

Wetlands, not just for the birds: A wastewater treatment story.

SESSION PRESENTER(S):



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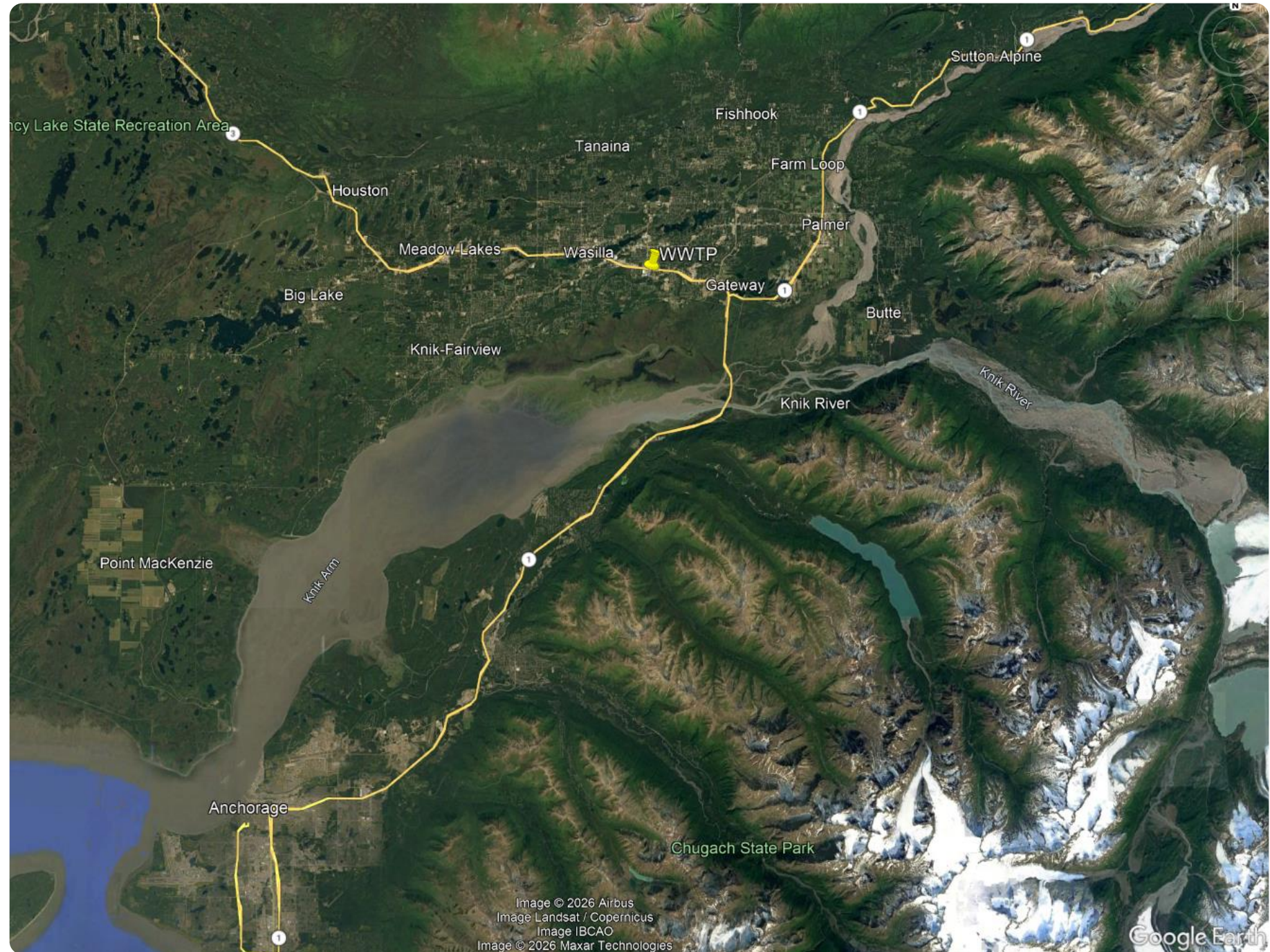
Agenda

1. Background
2. Pilot Study
3. Permitting Pathway
4. Regulatory Framework
5. Conclusions
6. Questions



Background

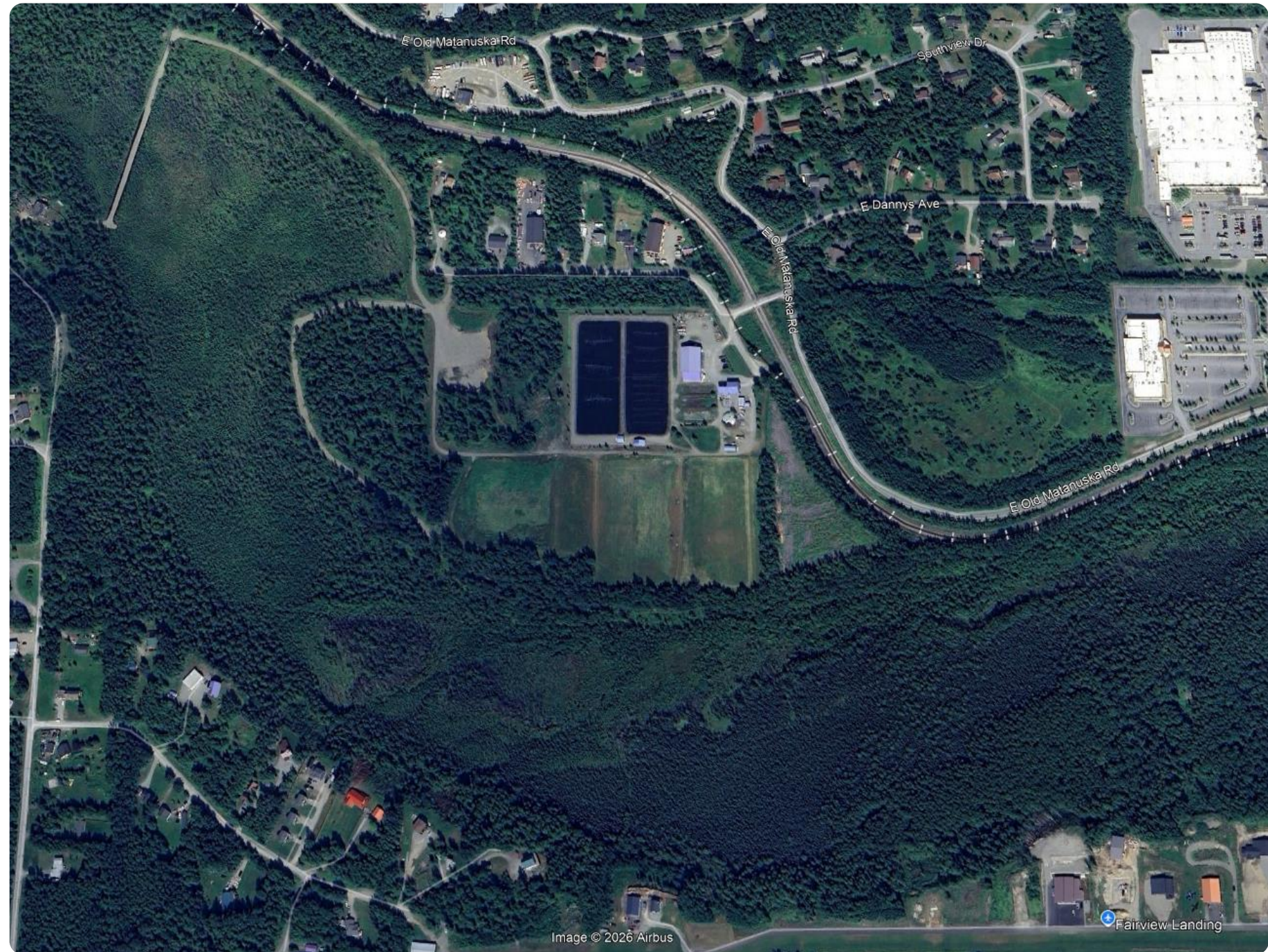
- Septic tank effluent pumping system (est. 1989)
- Subsurface infiltration beds are over capacity
- Surface and subsurface water quality impacts
- Adjacent wetland identified as a supplemental treatment/disposal option





Background

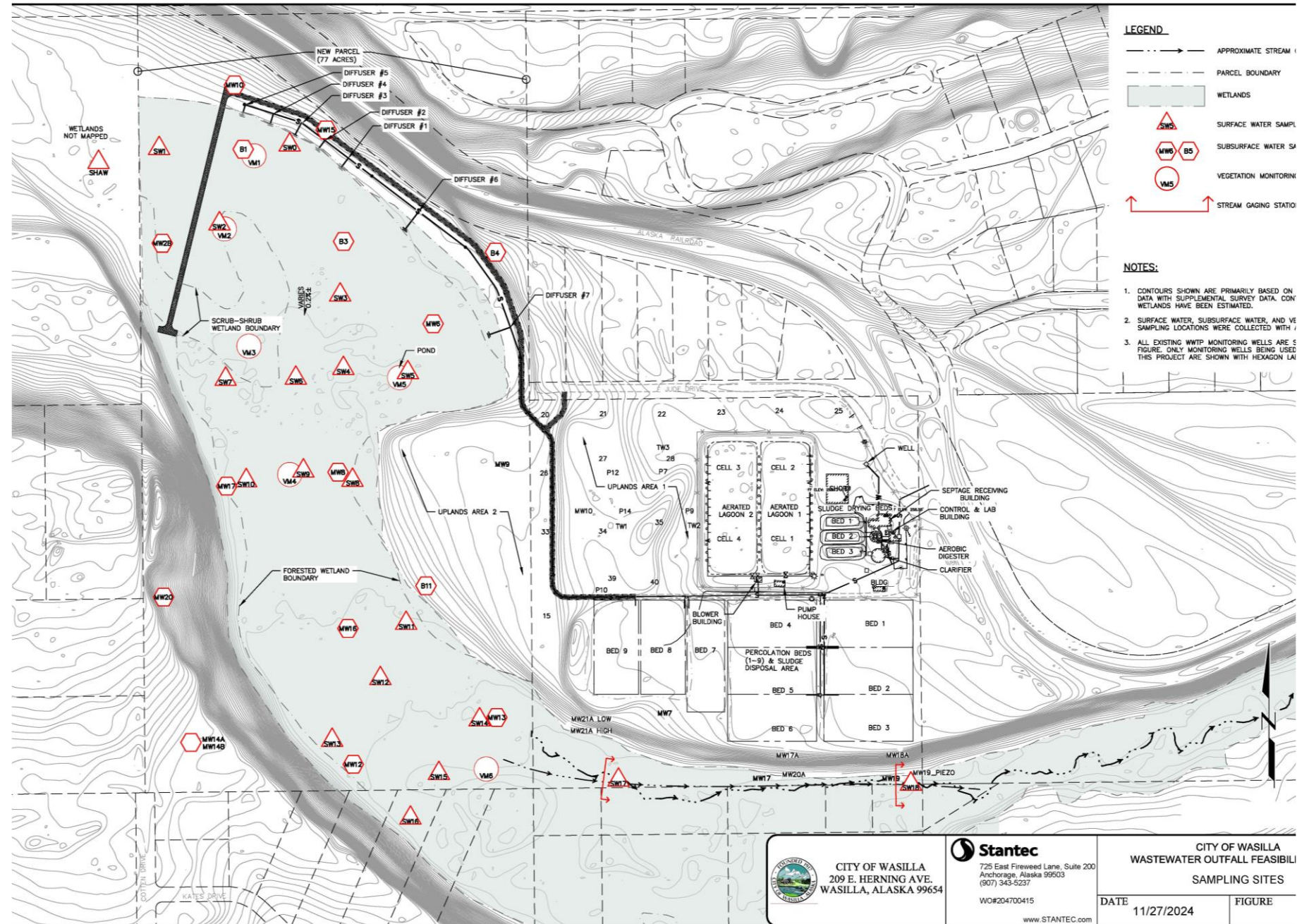
- Adjacent fen wetland with abundant groundwater discharge and complex vegetation structure
- Wetlands work well to improve water quality in a wide variety of settings – worldwide
- Natural wetlands can be particularly well suited – regulatory/permitting uncertainties





Pilot Study

- Authorized to provide opportunity for proof of concept
- Initiated in 2017
 - Water quality
 - Surface/ Subsurface
 - Vegetation
 - Field measure
 - Multi-spectral imagery
 - Hydrology
 - Bacteria
 - DNA fingerprinting

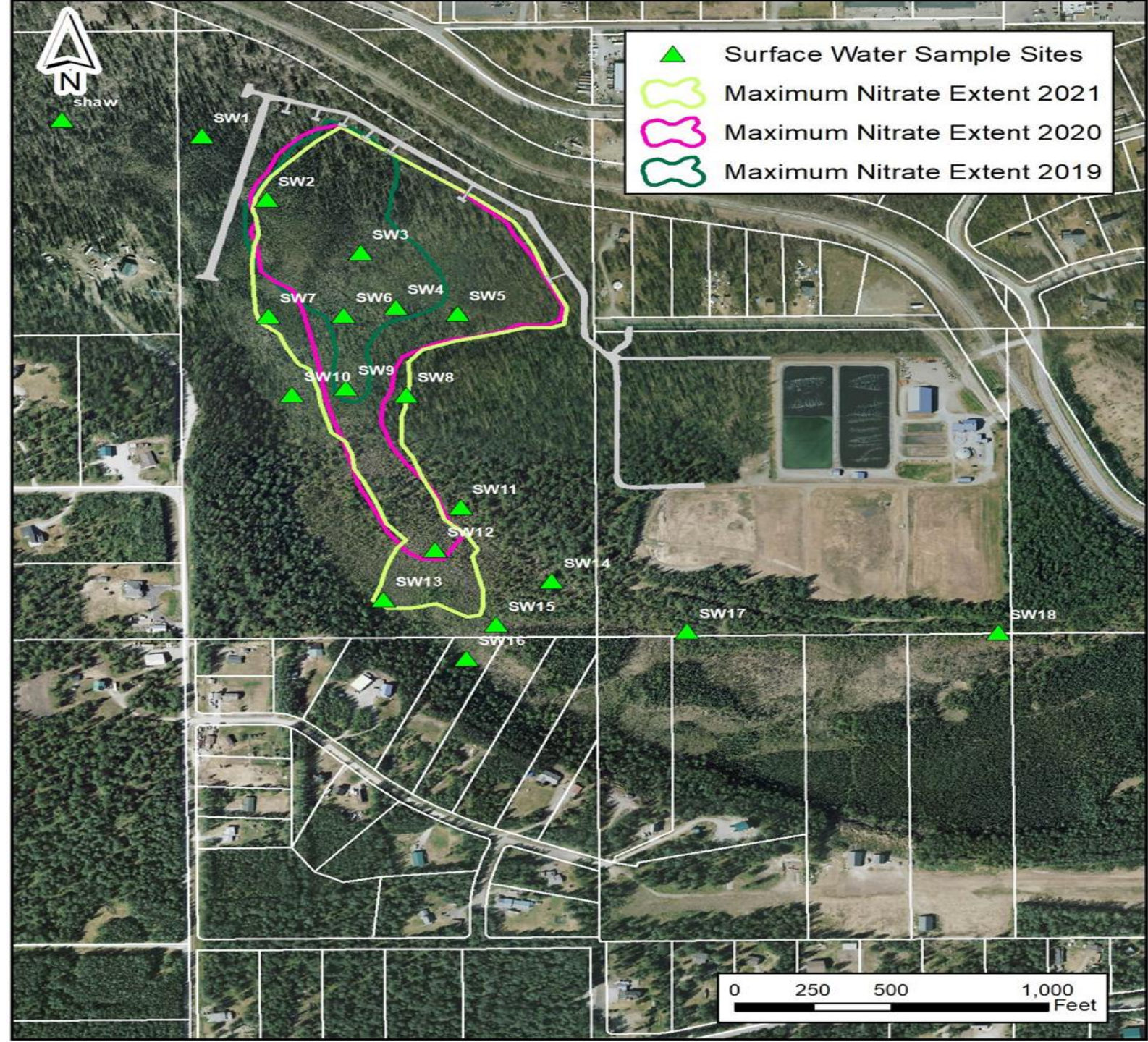




Pilot Study Results

- Highly effective summer removal of nutrients
- Human fecal bacteria removed <300 feet
- Winter removal of ammonia problematic
 - Glaciation
 - Slowed bacterial activity

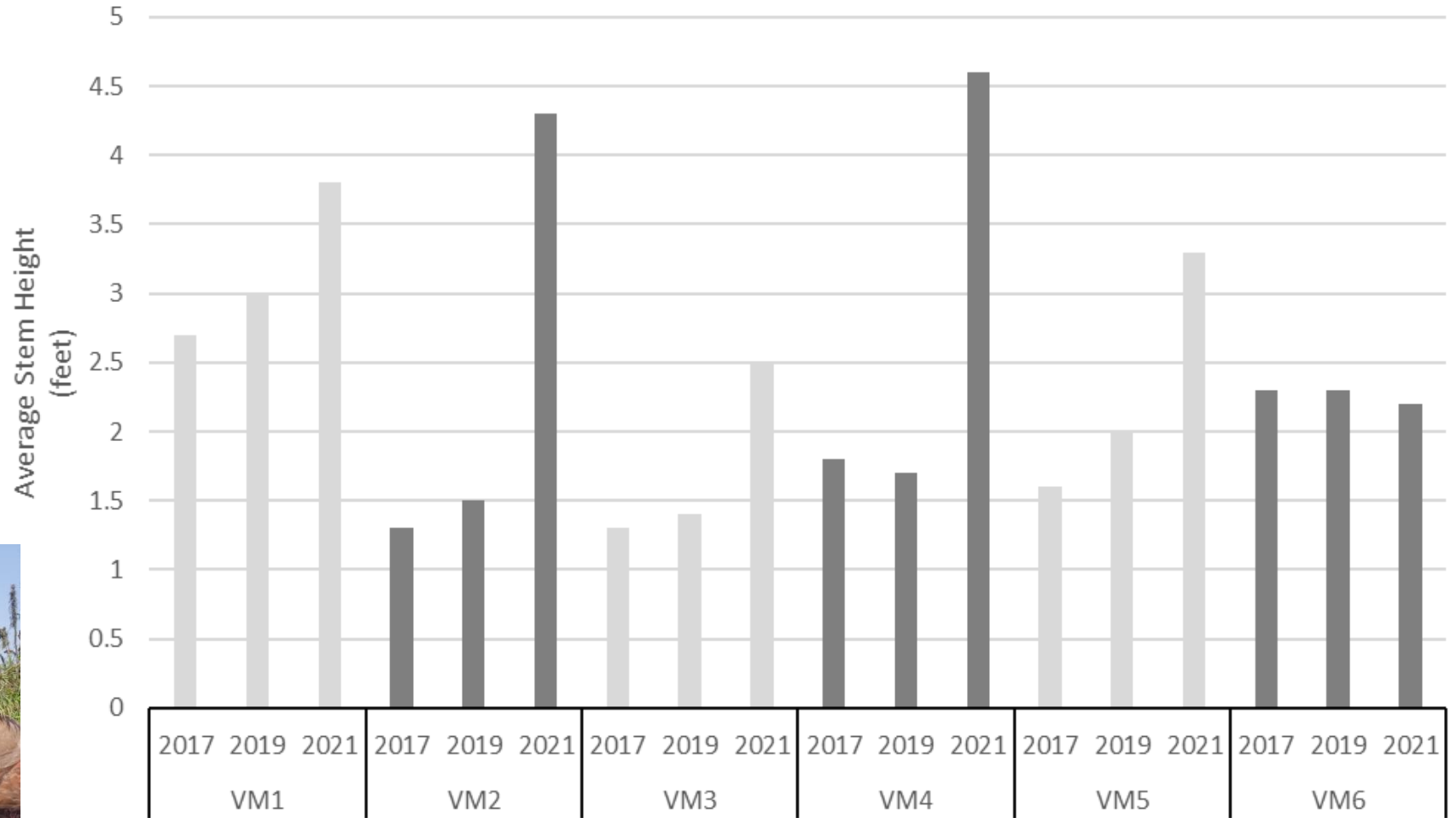
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Wetland Impacts

- Increased inundation
- Spring algal blooms
- Graminoid vegetation growth





Multi-spectral imagery

- Normalized Difference Vegetation Index (NDVI)
 - Index based on reflectance differences between Red and Near-Infrared light



Legend

- Surface Water Sample Locations
- ▭ Subset Area of Investigation

NDVI

High
Low

Notes

1. Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
2. Data Sources: Stantec
3. Background: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan,



Project Location Wasilla, AK	Prepared by RHI on 2021-03-19 TR by JM on 2021-3-31 IR Review by ABC on 2019-01-01
Client/Project Client Project Report	XXXXXXXX-XXXX-REVA
Figure No. 2	
Title NDVI 2020-09-03	

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Multi-spectral imagery

- Differences in NDVI over time can provide evidence of nutrient uptake
 - Valuable for vegetation impacts
 - Valuable to assess system function

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- Legend
- Surface Water Sample Locations
 - ▭ Subset Area of Investigation
- NDVI
- High
 - Low

Discussion

The high NDVI values (green) are likely indicative of nutrients pooling east of the berm and flowing south east towards SW5. Water sample data supports this observation. Additionally, water sample data support that some nutrients are breaching the northwest section of the berm, resulting in the higher NDVI observations in this area. Grasses and other wetland vegetation are likely thriving with the increase in nutrients during the past year also resulting in the increased NDVI throughout the site. We also see grubbing where grasses have succeeded in areas outside of the sample area towards the southwest.

- Notes**
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Project Location: Wasilla, AK
 Prepared by JH on 2021-02-15
 TR by JM on 2021-X-X
 IR Review by ABC on 2019-01-01

Client/Project: XXXXXXXXXXX-XXXX REV#

Client:
 Project:
 Report:

Figure No.: 5

High NDVI Discussion

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Permitting Pathway

- Cannot discharge into waters of the U.S. if water quality standards are not met at end of pipe
- Exceptions for applications in mixing zones in water bodies
- Mixing zone not possible in a wetland
- Declare wetland a Waste Treatment System and use wetland to naturally treat wastewater
- USACE and EPA consultation



Regulatory Framework

Section 404 of the Clean Water Act (CWA) and/or Section 10 of the Rivers and Harbors Act of 1899



U.S. ARMY



United States Army Corps of Engineers (USACE) Regulatory Program

Nationwide Permits (NWP)

- Activities with minimal wetland/waters impacts
- 60 different NWPs to cover activities from maintenance to bank stabilization
- Each has different limits, pre-construction notification requirements, delineation requirements, and applicable waters

Individual Permit

- For activities that do not qualify under a NWP
- Preapplication coordination, permit application form, joint public notice (Section 404 and Section 401 of the CWA), public notice comment period, USACE decision
- Section 404 Individual Permit Obtained



Regulatory Framework

Alaska Department of Fish and Game (ADF&G) Fish Habitat Permit

ADF&G has the statutory responsibility for protecting freshwater anadromous fish habitat and providing free passage for all fish in fresh water bodies (AS 16.05.841-871).



- Applies to activity in freshwater and anadromous fish habitat
- Any activity that may affect fish or fish habitat
- Fish Habitat Permit pending



Regulatory Framework

Alaska Pollutant Discharge Elimination System (APDES) Wastewater Discharge Permit



- Applies to activities that will discharge pollutants to surface waters
- APDES Discharge Permit pending





Conclusion

- Wetland remarkable capacity to remove nutrients and human fecal bacteria
 - Measurable water quality improvements
 - Greatly increases treatment plant capacity
 - Section 404 Individual Permit a Legitimate Pathway for Permitting
 - Wetlands are part of sewage treatment puzzle across the arctic/subarctic and the globe



Thank You!

Questions/Discussion

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