Hydro-Vulnerability Assessment

For Native Village of Venetie Tribal Government, including Venetie and Arctic Village

September 2021

Photo: A beautiful day in Arctic Village, Alaska in July 2021. Picture taken with a UAS (drone).

Prepared by the Yukon River Inter-Tribal Watershed Council in partnership with the Native Village of Venetie Tribal Government. Funding was provided by the BIA Tribal Climate Resilience Program, for the project: *Vulnerability Assessments for Changing Hydrology in Interior Yukon River Basin Communities. Grant # A19AP00196.*

ONE PEOPLE-ONE RIVER

Yukon River Inter-Tribal Watershed Council

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Executive Summary: The YRITWC worked with the Native Village of Venetie Tribal Government to assess threats related to water, or hydro-vulnerabilities in their communities of Arctic Village and Venetie. This is not a comprehensive document. The work was guided by concerns expressed by tribal leaders and Tribal Environmental Professionals. It includes what we can learn from using an Unmanned Aerial System (UAS or drone) and sensors, in addition to some easily available tools.

This report includes:

In Arctic Village: landfill documentation for management, an assessment of the sewage lagoon and its potential impacts to drinking water, and documentation of erosion.

In Venetie: documentation of the landfill, documentation of erosion especially near gravesites, documentation of mining related equipment in the Chandalar Mining District near Trilby Creek.

Introduction: A hydro-vulnerability assessment is a look at how water moves around a community, and how that movement may impact human health and well-being. Permafrost melt and increased rainfall, resulting from a changing climate, is destabilizing once frozen landscapes leading to increases in erosion and changes in contaminant pathways. This assessment includes 1.) documentation of the landfills in Arctic Village and Venetie, 2. an assessment of the sewage lagoon in Arctic Village in relation to the drinking water intake 2.) documentation of river and other erosion in Arctic Village and Venetie 3.) aerial photo documentation of abandoned mine related equipment near Trilby Creek, and water and soil sampling in the Chandalar Mining District which is upriver of Venetie.

For this work an UAS (or drone) was used equipped with infrared and NDVI sensors. DroneDeploy software was used to mosaic images together and create elevation and NDVI maps (a map of vegetation health). Additional tools that were used include the Alaska Department of Environmental Conservation (AK DEC) datasets including: community drinking water intakes, drinking water protection areas and contaminated sites.

LANDFILLS

Aerial photos were taken of the Arctic Village (figure 1) and the Venetie (figures 2 - 3) landfills. The images can be used in community outreach, to guide community-members where to dump, or to help the landfill manager. The waters shown in figure 3 have been sampled by YRITWC and the NVVTG Environmental Department.

Figure 1. Aerial of landfill in Arctic Village.

Figure 2. An aerial of the Venetie landfill.

Figure 3. Venetie landfill zoomed out view, showing waters where sampling has occurred.

SEWAGE LAGOON

There is a small sewage lagoon in Arctic Village that serves the school and the washerteria. The concern with this lagoon is potential impacts to the nearby drinking water intake that serves the community.

Figure 4 shows the drinking water protection zones for Arctic Village. The water is taken from surface water, which means that drinking water is under the direct influence of surface water. The yellow line is the 1 mile buffer around surface waters, and the red is the 1000 foot buffer. The protection of these areas from contaminants is encouraged by the US Environmental Protection Agency and State of Alaska.

The sewage lagoon was built just outside of the buffers of source water protection areas (see figure 5). The tiny blue dot just northeast of the school is the drinking water intake for the washerteria, and the school. The concern is that the lagoon is draining following the red arrow in figure 5, instead of away from the community as shown with the green arrow. Figure 6 is an elevation map, where blue are low areas, and red are areas of higher elevation. From this map it is clear that surface water flow is draining to the south, because of the topography of the area. Although, it is difficult to know the direction of groundwater flow.

The panel of maps in figure 7 includes a thermal map and a NDVI vegetative health map, with a little more information. It looks like there are two places that are draining surface waters, which are marked

on the first map as ‘A’ and ‘B’. In the aerial view a wet area can be seen at ‘A’, and what looks like a culvert that runs under the road. An additional drainage can be seen in the NDVI vegetation health map. This map displays photosynthetic activity, where dark green areas are healthy plants and red is dead. Interestingly, a plume of green can be seen at area ‘B’ indicating good growing conditions such as moisture and nutrients. Phosphorus and nitrogen from sewage lagoons can act as fertilizers and create good growing conditions. The third panel in figure 5 is further evidence of these two draining areas. This map is a thermal image, where purple indicates cool areas and yellow are warm areas. These images were taken on July 8, 2021 at about 2:15 pm. It was a warm day, so the cool areas are likely wetter areas as water takes longer to warm than dry ground. Both areas ‘A’ and ‘B’ are cooler wet areas, where there is likely some drainage. These don’t necessarily pose a human health risk, especially if the natural filtratration is working as designed, but it is something to keep an eye on, especially if there are other indicators of contamination, such as smell and/or contamination found in drinking water.

Figure 4. Overview of sewage lagoon, community drinking water source and drinking water protection zone.

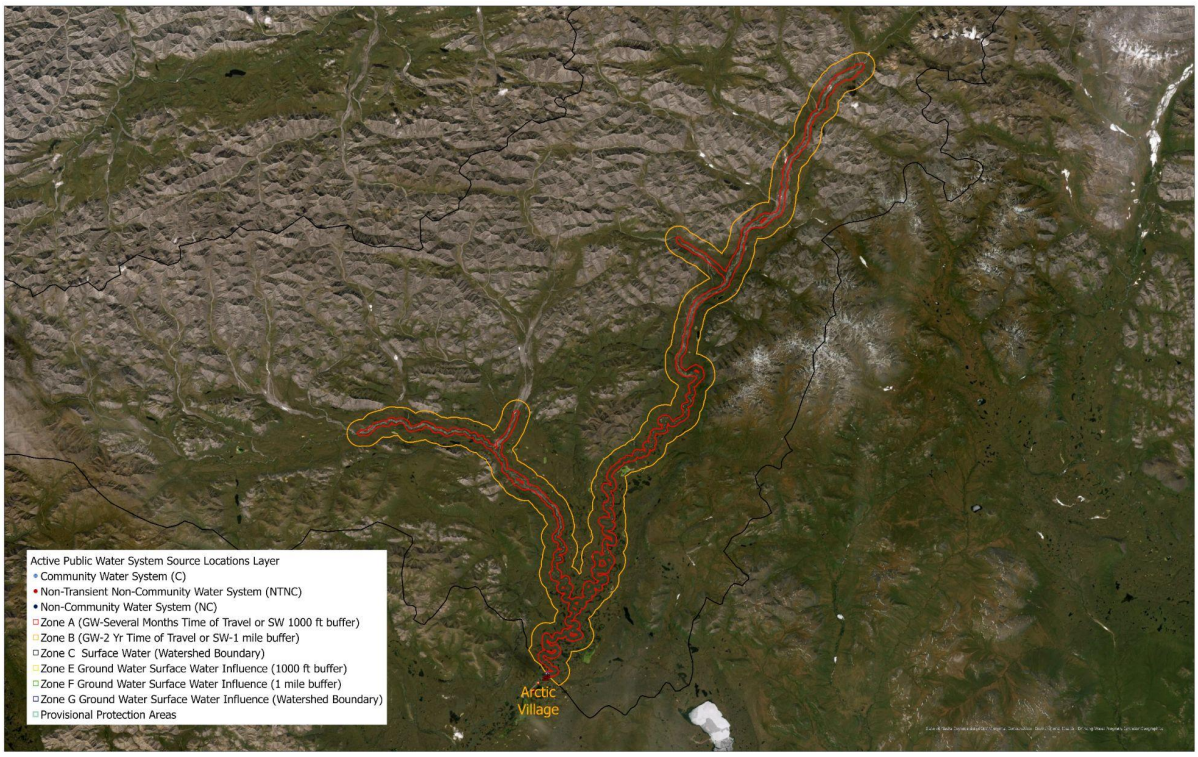


Figure 5. The sewage lagoon (mapped using an UAS) and the boundaries of the buffers for the drinking water protection zones.

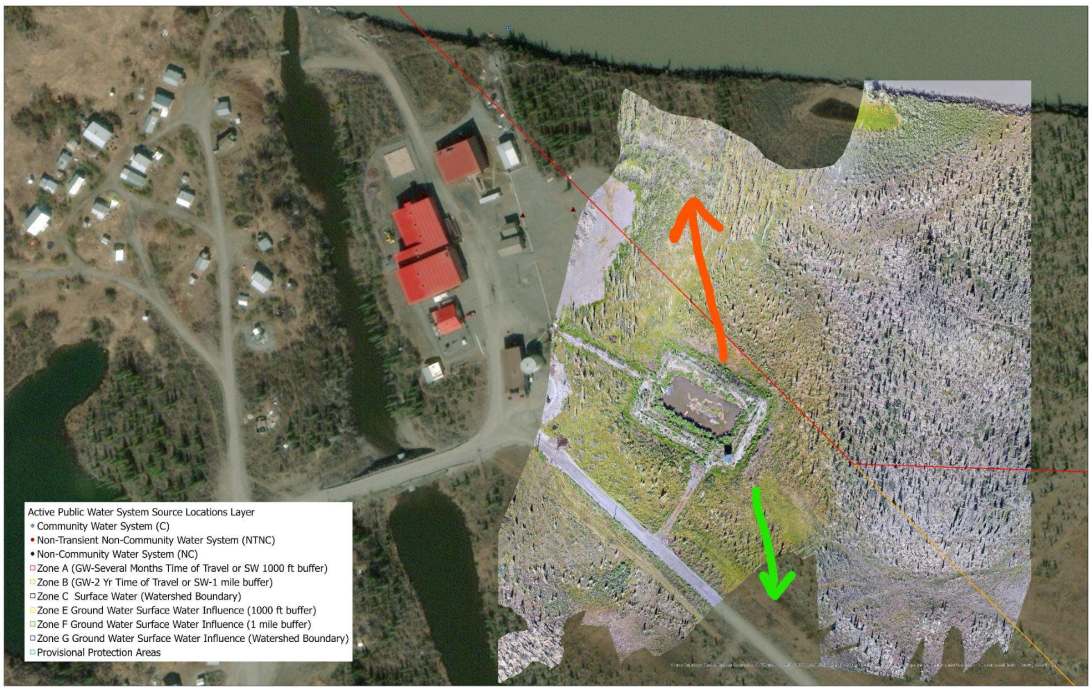


Figure 6. Elevation map where blue is low and red is high.

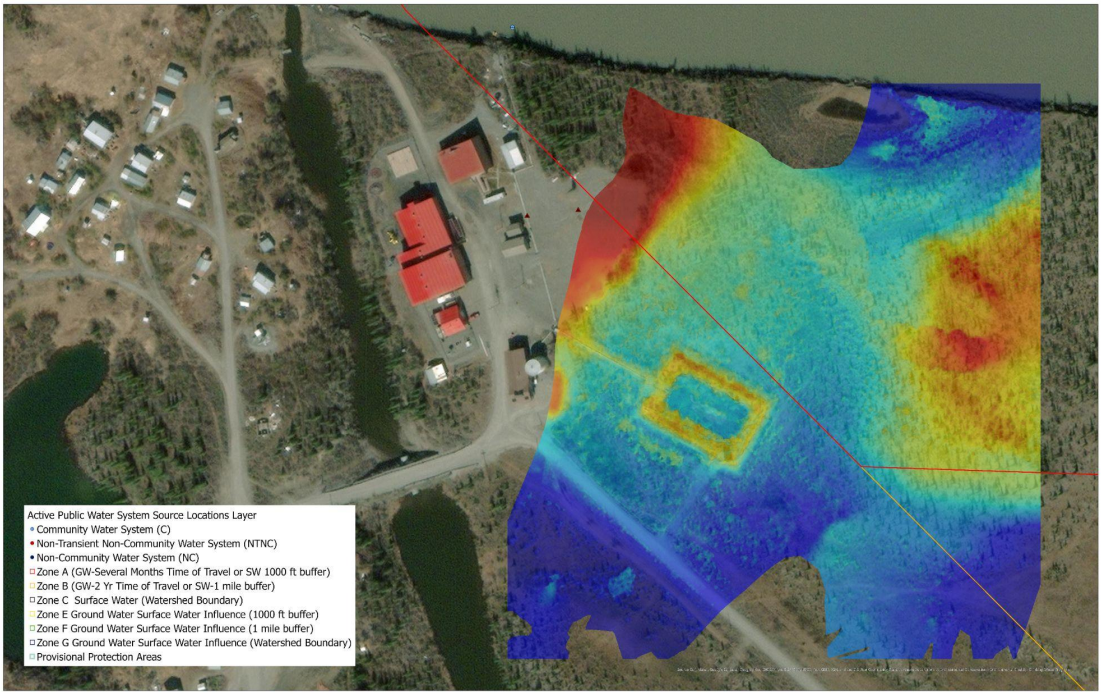
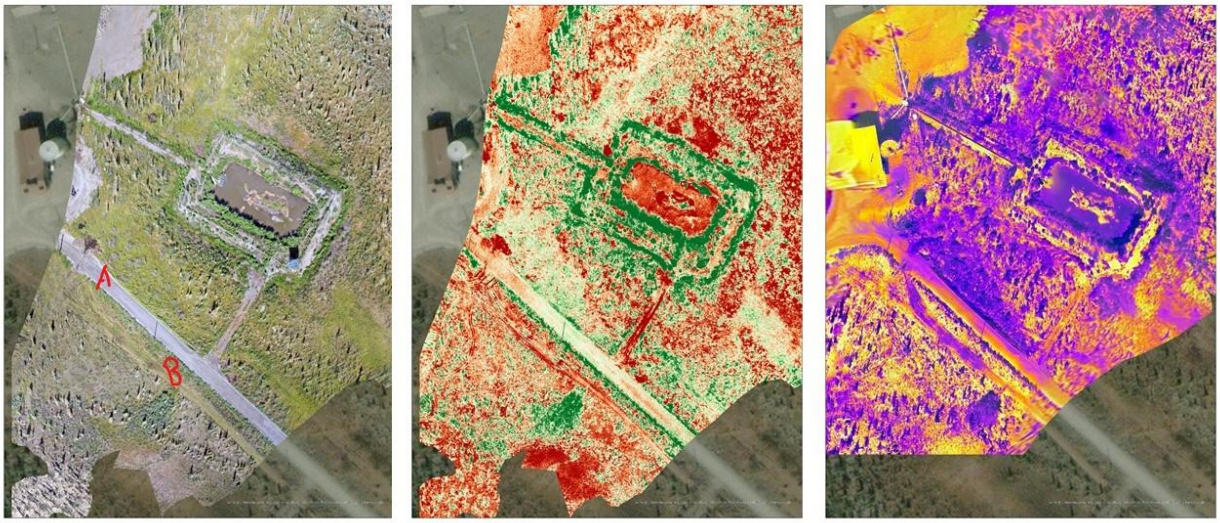


Figure 7. From left to right 1.) close-up aerial view 2.) NDVI vegetative health index 3.) thermal image



EROSION

In this section erosion is documented. These images can be used with historic imagery to show how erosion has occurred over time, or to compare to future images. They could potentially be used in grant applications for erosion mitigation efforts.

Figure 8. Documentation of an additional erosion concern near residential areas in Arctic Village.

Figure 9. Documentation of erosion in Venetie.

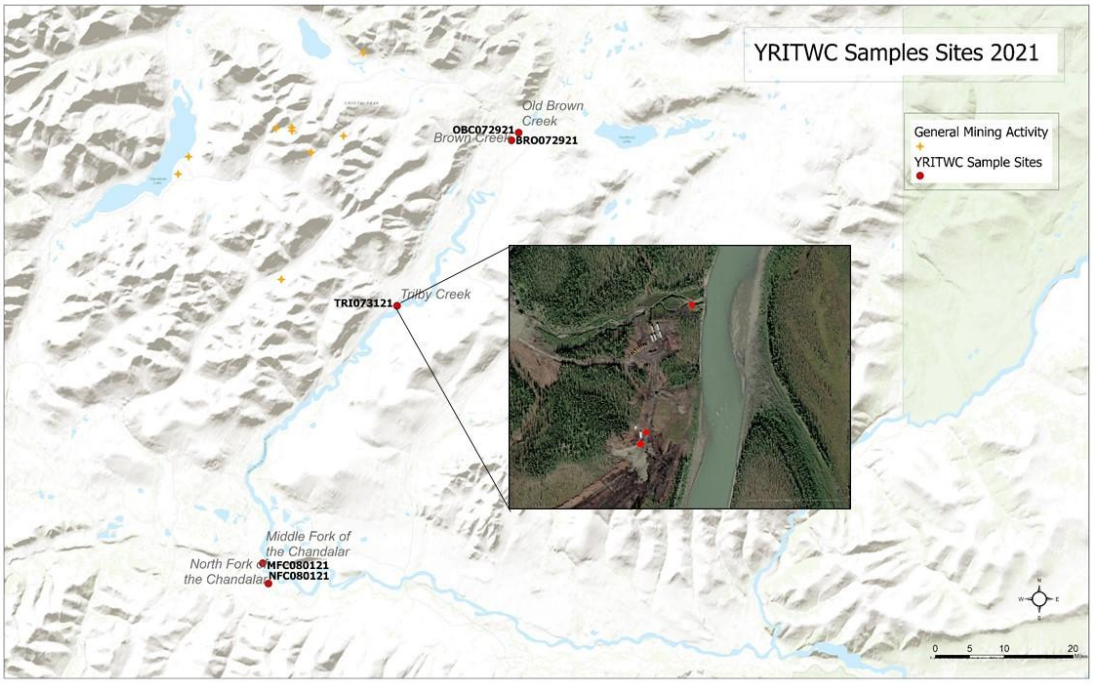
Figure 10. Close up of west cemetery in Venetie, which are of particular concern for erosion.

Figure 11. Close up of the east cemetery in Venetie.

CHANDALAR MINING DISTRICT

At the request of the tribes in Venetie, and Arctic Village YRITWC sampled in the Chandalar Mining District in July and August of 2021 (see figure 12 for sample locations) and documented mine related equipment using a UAS. Waters and soils were tested for 25 metals including mercury, soils were also tested for semi volatile organic fuels (Diesel Range Organics and Residual Range Organics). Additional sampling was done where mining equipment is staged at the Trilby Creek site for volatile fuels including Gasoline Range Organics. The presence of these petroleum hydrocarbons would indicate fuel in the environment, which can be harmful to aquatic life and human health. See full results of those samples in Appendix 1.

Figure 12. Sample sites.



Summary of sample results

Overall waters and sediment were found to be very clean. Sample results were compared to the Drinking Water Standards, and the standards for continued exposure for freshwater aquatic life from the AK DEC. The only samples that exceeded either of these was the pH of 8.5 in the Middle Fork of the Chandalar, which is at the limit for drinking water, and Mercury was found in Brown Creek that exceeded the standard for freshwater aquatic life.

The high pH in the Middle Fork is likely naturally occurring due to the bedrock in the area. Additional sampling throughout the open-water season would be useful for understanding natural conditions. Contacts at AK DEC reported that they have not taken any water samples in the Chandalar Mining District where YRITWC sampled. The mine operators have sampled here, but the results are not public information, and couldn't be found on-line.

The mercury found in Brown Creek was at 1.17 parts per billion (ppb). The limit for chronic exposure to freshwater aquatic life is set at 0.1 ppb. This means the mercury present in the creek is likely impacting any aquatic life there, including fish. Very low levels of DRO and RRO were found in Brown Creek, Trilby Creek, the North Fork of the Chandalar, and the Middle Fork of the Chandalar. The highest of these was the RRO in Trilby Creek at 176 mg/kg when the maximum presence allowed by the State of Alaska before a site is considered cleaned-up is 22,000 mg/kg. These low levels are unlikely to have impacts. Similarly, very low levels of Gasoline Range Organics were found near the fuel tank, and are unlikely to have any negative impacts.

There is a significant camp at Trilby Creek that supports mining activity. It includes seven pieces of heavy equipment, two very large fuel tanks, a trailer, and two other pieces of large mining equipment. There are also batteries, many 55 gallon drums, generators and other mine related equipment (see figures 13-17). All fuel tanks and 55 gallon barrels seem to be empty, based on thermal imagery and a hollow sound when knocked on, although they could have residual fuel in them. A bear has been digging around the large fuel tank near the airstrip, likely attracted by the smell of fuel, or the creosote treated foundation it is built on. Samples found little evidence of fuels in the soil here.

Online Exploration recently owned this mine claim (figure 18), although through a search of the State of Alaska's DNR land records, and the Alaska Mapper it was found that the lease was transferred to Atom Gold Alaska Corporation in 2021. During a phone conversation on March 18, 2021 with Kevin Adler the previous operator at OnLine Exporation (olexplor@alaska.net, 907- 345-4815) he explained that they planned to work during the 2021 summer season. Online Exploration purchased the equipment staged at Trilby, from the previous operators Goldrich Mining Company, and planned to either reccomision them for use, or backhaul them. They were planning to do exploratory work on Trilby and Big Creek, with some drilling, Ground Penetrating Radar, and perhaps limited suction dredging. If they found enough gold to make the expense worth it, they planned to raise funds and develop a larger placer gold mine, basically digging through old river beds, crushing and washing rocks. This could be at Big Creek, Trilby Creek or both. We were at the site on July 31, 2021, and there were no signs of recent activity. The plans of Atom Gold are unknown. This site has been added to YRITWC's Brownfields inventory, which means we will continue to monitor the site, and if the equipment becomes abandoned, we will look for the responsible party and work to hold them accountable to get the site cleaned-up. Appendix 2. includes the summary of this site for including it in the YRITWC's Brownfield inventory. Given its remoteness, it would be a significant effort and cost to clean this area up.

Figure 13. Aerial overview from the airplane of the gold mine camp.

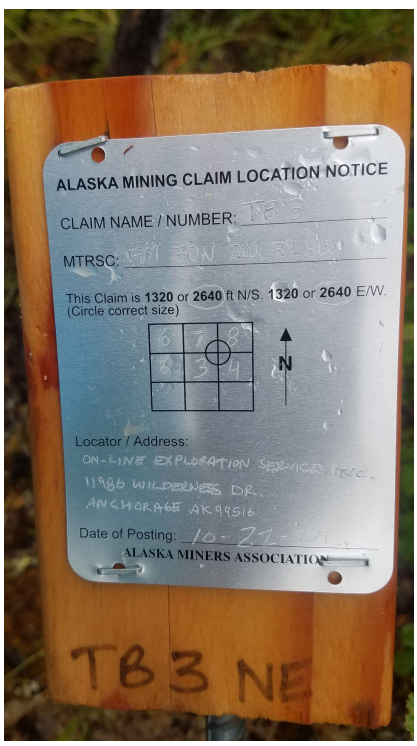
Figure 14. Heavy equipment, fuel tanks and other equipment.

Figure 15. Looking inside the trailer.

Figure 16. Centrifuge for separating the gold.

Figure 17. Large fuel tank near the airstrip.

Figure 18. Posted at site



Conclusion

This report contains documentation of potential threats to clean water and erosion for the Native Village of Venetie Tribal Government. Potential threats include the landfill, sewage lagoon, erosion and an upriver mining district. It is intended to provide more information about some of the concerns expressed by tribal leaders, tribal environmental professionals and residents. This report represents a snapshot in time and it is our hope that it may contribute to future monitoring and assessment toward achieving community goals and priorities.