparrow *Passerculus sandwichensis*	0.2696	0.154	0.00	0.00	0.57
Dark-eyed Junco *Junco hyemalis oreganus*	1.47	1.69	0.00	0.00	1.15
Rusty Blackbird *Euphagus carolinus*	0.81	2.615	0.46	0.57	3.22
White-winged Crossbill *Loxia leucoptera*	0.438	0.158	0.00	0.00	0.352
Common Redpoll *Acanthis flammea*	0.3065	4.46	1.07	3.49	14.6

†Based on literature search

6.10 RECREATION

Recreation includes both consumptive and non-consumptive forms of recreation that are water dependent and occur in either an incidental or obligatory manner in wetlands. For example, sport fishing, swimming, kayaking, hunting, etc.

6.10.1 Functional Condition Score for Recreation

The functional condition of Tract A and the anticipated functional condition of the compensatory mitigation project are described in the following sections.

6.10.1.1 Tract A

Tract A is separated from Creamer's field. During permitting, a deed restriction along the northern property boundary was added to connect Tract A to Creamer's Refuge. The proximity of Tract A was recognized as a non-consumptive recreation value.

Tract A has low connectivity to Creamers Field due to historic human activity. Tract A has been isolated from downstream habitat by commercial subdivision and road development. As early as 1938, habitat connectivity had been lost due to the construction of the Steese Highway and agricultural activities to the west. Significant fragmentation occurred during the TAPS constriction when the area south of North Side Business Park was cleared and filled. Even at the north end of Tract A, wildlife access is restricted due to the clearing of vegetation and road and home/business construction. The habitat value is further degraded by road noise from the Steese Highway as all of Tract A is within 1,000 feet of the road surface. The overall habitat condition of Tract A despite high diversity is reduced due its fragmentation from other wildlife habitat.

6.10.1.2 Compensatory Mitigation Project Functional Assessment

The site of the CMP is contiguous with areas under management for wildlife and waterfowl habitat. The constructed mitigation wetlands will have high habitat connectivity and recreational value.

Table 27: Functional Condition Scores for Wildlife Habitat

Function	Tract A Wetlands	Compensatory Mitigation Project
R	0.25 low functioning	1.0 high functioning after establishment

The CMP is replacing the recreation functions of Tract A at a 14.1 to 1.0 ratio. The functional debits and credits for recreation are presented Table 28.

Table 28: Mitigation Credit and Debit Score for Recreation.

Habitat Type	Acres	Functional Condition Score†	‡Total score
Tract A Conservation Area			
Shallow open water	2.056	0.25	0.514
Emergent wetlands	6.201	0.25	1.550
Shrub scrub wetlands	0.417	0.25	0.104
Upland forest	0.984	0.25	0.246
		Total Functional Debit	**2.414**
Compensatory Mitigation Project			
Shallow open water	2.474	1.0	2.474
Emergent wetlands	7.930	1.0	7.930
Shrub scrub wetlands	0.537	1.0	0.537
Deep open water	1.490	1.0	1.490
Upland forest	0.954	1.0	0.954
		Total Functional Credit	**13.38**

† Established previously in preceding table.

‡ Total Score is calculated by multiplying habitat type acreage and functional score. Total score is a summation of the habitat type scores for each area.

6.11 UNIQUENESS/HERITAGE

Uniqueness/heritage includes use of wetlands for aesthetic enjoyment, nature study, education, scientific research, open space, preservation of rare or endemic species, protection of archaeologically or geologically unique features, maintenance of historic sites, and an infinite number of other mostly intangible uses.

6.11.1 Functional Condition Score for Production Export

The functional condition of Tract A prior to subdivision development and the anticipated functional condition of the compensatory mitigation project are described in the following sections.

6.11.1.1 Tract A Functional Assessment

Tract A wetlands has no known uniqueness/heritage functions.

6.11.1.2 Compensatory Mitigation Project Functional Assessment

The compensatory mitigation project has no planned uniqueness/heritage functions.

Table 29: Functional Condition Scores for Uniqueness/Heritage

Function	Tract A Wetlands	Compensatory Mitigation Project
S/TR	0.0 – Function does not exist	0.0 – Function not planned
Associated Functions	None	None

7.0 MITIGATION WORK PLAN

The following sections contain a detailed work descriptions and specifications for the compensatory mitigation project, including:

- The geographic boundaries of the project;

- Construction methods, timing, and sequence;
- Source(s) of water, including connections to existing waters and uplands;
- Methods for establishing the desired plant community;
- Plans to control invasive plant species;
- The proposed grading plan, including elevations and slopes of the substrate; and
- Erosion control measures.

7.1 COMPENSATORY MITIGATION PROJECT PLAN

North Side Management, LLC proposes to directly replace the functions of Tract A by constructing a compensatory mitigation project in the northwest corner of North Side Business Park. The plan view and profile for the CMP are provided in Attachment A. The plan sheets show that portion of Tract A proposed for replacement and the location of the compensatory mitigation work. The CMP replaces the functions of Tract A with enhanced wetlands in the northeast corner of the subdivision. The CMP will encompass Lots 28 through 33 and result in a permanent conservation area of 13.4 acres to replace the existing Tract A conservation easement of 9.56 acres. Tract A will be utilized as a drainage easement but North Side Management, LLC proposes to give a functional lift over the existing permit condition by creating a drainage swale with emergent wetland bottoms. Specific activities proposed include:

- Preserving existing upland forest along the west property boundary;
- Preserving existing shrub/scrub wetlands along the north property boundary;
- Excavation and removal of peat and gravel from the deep water habitat area;
- Excavation and removal of peat from the shallow water habitat area;
- Excavation and removal of peat from the emergent wetland habitat area;
- Placement of overburden subgrade in the shallow water and emergent wetland area;
- “Live haul” and substrate placement in shallow open water area;
- “Live haul” and substrate placement in emergent wetland areas; and
- Monitoring of the completed compensatory mitigation project.

7.2 CONSTRUCTION METHODS

Construction methods for the compensatory mitigation project are provided below based on project unit operation.

Vegetation Clearing

The vegetative buffer will be left intact at the west side of the new conservation area throughout all construction activities.

Clearing will initially be done manually to salvage the larger trees and then the remaining scrub and underbrush will be removed by dozer. Dozed material will be shoved to the center and to the south/southeast of the new conservation area. The following construction methods will be employed:

- Manual vegetation clearing of large trees;
- Mechanized vegetation clearing using tracked bulldozers;
- Burning of slash and cleared vegetation.

Peat Removal and Excavation

Unsuitable frozen organic peat will be removed from the compensatory mitigation project area using tracked bulldozers. The current deep water pond will be expanded from the south / southwest to the north initially by backhoe, and then by dragline. The excavated materials will be roughly classified between silts, overburden and peat. The peat will be sold and the silts and overburden will be stockpiled for the reclamation work and construction of the shallow open water areas.

Site Backfill and Contouring

Final construction of the new site will involve placement of the stockpiled overburden and silts. Following placement, the overburden and silts will be contoured to form the shallow open water and surrounding emergent wetlands. Once final grading is complete, transplanting plant materials from the original conservation site to the new site will occur.

The final activity would be to excavate the 50-foot buffer at the north side of the overall development down a minimum of 3 feet below existing grade to facilitate drainage from the properties to the north, and the site itself, to drain to the new conservation tract. Although shown as a uniform 3 foot depth, in reality the profile would be irregular and consist of irregularly spaced deeper areas that would hold water during the dryer portions of the year. Additionally, the east and west ends of the bottom of the swale will be sloped to join the water features in the CMP and on Tract A.

Monitoring

The site will be monitored annually for 5 years to ensure that ecological performance goals are being met. The proposed monitoring and frequency of monitoring activity proposed is provided in Section 9.0.

7.3 TIMING AND SEQUENCE OF CONSTRUCTION

The following timeline for the CMP:

Summer 2018

Vegetation clearing will be completed in summer 2018. The slash piles will be burned in the of Spring 2019 prior to the end of snowmelt.

Summer 2018 - 2021

Peat will be dozed from the areas that still have it, starting summer 2018 and continuing each summer through 2021. Timeline may be accelerated depending on the rate of peat consumption in the Fairbanks market.

Deep Pond excavation will start in summer 2018 and continue through summer 2022.

Summer 2021

Site backfill, contouring, growth media replacement, and final grading activities. Tract A disturbance will occur.

Summer 2021 through 2025

Ecological monitoring conducted and annual reports submitted to the U.S. Army Corps of Engineers by December 31 of each year.

7.4 METHOD FOR ESTABLISHING DESIRED PLANT COMMUNITIES

North Side Management, LLC plans to rely on preservation of existing vegetation to establish vegetation in the upland forest areas and palustrine shrub/scrub wetland areas of the compensatory mitigation project areas. "Live-haul" soil placement methods to establish plant communities within the emergent wetlands and shallow water areas. Each of these methods is described in the following sections.

7.4.1 Preservation of Existing Vegetation

The principal advantage of preserving natural vegetation is protecting desirable trees, vines, bushes and grasses from damage during project development. The existing upland forest along the western edge of the mitigation project area and the shrub/scrub wetlands will be left undisturbed. Prior to construction, the planned limit of excavation for the open water and emergent wetland types will be marked in the field. No equipment or personnel will be permitted beyond the flagging during construction.

7.4.2 "Live Haul" Growth Media Management

Live haul growth media management is a vegetation establishment technique that involves the excavation of desirable soils, seedbeds, and hauling of soil to replacement areas in a single step, without stockpiling. Research indicates that direct-haul soil can result in higher mycorrhizae levels, better physical characteristics, and a slightly greater potential for seed bank benefits compared to reclamation where soil has been hauled from stockpile (Schuman, 2002). A high degree of control will be exercised by North Side Management, LLC during the "live-haul" phase of construction. Minimally, the following actions will occur:

- Prior to the start of soil removal from Tract A, the depth of existing soil will be determined for the emergent wetland area and the shallow open water area. Individual depth measurements will be made on a 150 foot grid within Tract A using a handheld soil probe or shovel.
- Soil replacement depths will be based on the depth of existing soils at Tract A.
- Soils will be removed using wheel loaders or tracked excavators and hauled in off highway trucks. The operator will be instructed to remove the soil with as little mixing as possible.
- Once excavated, the soil will be transported and placed within the compensatory mitigation area. Efforts will be made to ensure that vehicle traffic on the soils slated for salvage is minimized by marking excavation limits and phasing soil salvage activities.

7.4.3 Invasive Species Control

The use of the "live haul" method and preservation of existing vegetation are the methods proposed to prevent the introduction of invasive species. As part of the pre construction surveys, invasive species will be identified and marked.

7.4.4 Erosion and Sediment Control during Construction

North Side Management, LLC will obtain and comply with the Alaska Pollutant Discharge Elimination System Multi-Sector General Permit. The primary means for controlling erosion sediment control during construction will be:

- Preservation of existing vegetation;
- Phasing of construction activities;
- Live haul of soil materials;
- Perimeter sediment control; and
- Dust control.

8.0 MAINTENANCE PLAN

The design of the CMP is designed to be maintenance free and self sustaining once completed. Following construction, the site will be inspected until final stabilization is achieved. For the purposes of this project permanent vegetation stabilization will be achieved when emergent wetland areas have a 70 percent cover of emergent wetland vegetation.

9.0 PERFORMANCE STANDARDS

Pursuant to 33 CFR § 332.5 performance standards must be developed for all compensatory mitigation projects. The performance standards must be based on attributes that are objective and verifiable. Ecological performance standards must be based on the best available science that can be measured or assessed in a practicable manner. Performance standards may be based on variables or measures of functional capacity described in functional assessment methodologies, measurements of hydrology or other aquatic resource characteristics, and/or comparisons to reference aquatic resources of similar type and landscape position.

The use of reference aquatic resources to establish performance standards will help ensure that those performance standards are reasonably achievable, by reflecting the range of variability exhibited by the regional class of aquatic resources as a result of natural processes and anthropogenic disturbances.

Performance standards based on measurements of hydrology should take into consideration the hydrologic variability exhibited by reference aquatic resources, especially wetlands. Where practicable, performance standards should take into account the expected stages of the aquatic resource development process, in order to allow early identification of potential problems and appropriate adaptive management.

Wetland Evaluation Technique (WET) is a broad approach to understanding and evaluating wetlands. It is based on information about correlative predictors of wetland functions. WET is most commonly used to allow regulators, and planners to predict the probability of a wetlands capability to perform specific functions. WET addresses 11 functions and values of wetlands:

- Groundwater recharge (GWR);
- Groundwater discharge (GWD);
- Flood flow alteration (FFA);

- Sediment stabilization (SS);
- Sediment/toxicant retention (S/TR);
- Nutrient removal/transformation (NR/T);
- Production export (PE);
- Aquatic diversity/abundance (AD/A);
- Wildlife diversity/abundance (WD/A);
- Recreation (R); and
- Uniqueness/heritage (U/H).

The performance standards for each of the above functions are provided in the following sections.

9.1 GROUNDWATER RECHARGE (GWR) PERFORMANCE STANDARDS

In order to achieve the functional credits listed in Table 6, the compensatory mitigation project must meet the following performance standards:

1. Create 1.49 acres of deep open water habitat with the following attributes:
    a. Depth of excavation to be below existing groundwater table;
    b. Pool depth to extend to 25 feet below apparent groundwater elevation;
2. Create 0.954 acres of upland habitat with the following attributes:
    a. Unthawed subsurface soils;
    b. Relatively high permeability surface soils.

The above attributes are measurable and must exist following grading and excavation activities.

Following grading activities, as built surveys will be provided to document that the GWR performance standards have been met. A series of monitoring wells has been installed and the depth to water will be measured in those wells and compared to the depth to water in the CMP deep open water habitat to verify groundwater connectivity. The well survey will be performed following construction of the deep water habitat and in the final year of the proposed 5 year monitoring period.

9.2 GROUNDWATER DISCHARGE (GWD) PERFORMANCE STANDARDS

In order to achieve the functional credits listed in Table 7, the compensatory mitigation project must meet the following performance standards:

1. Create 1.49 acres of deep open water habitat with the following attributes:
    a. Depth of excavation to be below existing groundwater table;
    b. Pool depth to extend to 25 feet below apparent groundwater elevation;

The above attributes are measurable and must exist following grading and excavation activities.
Following grading activities, as built surveys will be provided to document that the GWD performance standards have been met. A series of monitoring wells has been installed and the depth to water will be measured in those wells and compared to the depth to water in the CMP deep open water habitat to verify groundwater connectivity. The well survey will be performed

following construction of the deep water habitat and in the final year of the proposed 5 year monitoring period.

9.3 FLOOD FLOW ALTERATION

In order to achieve the functional credits listed in Table 16, the mitigation project must:

1. Create 54.54 acre feet of above ground storage:
    a. 10 feet of surface storage above the deep water habitat;
    b. 6 feet of surface storage above the shallow water habitat;
    c. 3 feet of surface storage above the emergent habitat; and
    d. 1.5 feet of storage in the organic layer of shrub scrub wetlands (existing).

Following grading activities, an as built survey will be used to document the created flood storage capacity of the compensatory mitigation project. Photographs of flood storage following spring breakup will be taken annually for 5 years to document that modeled capacity is sufficient to meet actual conditions.

9.4 SEDIMENT STABILIZATION

This function is neither present nor planned to be present in the compensatory mitigation project. No project specific performance standards are required.

9.5 SEDIMENT/TOXICANT RETENTION

In order to achieve the functional credits listed in Table 20, the mitigation project must:

1. Create 7.930 acres of emergent wetlands;
    a. Must have equivalent substrate depth as Tract A wetlands based on soil survey of Tract A;
    b. Have equivalent vegetation density as Tract A after 2 years; and
    c. Aerobic/Anaerobic conditions must develop in substrate.
2. Create 2.474 acres of shallow open water;
    a. Must have equivalent substrate depth as Tract A wetlands;
    b. Have equivalent vegetation density as Tract A after 2 years;
3. Create 1.49 acres of deep water habitat; and
4. Preserve 0.537 acres of shrub scrub habitat.

9.6 NUTRIENT REMOVAL/TRANSFORMATION

In order to achieve the functional credits listed in Table 22, the mitigation project must:

1. Create 7.930 acres of emergent wetlands;
    a. Must have equivalent substrate depth as Tract A wetlands;
    b. Have equivalent vegetation density as Tract A after 2 years; and
    c. Aerobic/Anaerobic conditions must develop in substrate.
2. Create 2.474 acres of shallow open water;
    a. Must have equivalent substrate depth as Tract A wetlands;
    b. Have equivalent vegetation density as Tract A after 2 years;
3. Create 1.49 acres of deep water habitat; and

4. Preserve 0.537 acres of shrub scrub habitat.

As described in Section 7.4.2, prior to the start of soil removal from Tract A, the depth of existing soil will be determined for the emergent wetland area and the shallow open water area. Individual depth measurements will be made on a 150 foot grid within Tract A using a handheld soil probe or shovel. Following substrate placement, depths within the CMP will be verified by using a handheld soil probe or shovel to ensure that placement depths are similar to those measured in Tract A. Figures showing the measured depths of substrate on Tract A will be provided the USACE prior to the start of substrate removal. Figures showing the placed depth of substrate will be provided to the USACE following completion of the liv-haul (Section 7.4.2).

9.7 PRODUCTION EXPORT

This function is neither present nor planned to be present in the compensatory mitigation project. No project specific performance standards are required.

9.8 AQUATIC DIVERSITY/ABUNDANCE

In order to achieve the functional credits listed in Table 25, the compensatory mitigation project must meet the following performance standards:

1. Create 7.930 acres of emergent wetlands;
    a. Must have equivalent substrate depth as Tract A wetlands;
    b. Have equivalent vegetation density as Tract A after 2 years; and
    c. Aerobic/Anaerobic conditions must develop in substrate.
2. Create 2.474 acres of shallow open water;
    a. Must have equivalent substrate depth as Tract A wetlands;
    b. Have equivalent vegetation density as Tract A after 2 years; and
3. Establish/recover the invertebrate community to Tract A levels.

As part of the monitoring effort for the compensatory mitigation project, an invertebrate study will need to be completed within Tract A prior to disturbance and within the CMP every other year starting in year 2 until the functional capacity of the completed project is met.

9.9 WILDLIFE DIVERSITY/ABUNDANCE

A bird survey similar to that performed by ABR, Inc. in 2008 shall be used to document whether the compensatory mitigation project has achieved the wildlife diversity/abundance level documented for Tract A in 2008. Nesting density surveys conducted once every 2 years shall be measurement criteria for comparison.

9.10 RECREATION

In order to achieve the functional credits listed in Table 27, the compensatory mitigation project must be constructed in the northwest corner of Northside Business Park. All described functional values of Tract A must be replaced following development of the CMP.

9.11 UNIQUENESS/HERITAGE

Uniqueness/heritage includes use of wetlands for aesthetic enjoyment, nature study, education, scientific research, open space, preservation of rare or endemic species, protection of archaeologically or geologically unique features, maintenance of historic sites, and an infinite number of other mostly intangible uses. No activities are planned to evaluate this function following development of the CMP.

Table 30: Summary of Compensatory Mitigation Project Performance Goals.

Performance Standard	Description	Documentation Method
GWR 1	1.49 acres of deepwater habitat	As built survey
GWR 1 (a)	Groundwater elevation	As built survey
GWR 1 (b)	Pool Depth	As built survey
GWR 2	0.477 acres of upland habitat	As built survey
GWR 2 (a)	Unthawed subsurface soils	Project soils report
GWR 2 (b)	High permeability surface soils	Project soils report
FFA 1 (a through d)	Surface storage capacity	As built survey
SS	Sediment stabilization	No performance standard
S/TR 1(a)	Soil management plan	Soil report (Section 7.4.2)
S/TR 1(b)	As built survey	Soils report (section 7.4.2)
S/TR 1(c)	Inspection of soils	Monitoring report (2 year)
S/TR 2(a)	Soil management plan	Soil report (Section 7.4.2)
S/TR 2(b)	Inspection of soils	Monitoring report (2 year)
S/TR 3	1.49 acres of deepwater habitat	As built survey
S/TR 4	0.537 acres shrub/scrub habitat	As built survey
NR/T 1(a)	Soil management plan	Soil report (Section 7.4.2)
NR/T 1(b)	As built survey	Soils report (section 7.4.2)
NR/T 1(c)	Inspection of soils	Monitoring report (2 year)
NR/T 2(a)	Soil management plan	Soil report (Section 7.4.2)
NR/T 2(b)	Inspection of soils	Monitoring report (2 year)
NR/T 3	1.49 acres of deepwater habitat	As built survey
NR/T 4	0.537 acres shrub/scrub habitat	As built survey
PE	Production Export	No performance standard
AD/B 1(a)	Soil management plan	Soil report (Section 7.4.2)
AD/B 1(b)	As built survey	Soils report (section 7.4.2)
AD/B 1(c)	Inspection of soils	Monitoring report (2 year)
AD/B 2(a)	Soil management plan	Soil report (Section 7.4.2)
AD/B 2(b)	Inspection of soils	Monitoring report (2 year)
AD/D 3	Invertebrate community recovery	Monitoring Report (2 year) Monitoring Report (4 year)
WD/A	Avian community density and diversity equivalent to Tract A	Bird survey (year 2) Bird survey (year 4) if needed
R	Functional values of Tract A reproduced successfully	Monitoring of site post construction

10.0 LONG-TERM MANAGEMENT PLAN

North Side Management, LLC intends to set aside the completed compensatory mitigation project as a deed restrictions pending acceptance as a conservation easement. The compensatory mitigation project has been designed, to the maximum extent practicable, to be self-sustaining once performance standards have been achieved.

The CMP design contains no active engineering features (e.g., pumps) and has been sited to ensure that natural hydrology will support long-term sustainability.

The deed restriction will be recorded on the deed and plat for North Side Business Park once approved. Initially North Side Management, LLC will be the owner of the conservation easement. Ultimately, North Side Management, LLC would like to turn the deed restricted area into a conservation easement managed by the State of Alaska for inclusion within the Creamers Field Wildlife Refuge.

11.0 ADAPTIVE MANAGEMENT PLAN

Tract A soils and vegetation will be transported to the CMP area. North side Management, LLC will adhere to the following notification requirements:

> (1) If the compensatory mitigation project cannot be constructed in accordance with the approved mitigation plans, the permittee or sponsor must notify the district engineer. A significant modification of the compensatory mitigation project requires approval from the district engineer.
>
> (2) If monitoring or other information indicates that the compensatory mitigation project is not progressing towards meeting its performance standards as anticipated, the responsible party must notify the district engineer as soon as possible. The district engineer will evaluate and pursue measures to address deficiencies in the compensatory mitigation project. The district engineer will consider whether the compensatory mitigation project is providing ecological benefits comparable to the original objectives of the compensatory mitigation project.
>
> (3) The district engineer, in consultation with the responsible party (and other federal, tribal, state, and local agencies, as appropriate), will determine the appropriate measures. The measures may include site modifications, design changes, revisions to maintenance

Since the subject wetlands are precipitation driven, two possibilities exist that would impact the success of the CMP:

1. Too little water is retained in the created shallow water areas to maintain the emergent fringe wetlands; or
2. Too much water is retained in the CMP and the emergent fringe is reduced.

In the event that too little water is retained in the shallow pools to sustain the fringe wetlands, a weir between the shallow pool and the deep pool will be added to maintain water depths.

In the event that too much water is retained in the CMP, a ‘big pool’ condition would develop. This has happened repeatedly with the existing Tract A wetlands as documented in the aerial photography and is not considered an indication of CMP failure. If the conditions persist, drainage in the northwest corner may be enhanced to reduce the retained water levels.

12.0 FINANCIAL ASSURANCES

Tract A will remain undisturbed except for vegetation clearing until the mitigation project plan is accepted by the corps. Following acceptance of the compensatory mitigation project plan, North Side Management, LLC will begin grading and construction of the CMP. Tract A soils and vegetation will be transported to the CMP project area. North Side Management, LLC has sufficient financial resources to accomplish the project and does not foresee the need to provide a financial assurance.

Table 30: Summary of Compensatory Mitigation Project Performance Goals.

Performance Standard	Description	Documentation Method
GWR 1	1.49 acres of deepwater habitat	As built survey
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The deed restriction will be recorded on the deed and plat for North Side Business Park once approved. Initially North Side Management, LLC will be the owner of the conservation easement. Ultimately, North Side Management, LLC would like to turn the deed restricted area into a conservation easement managed by the State of Alaska for inclusion within the Creamers Field Wildlife Refuge.

11.0 ADAPTIVE MANAGEMENT PLAN

Tract A will remain undisturbed except for vegetation clearing until the mitigation project rough grading is accepted by the corps based on as built surveys and inspection. Once rough grading is accepted, Tract A soils and vegetation will be transported to the project area. North side Management, LLC will adhere to the following notification requirements and requirements:

> (1) If the compensatory mitigation project cannot be constructed in accordance with the approved mitigation plans, the permittee or sponsor must notify the district engineer. A significant modification of the compensatory mitigation project requires approval from the district engineer.
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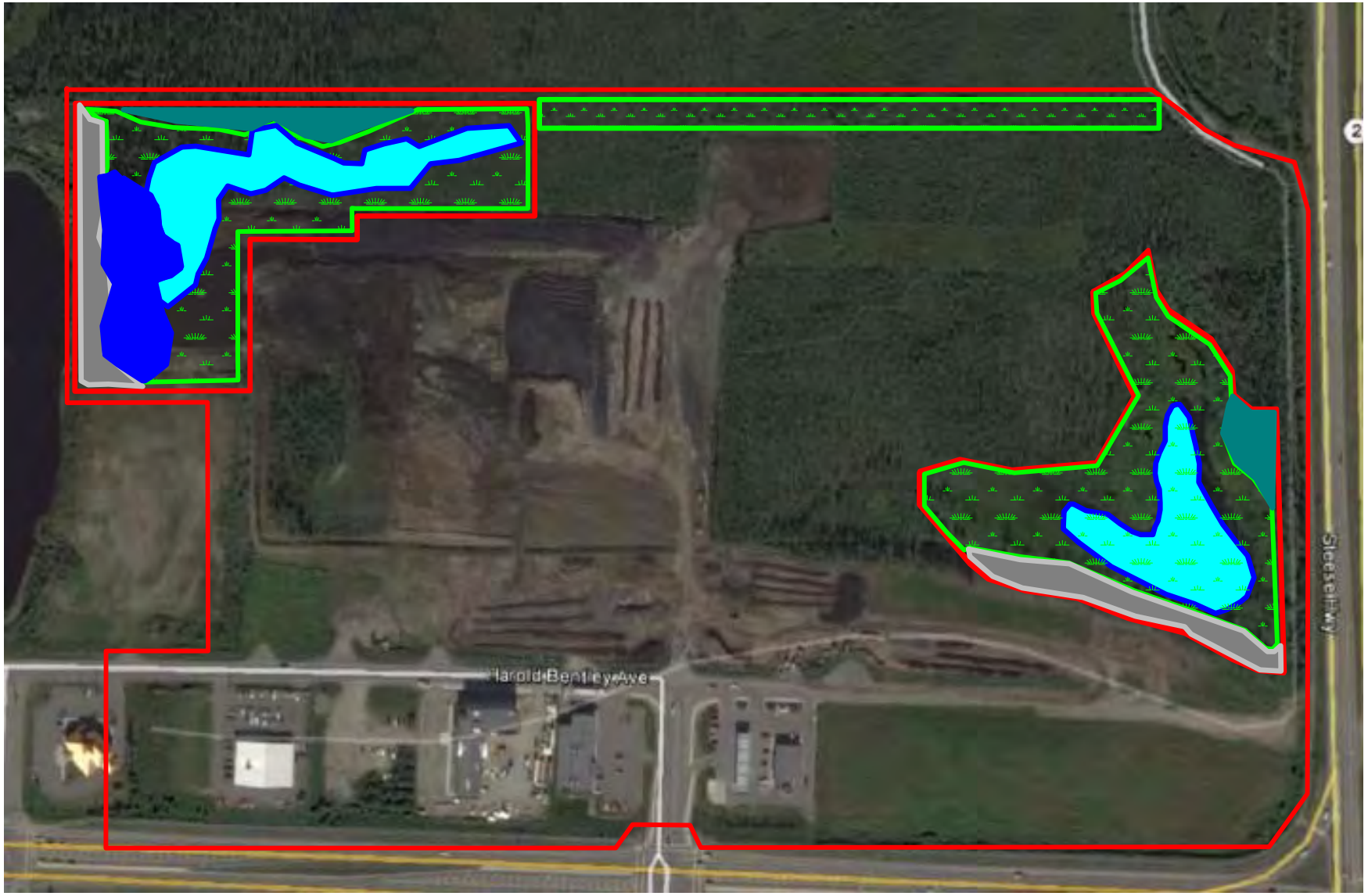
12.0 FINANCIAL ASSURANCES

Tract A will remain undisturbed except for vegetation clearing until the mitigation project rough grading is accepted by the corps based on as built surveys and inspection. Once rough grading is accepted, Tract A soils and vegetation will be transported to the project area. North Side Management, LLC has sufficient financial resources to accomplish the project and does not foresee the need to provide a financial assurance.

ATTACHMENT 1

PROJECT PLANS AND SPECIFICATIONS



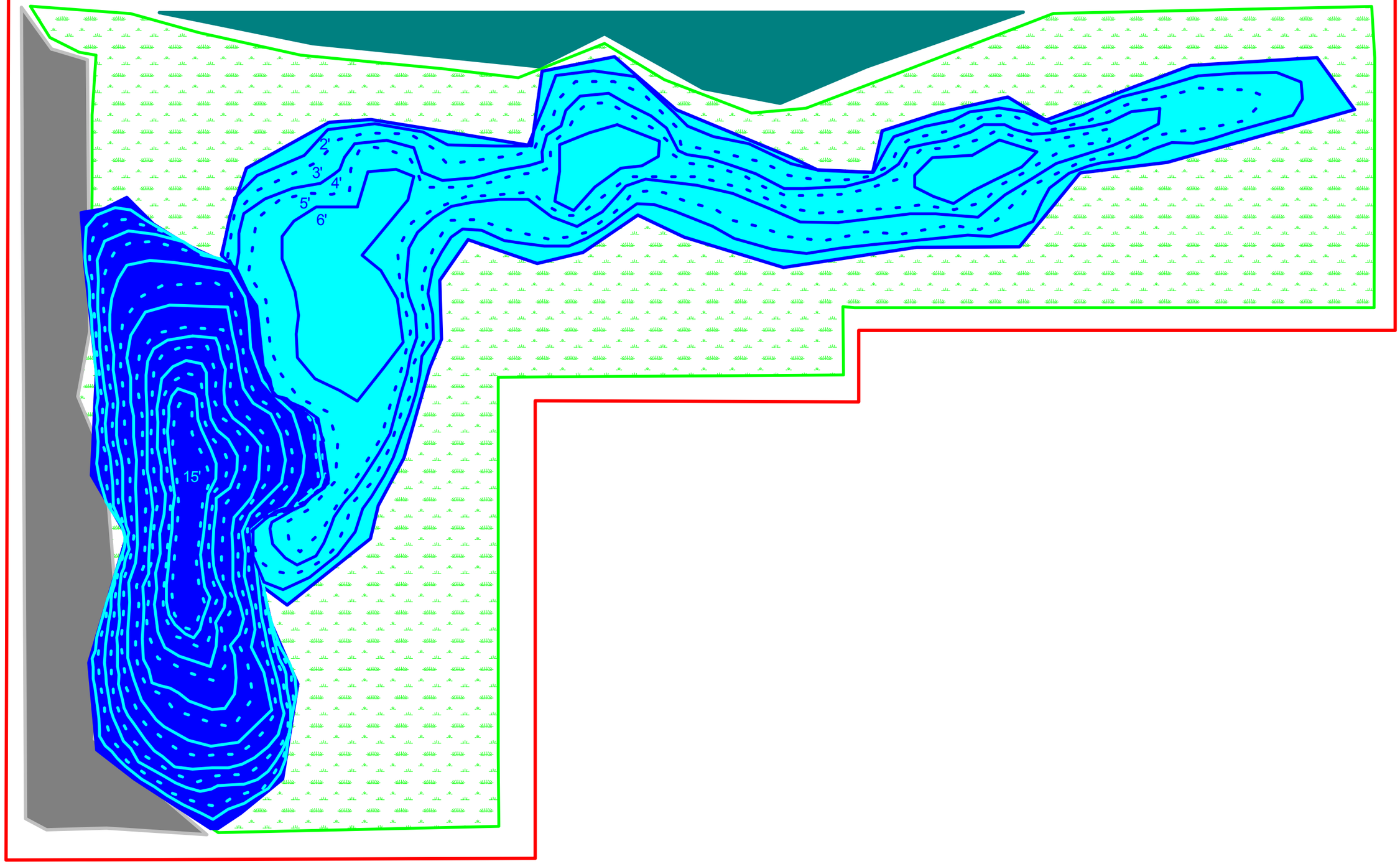
Shallow Open Water

Palustrian Shrub Scrub wetland

Emergent wetland

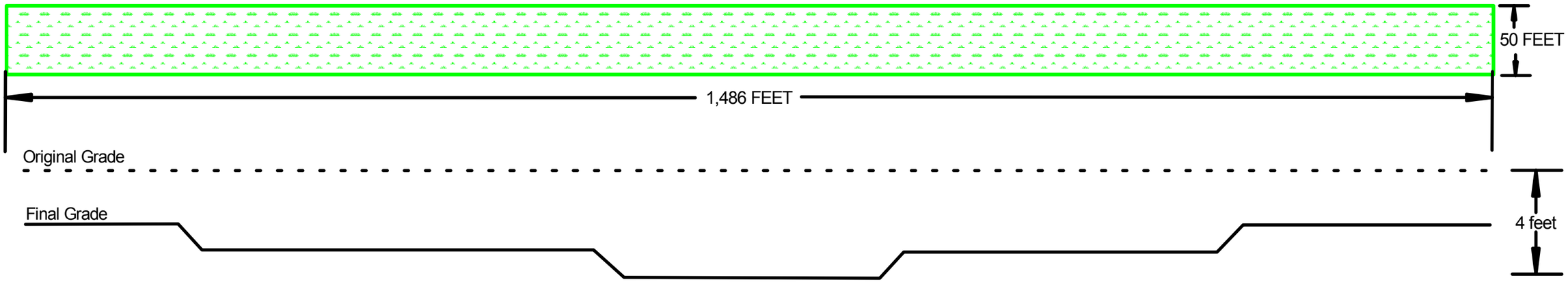
Upland deciduous forest

TRAVIS/PETERSON ENVIRONMENTAL CONSULTING, INC. 329 2ND STREET FAIRBANKS, ALASKA 99701	**NORTH SIDE MANAGEMENT, LLC.** **NORTHSIDE BUISNESS PARK**	**COMPENSATORY MITIGATION PROJECT PLAN** **SHEET 1 OF 4**	
PROJECT NO: 1308-10	**FILE: PROJECTS/1308/10/-MITIGATION PLAN/FIGURES/SHEET 1 OF 3**	**DATE: 03/21/2017**	**SCALE: 1 inch = 360 feet**

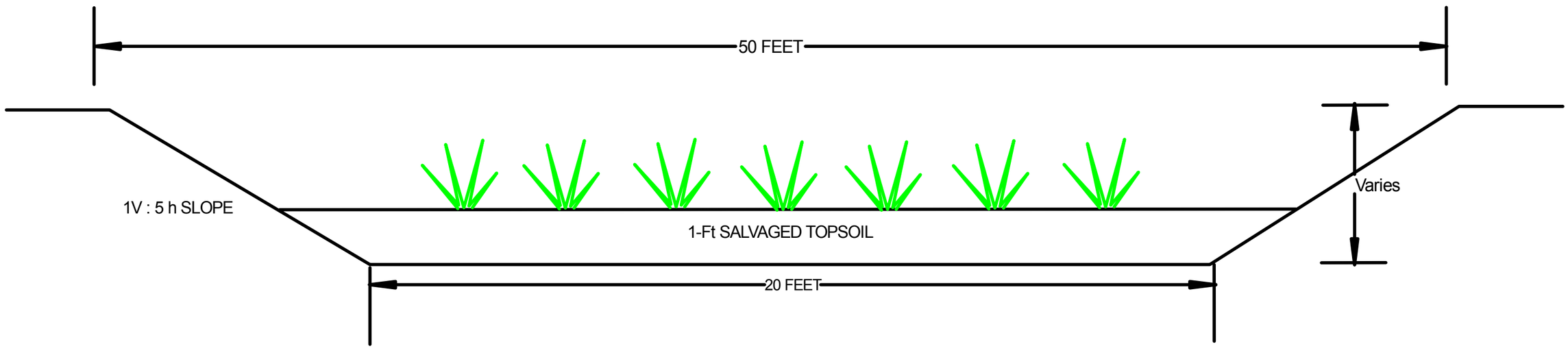


TRAVIS/PETERSON ENVIRONMENTAL CONSULTING, INC. 329 2ND STREET FAIRBANKS, ALASKA 99701	**NORTH SIDE MANAGEMENT, LLC.** **NORTHSIDE BUISNESS PARK**	**COMPENSATORY MITIGATION PROJECT PLAN** **SHEET 2 OF 4**

PROJECT NO: 1308-10	**FILE: PROJECTS/1308/10-MITIGATION PLAN/FIGURES/SHEET 2 OF 3**	**DATE: 03/21/2017**	**SCALE: 1" = 2,008'**



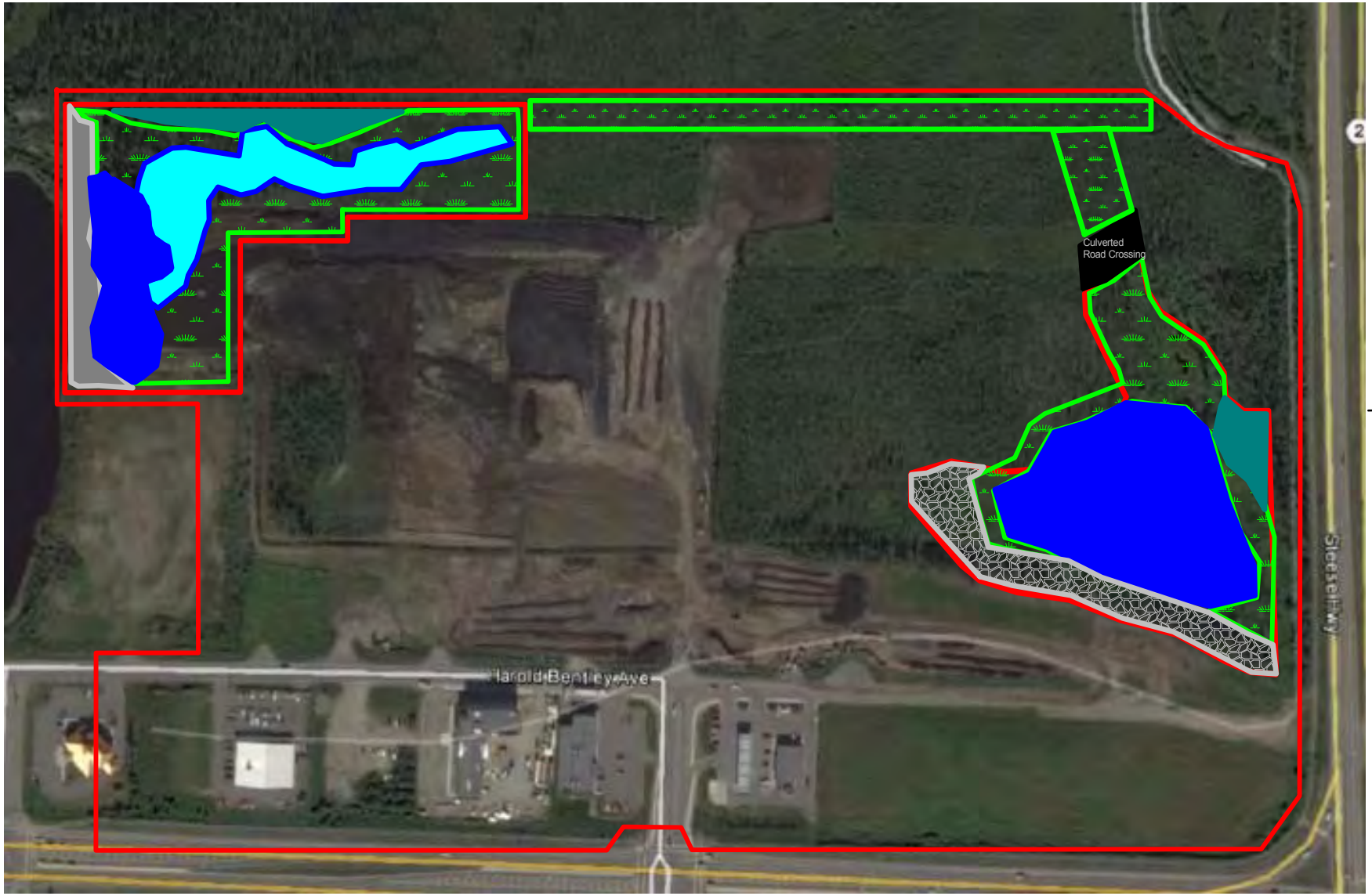
TRACT B PLAN VIEW AND LONGITUDINAL PROFILE



TRACT B SWALE CROSS SECTION

TRAVIS/PETERSON ENVIRONMENTAL CONSULTING, INC. 329 2ND STREET FAIRBANKS, ALASKA 99701	**NORTH SIDE MANAGEMENT, LLC.** **NORTHSIDE BUISNESS PARK**	**COMPENSATORY MITIGATION PROJECT PLAN** **SHEET 3 OF 4**

PROJECT NO: 1308-10	**FILE: PROJECTS/1308/10/ - MITIGATION PLAN/FIGURE/VEGETATION GRADING**	**DATE: 03/21/2017**	**SCALE: AS SHOWN**



Shallow Open Water

Palustrian Shrub Scrub wetland

To be converted into subdivision lots

Emergent wetland

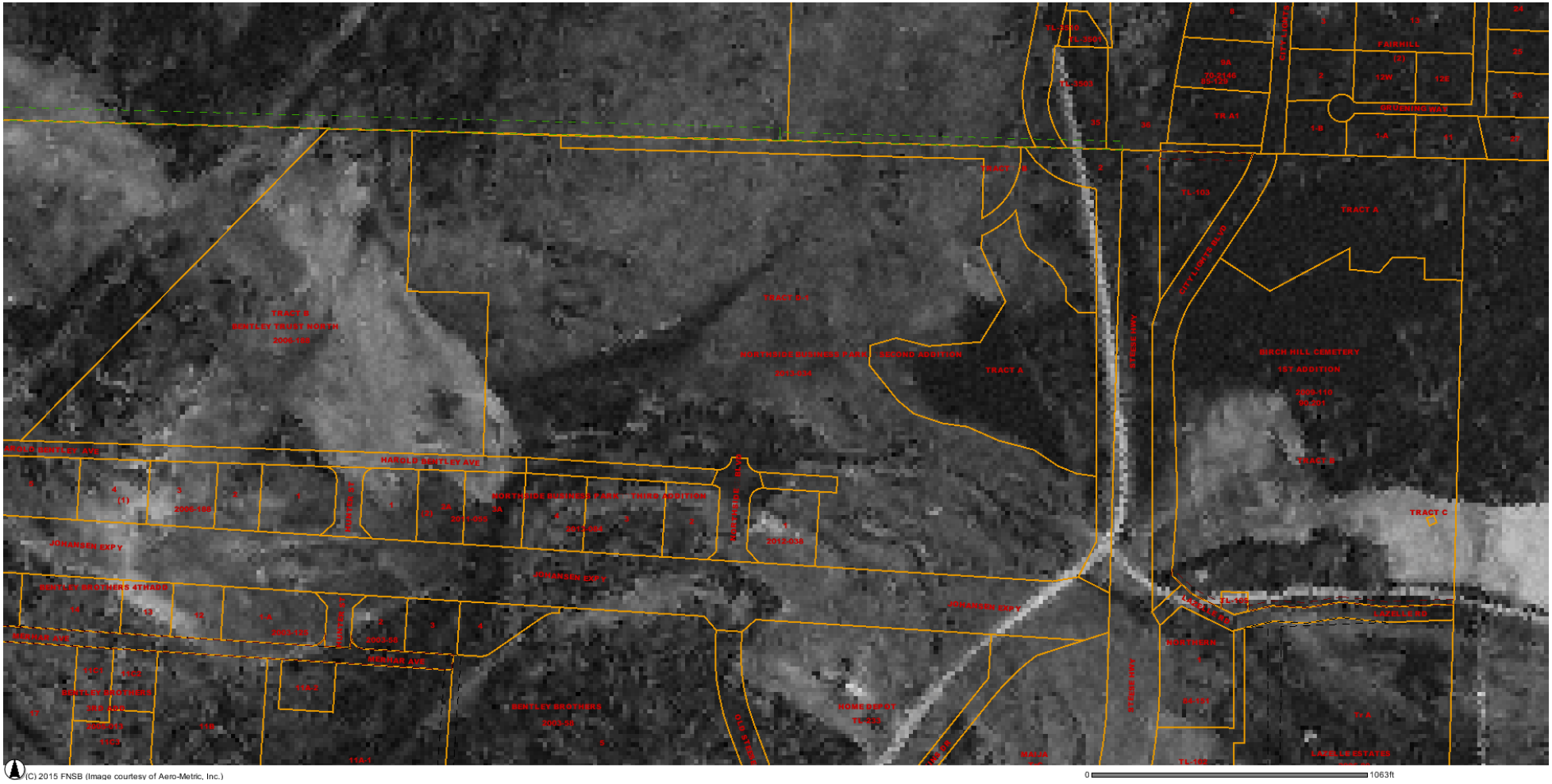
Upland deciduous forest

Deep Open Water

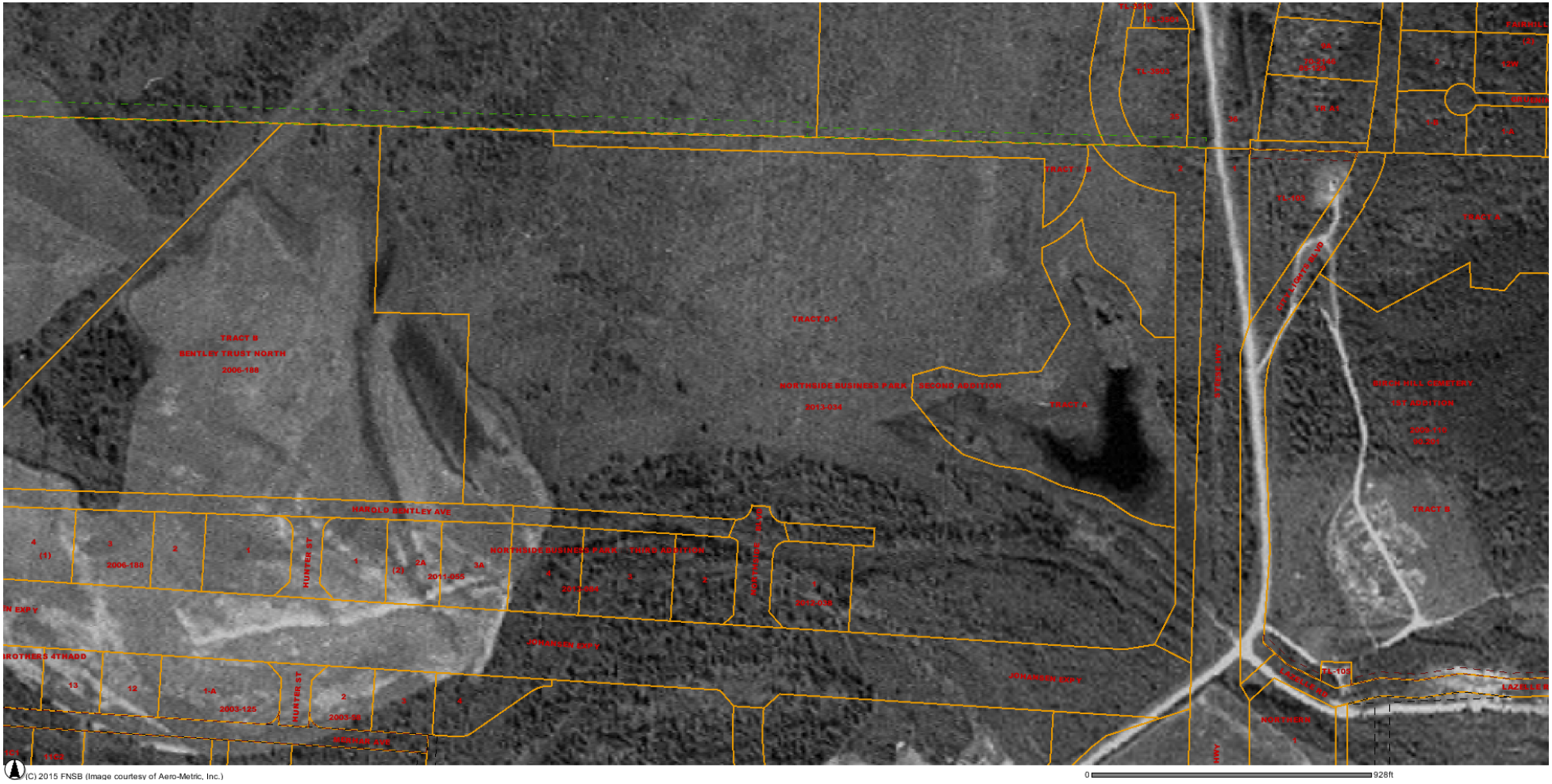
TRAVIS/PETERSON ENVIRONMENTAL CONSULTING, INC. 329 2ND STREET FAIRBANKS, ALASKA 99701	**NORTH SIDE MANAGEMENT, LLC.** **NORTHSIDE BUISNESS PARK**		**COMPENSATORY MITIGATION PROJECT PLAN** **SHEET 1 OF 4**
PROJECT NO: 1308-10	**FILE: PROJECTS/1308/10/-MITIGATION PLAN/FIGURES/SHEET 1 OF 3**	**DATE: 03/21/2017**	**SCALE: 1 inch = 360 feet**

ATTACHMENT 2

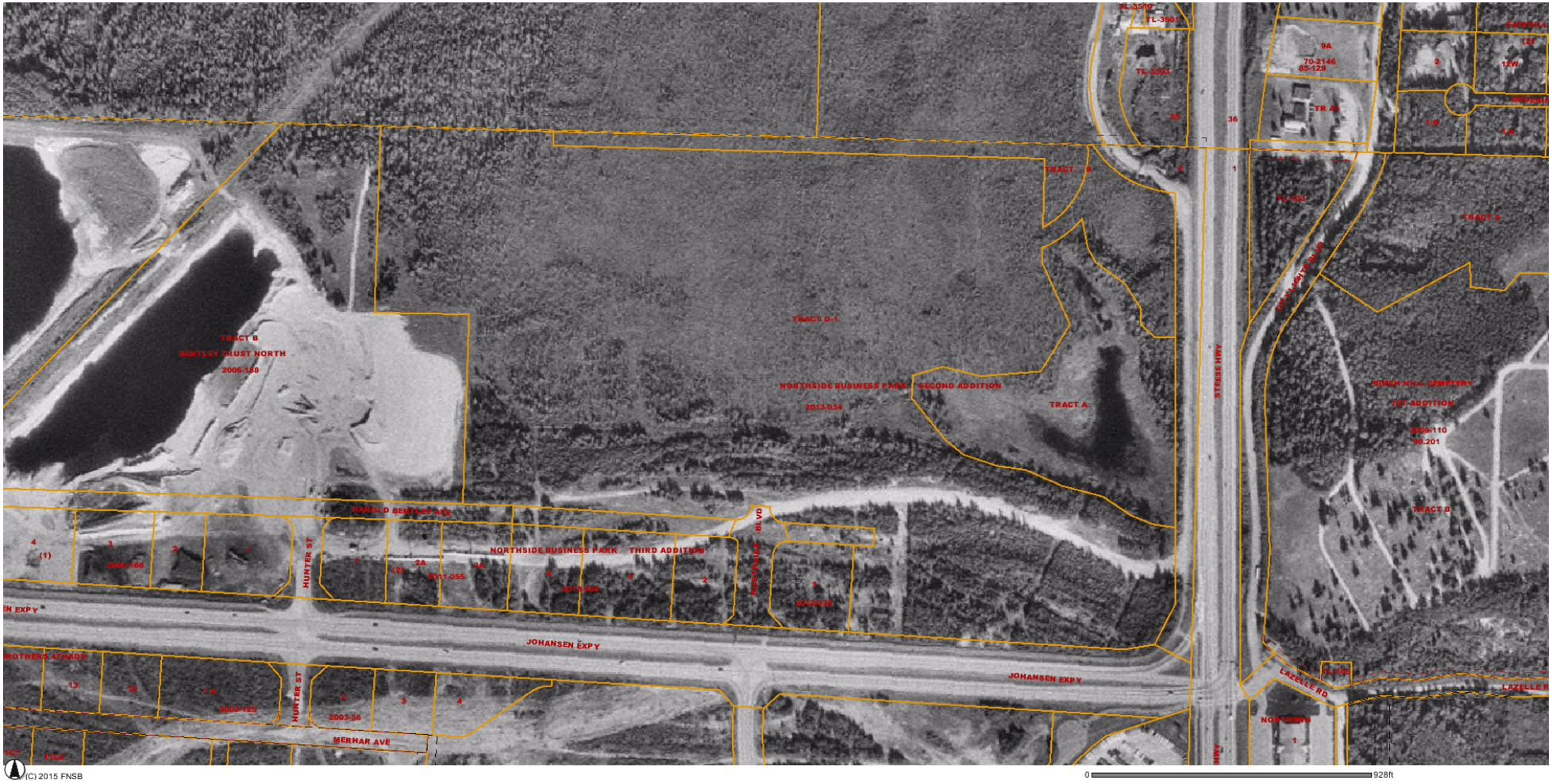
HISTORIC AERIAL PHOTOGRAPHS



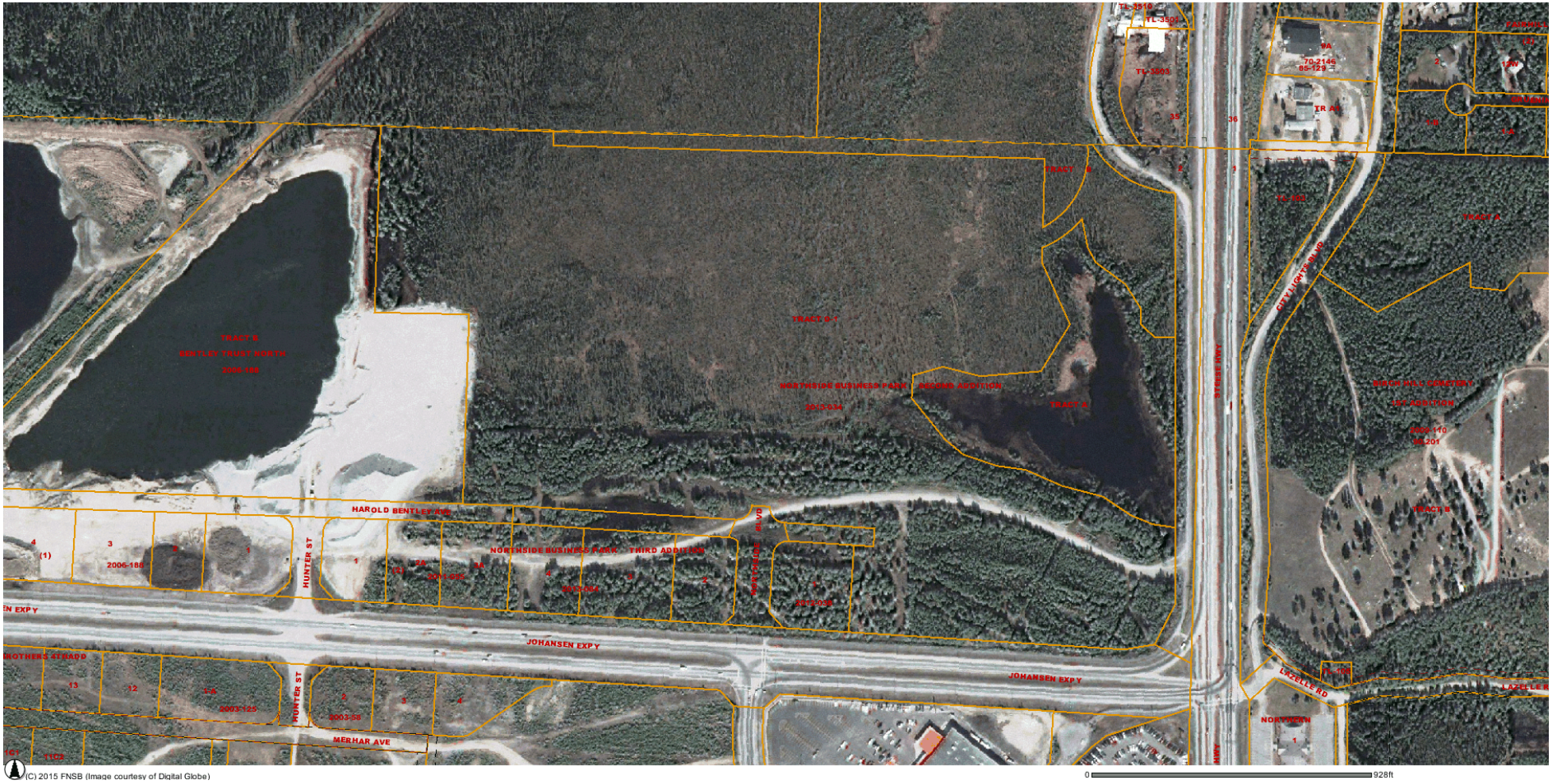
1938 Aerial Photograph



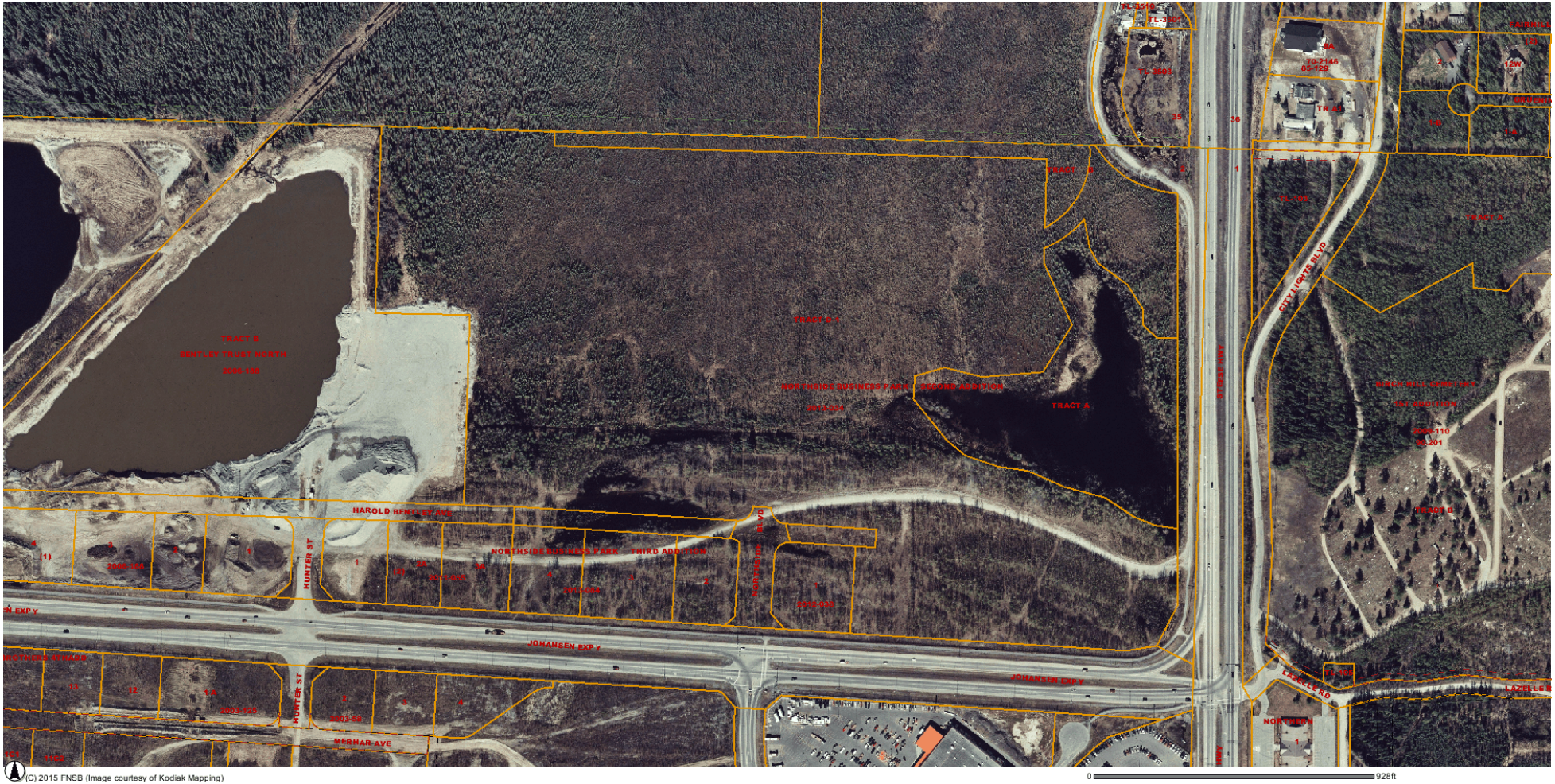
1949 Aerial Photograph



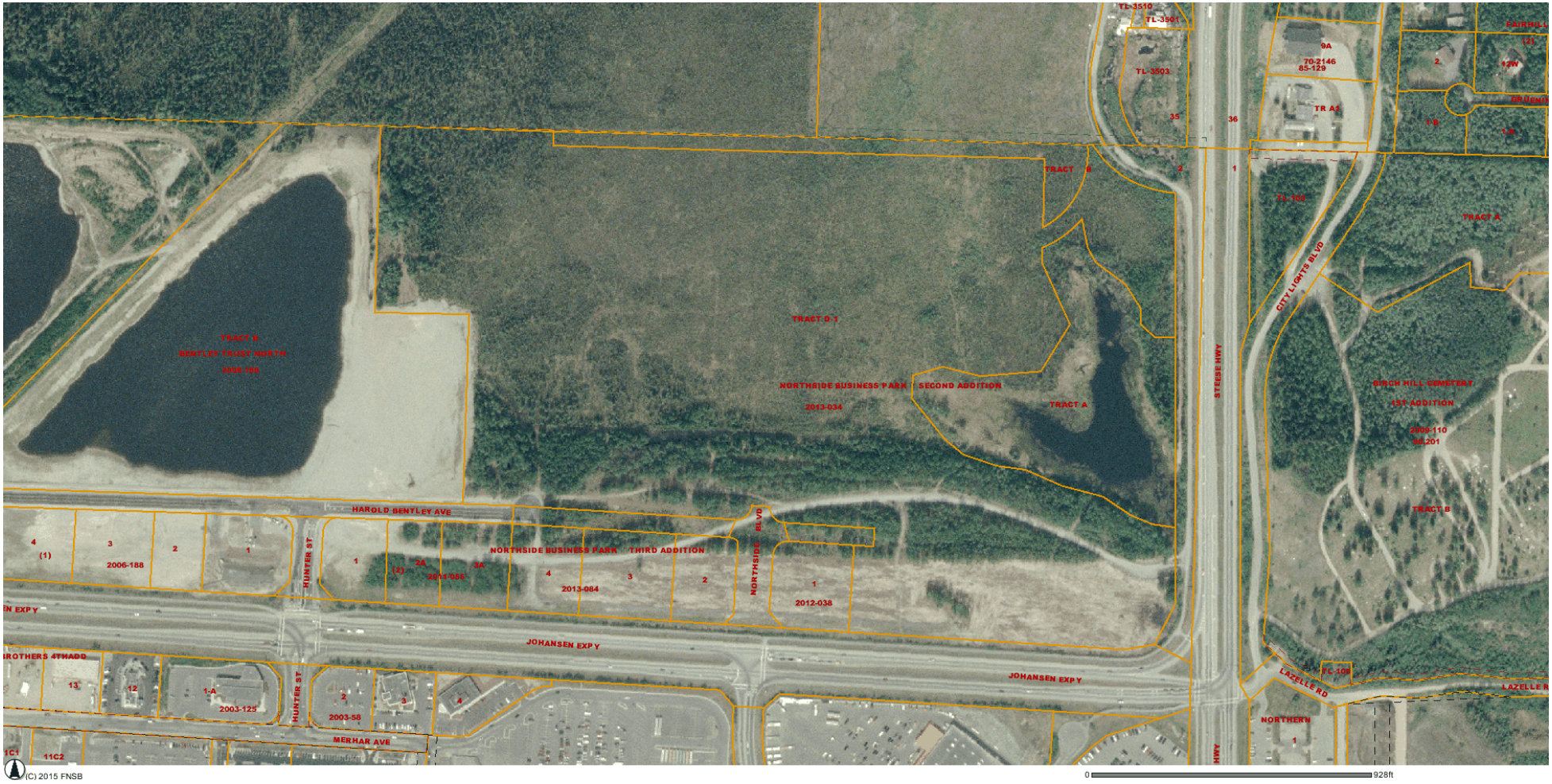
1996 Aerial Photograph



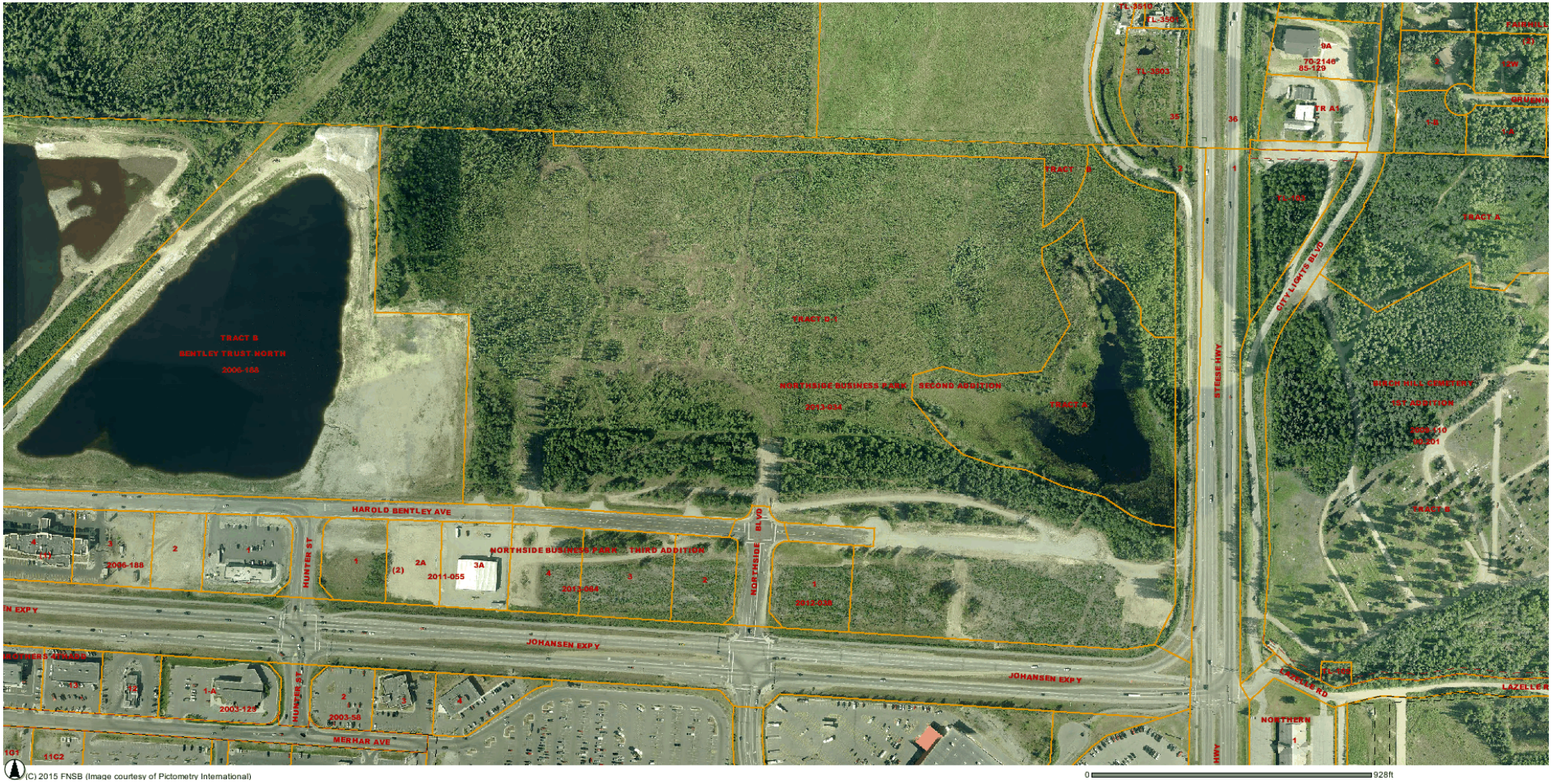
2002 Aerial Photograph



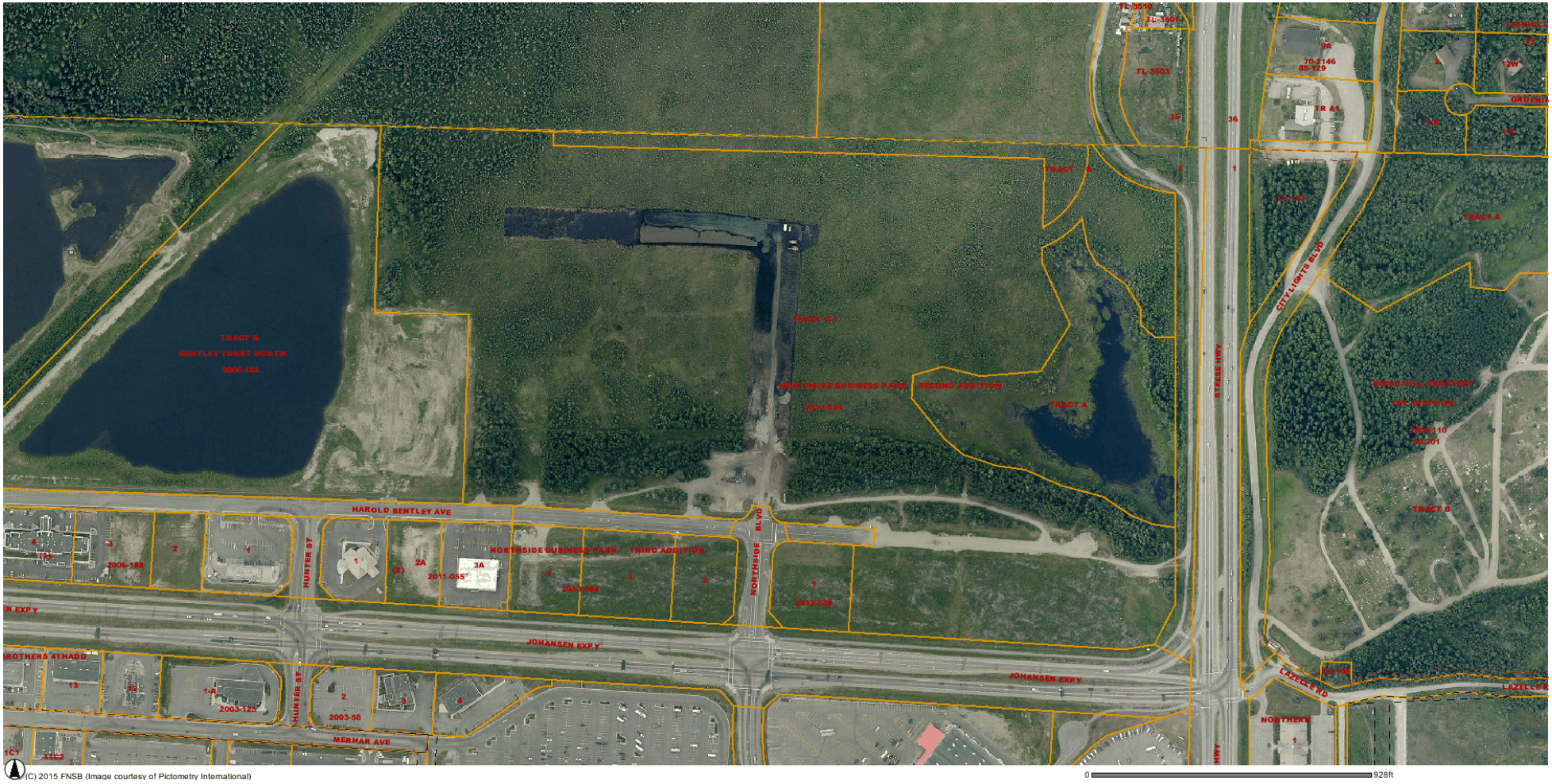
2003 Aerial Photograph



2007 Aerial Photograph



2009 Aerial Photograph



2012 Aerial Photograph