Nuyakuk River Hydroelectric Project (P-14873)

Initial Study Report (ISR) Meeting

December 5, 2023

Nushagak COOPERATIVE

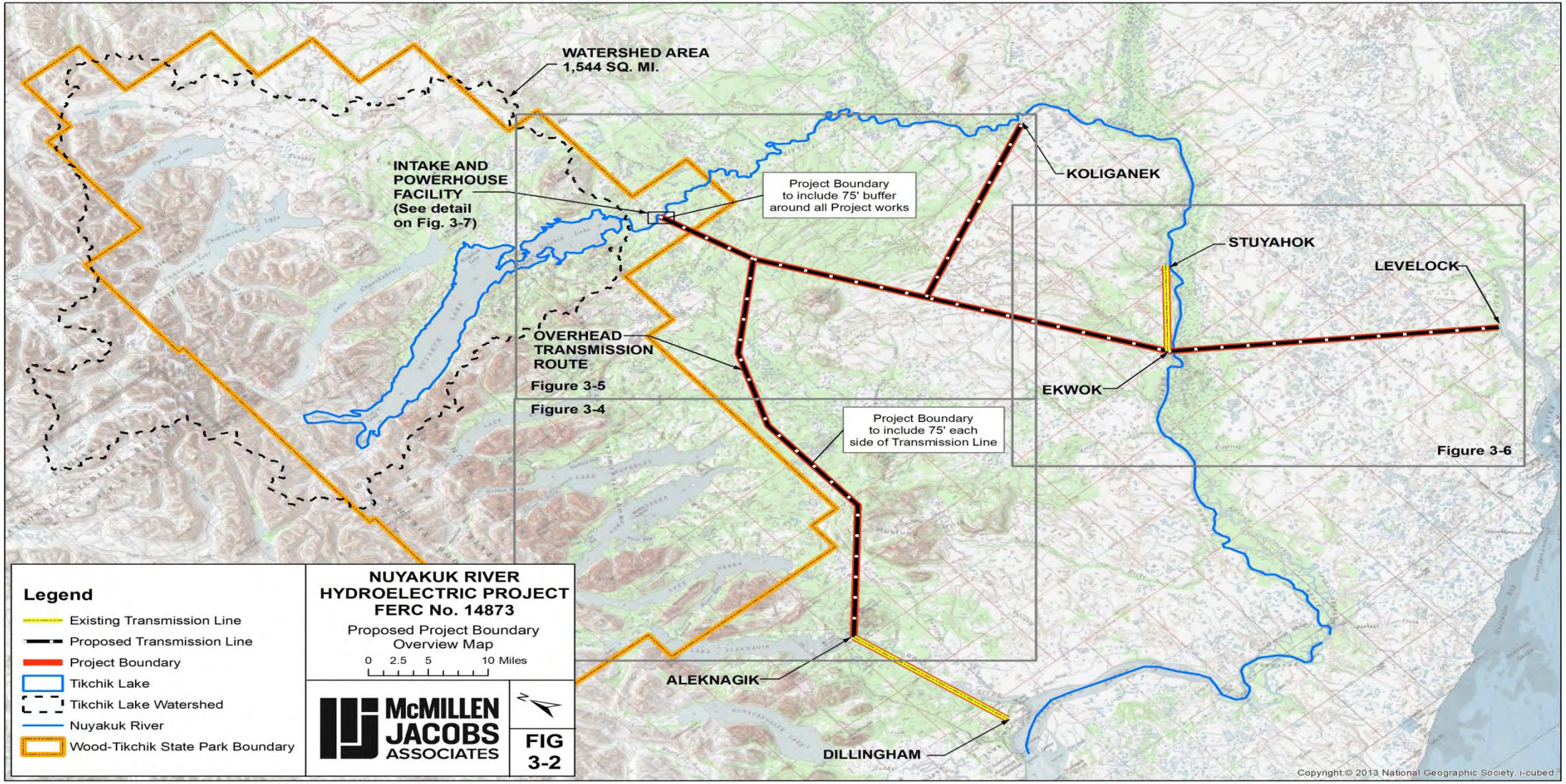
LOGISTICS

- Refreshments
- Bathrooms
- Meeting Recording
- Sign-in Sheet
- RWG Sign-up Sheets

MEETING INTENT

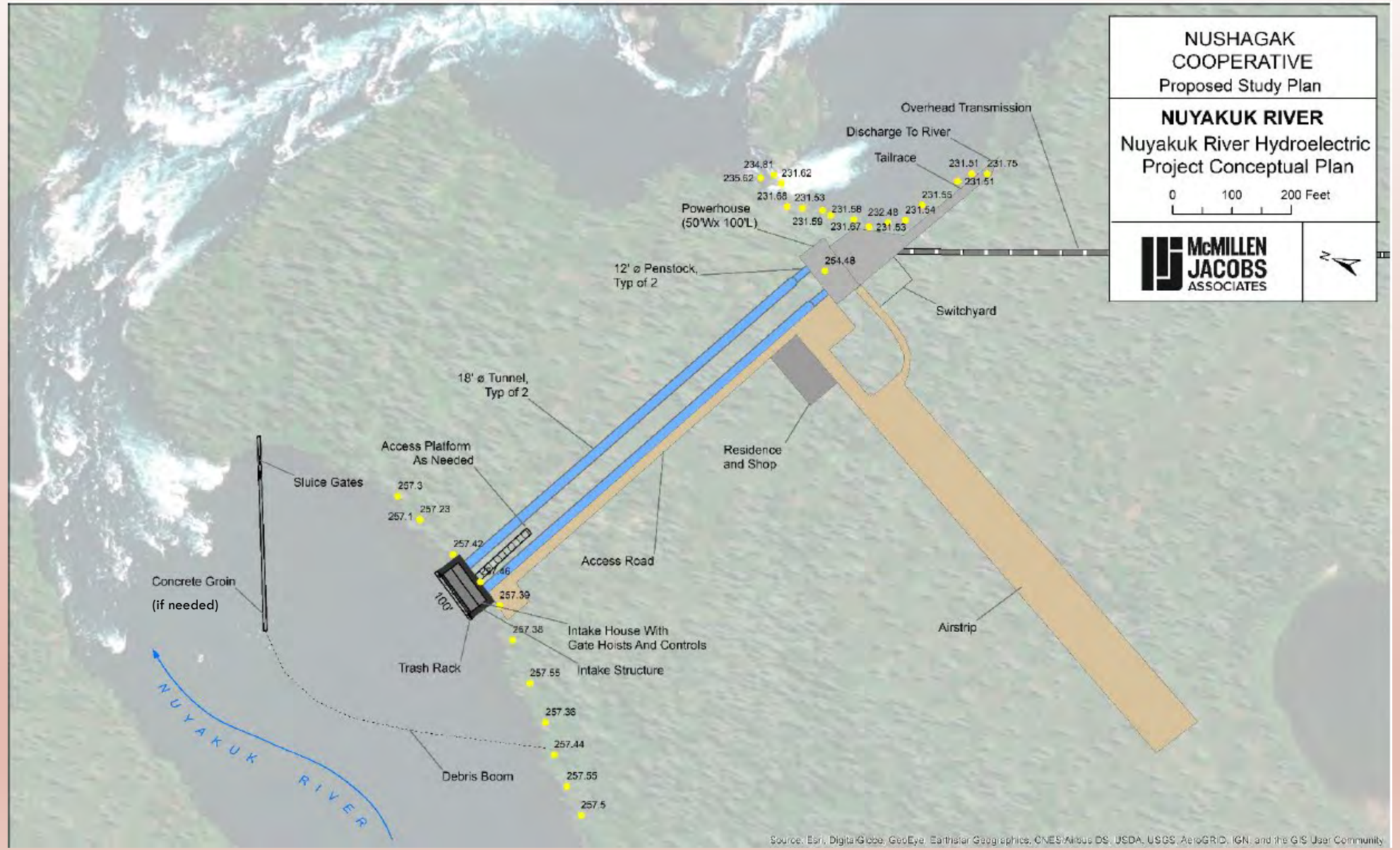
- FERC input – Matt Cutlip
- Describe results from all studies conducted in 2023
  - Prelude to your respective reviews
- Intent of ISR
- Reminder of current Project concept
- Questions and comments on work conducted and results
  - State your name
- Describe plans for 2024
- Formation of additional technical working groups
- Lay out the remainder of the FERC process
  - Key milestones into the future
- Discuss upcoming future meetings, communications w/FERC, opportunities for informal input
- Global questions and comments

PROJECT AREA



KEY PROJECT FEATURES

- Currently proposed between 10-14MW
- No dam – utilization of existing natural control
- Limited footprint and short bypass reach through limited aquatic habitat zone
- No lengthy access roads necessary – Air or via river
- Highest annual flows coincide with peak run timing for key salmonid species, renewable hydro generation would allow for power production for 100% of the fish processing effort
- As currently conceptualized, would take Dillingham/Aleknagik and four remote villages almost completely off fossil fuel generation annually
- Based on analysis, most appealing renewable option in the region. Multiple options have been analyzed over the past 10 years


NUSHAGAK
COOPERATIVE
Proposed Study Plan
NUYAKUK RIVER
Nuyakuk River Hydroelectric
Project Conceptual Plan
0 100 200 Feet
McMILLEN
JACOBS
ASSOCIATES
Overhead Transmission
Discharge To River
Tailrace
Powerhouse
(50'Wx 100'L)
12' ø Penstock,
Typ of 2
Switchyard
18' ø Tunnel,
Typ of 2
Access Platform
As Needed
Sluice Gates
Residence
and Shop
Access Road
Concrete Groin
(if needed)
Intake House With
Gate Hoists And Controls
Intake Structure
Trash Rack
Airstrip
Debris Boom
NUYAKUK RIVER
234.81
235.62
231.62
231.68
231.53
231.58
232.48
231.54
231.59
231.67
231.53
231.51
231.75
231.51
231.55
254.48
257.3
257.1
257.23
257.42
257.46
257.39
257.38
257.55
257.36
257.44
257.55
257.5
100'
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

KEY DEVELOPMENTS OVER THE PAST YEAR

- Collaborative ARWG and public involvement related to technical study plan improvements (collective development, review and commenting)
  - Bi-monthly ARWG meetings
  - Website updates and emails to contact list throughout process
  - Review/comment period associated with the RSP
- Geotechnical analysis
- Biological study camp established
- All requisite natural resource permit applications submitted
  - ADNR Land-use Permit
  - ADFG Fish Habitat Permit
  - ADFG Fish Resource Permit
- 2023 Study season completed
- Development of life cycle and economic models
- Cooperative agreements reached with BBSRI, BBNA and NMFS related to certain study elements
- Multiple ARWG and public meetings along with presentation at relevant regional conferences

PROJECT GOALS

- Respect the environment and all local/regional interests

- At the current phase – Assess the feasibility of the Project via:
  - Natural resource studies
  - Geotechnical evaluations
  - Preliminary design concepts
  - Dialogue with the local and regional stakeholders

- Use the best possible science and regional experts to assess feasibility

- If deemed environmentally feasible, the Project will
  - Significantly reduce (if not eliminate) current reliance on fossil fuel resources for electricity
  - Represent a long-term, renewable power source for the region
  - Lower power rates, over time
  - Provide short and long-term employment opportunities for the region

- Consistently collaborate with, inform and involve all interested regional individuals, Tribal entities, and public interest groups throughout the process

2023 STUDY RESULTS

NATURAL RESOURCE STUDY PROGRAM

- Fisheries/Aquatics
  - Fish Community and Behavior Near the Project Area
  - Falls Fish Passage Study
  - Entrainment and Impingement Study
  - Tailrace False Attraction Evaluation
  - Chinook and Sockeye Life Cycle Modeling
  - Integrated Risk Assessment of Fish Populations
- Water Resources
  - Dissolved Oxygen and Water Temperature Focus
  - Flow Duration Curve/Stationarity Assessment*
  - Future Flows Study*
  - Ice Processes Assessment
- Terrestrial
  - Botanical Impact Assessment
  - Wetlands Impact Assessment
  - Caribou Population Evaluation
- Cultural
  - Subsistence Study
  - Section 106 Evaluation
- Recreation and Aesthetics
  - Noise Study
  - Recreation Inventory

**Voluntary study, not required by FERC*

FISHERIES/AQUATICS

FISH COMMUNITY AND BEHAVIOR NEAR THE PROJECT AREA

Methods

- Underwater Video
- Snorkel Surveys (stage dependent)
- Net/ trap sampling
- Predator Angling
- Observation Tower [BBSRI]
- Sonar Smolt Monitoring

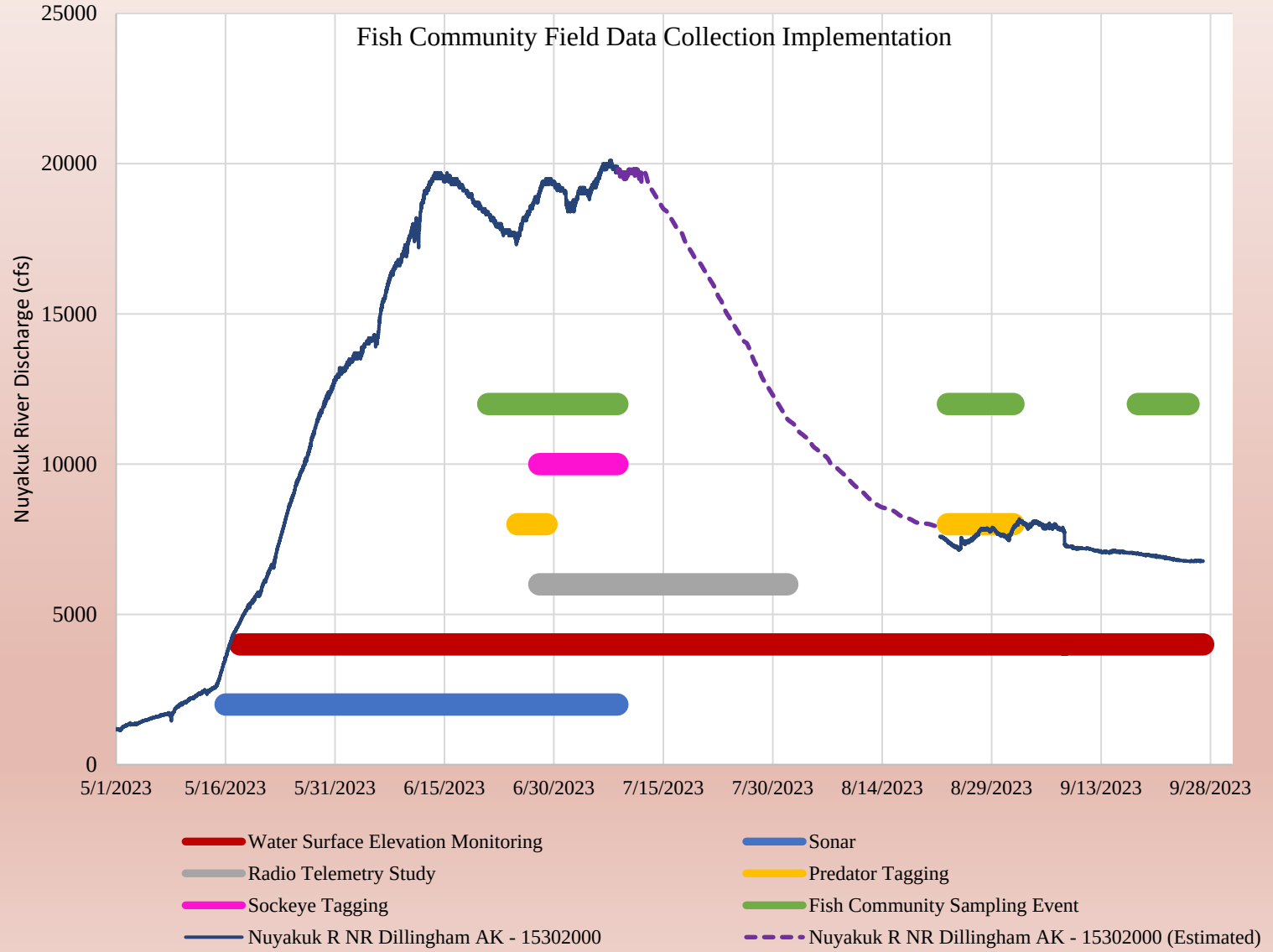
FISH COMMUNITY AND BEHAVIOR NEAR THE PROJECT AREA

Results

Common Name	Species Name	Life Stage	Project Zone	Encounter Method	Observation Period
Chinook Salmon	*Oncorhynchus tshawytscha*	fry	1	SE, VO	June 15-July 16
		smolt	1, 2, 3	SE, VO	June 15-Aug 15
		adult	2	VO	July 2
Sockeye Salmon	*Oncorhynchus nerka*	fry	1, 2, 3	SE, VO, MT	May 15-Sept 30
		smolt	1, 2, 3	SE, VO, MT	May 15-Sept 30
		adult	1, 2, 3	GN, AN, VO	June 15-Aug 30
Grayling	*Thymallus thymallus*	adult	1, 2, 3	AN, VO	June 15-Aug 30
		juvenile	1, 3	VO	Aug 28-Sept 1
		smolt	1	SE	Aug 26
Pink Salmon	*Oncorhynchus gorbuscha*	fry	1, 3	SE, VO	June 15-July 15
Coho Salmon	*Oncorhynchus kisutch*	fry	1, 3	MT, SE	June 24
		smolt	1, 3	SE	June 25-Aug 15
Arctic Lamprey	*Lampetra camtschatica*	smolt	1	MT	June 24
Chum Salmon	*Oncorhynchus keta*	adult	1	VO	July 4
Pike	*Esox lucius*	adult	3	VO	June 15-Sept 30
		juvenile	1	SE	Aug 26
Humpback Whitefish	*Coregonus pidschian*	juvenile	1	SE	June 25
Pygmy Whitefish	*Prosopium coulterii*	juvenile	1, 3	SE	June 30-Sept 30
Burbot	*Lota coulter*		3	MT	Aug 23
Sculpin[3]	*Cottoidea*	juvenile	1, 3	SE	June 25
		adult	1, 3	MT	June 30-Sept 30
Lake Trout	*Salvelinus namaycush*	adult	2	AN	Aug 25
Rainbow Trout	*Oncorhynchus mykiss*	adult	1, 2, 3	AN	May 15-Sept 30
3 Spined Stickleback	*Gasterosteus aculeatus*	adult	1, 2, 3	SE	May 15-Sept 30
9 Spined Stickleback	*Pungitius pungitius*	adult	1, 2, 3	SE	May 15-Sept 30

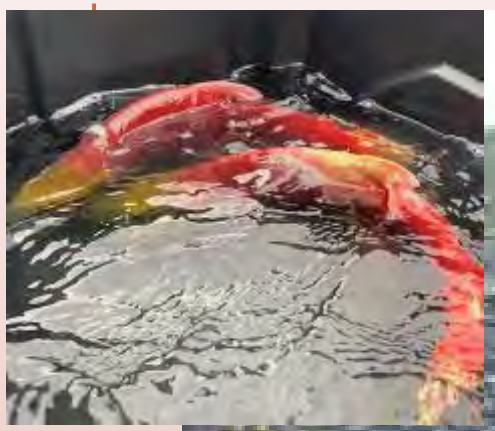
FISH COMMUNITY AND BEHAVIOR NEAR THE PROJECT AREA

Results



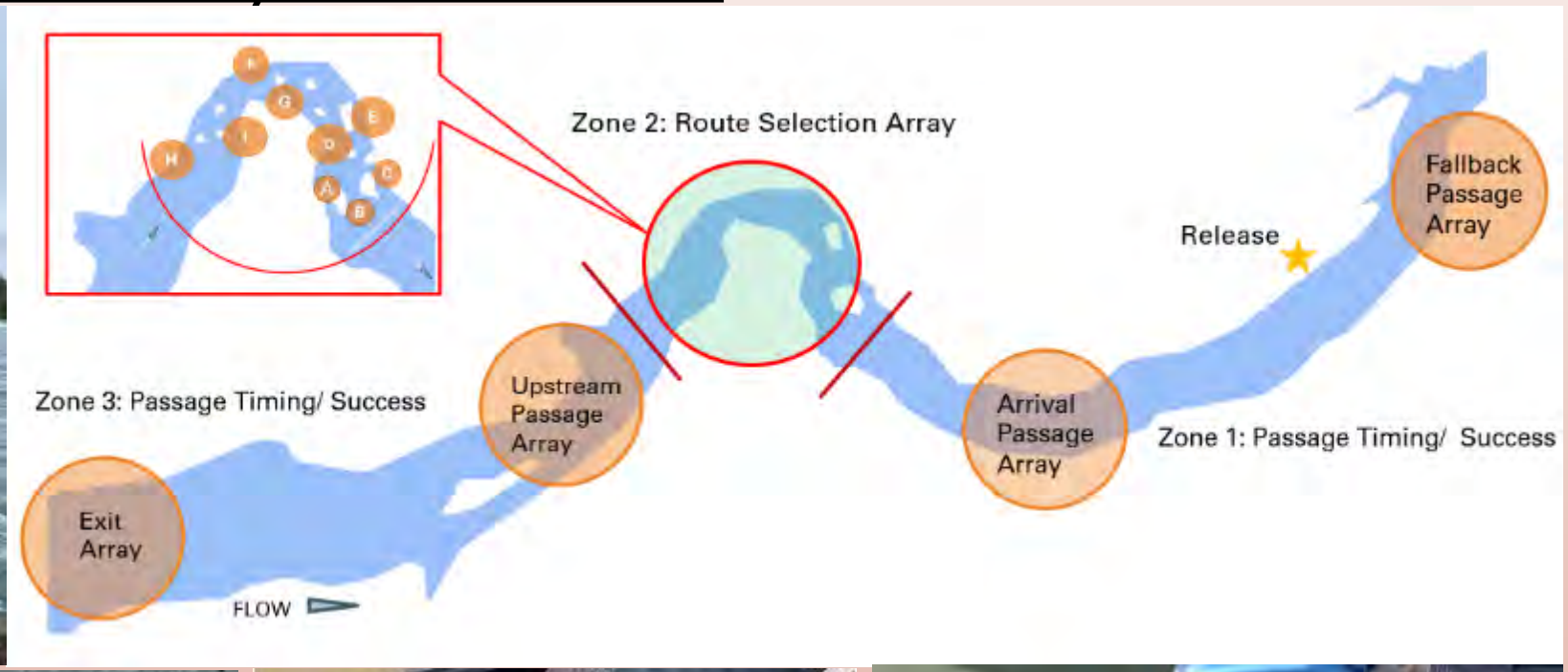
FISH COMMUNITY AND BEHAVIOR NEAR THE PROJECT AREA

FISH COMMUNITY AND BEHAVIOR NEAR THE PROJECT AREA



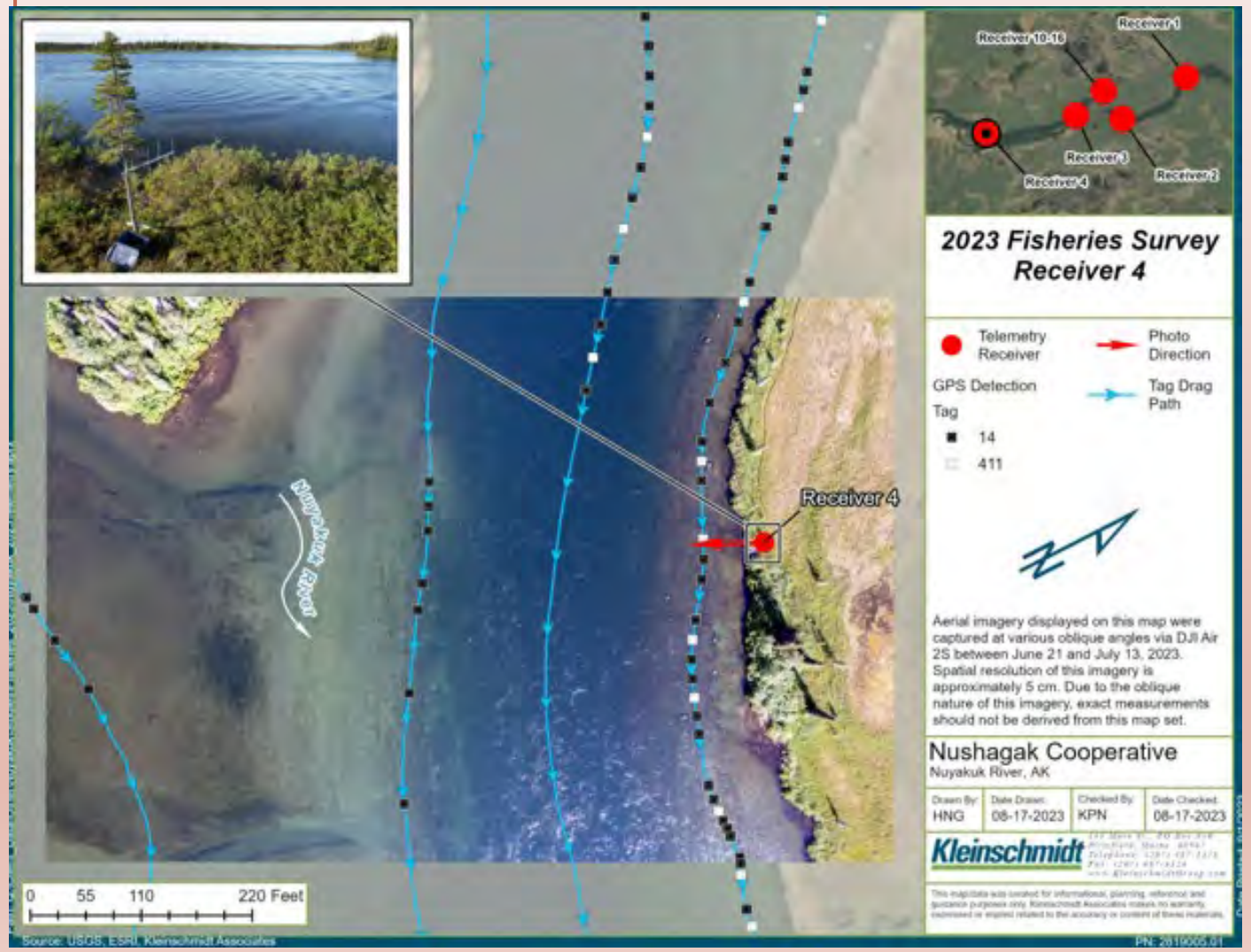
FALLS FISH PASSAGE STUDY

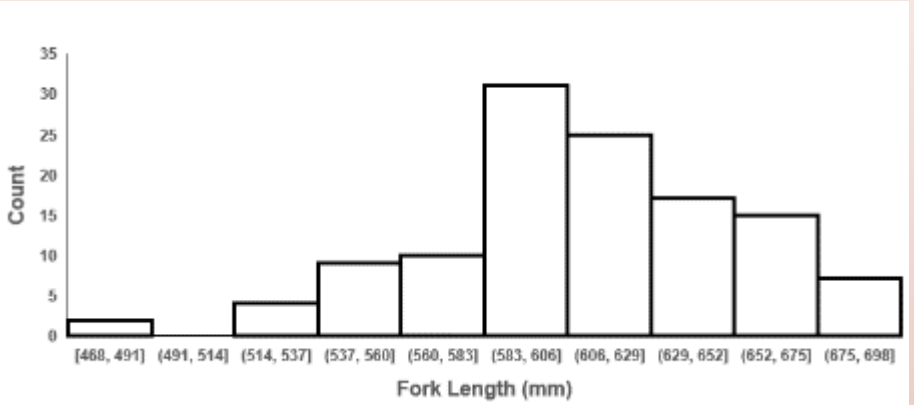
Telemetry Field Methods



FALLS FISH PASSAGE STUDY

Telemetry Field Results





Preliminary results indicate that 96% of Sockeye tagged in Zone 1 successfully passed through the Falls Reach in Zone 2 and exited the study area past receivers located in Zone 3.

Preliminary results indicate that passage rate through the Falls Reach was related to flow.

FALLS FISH PASSAGE STUDY

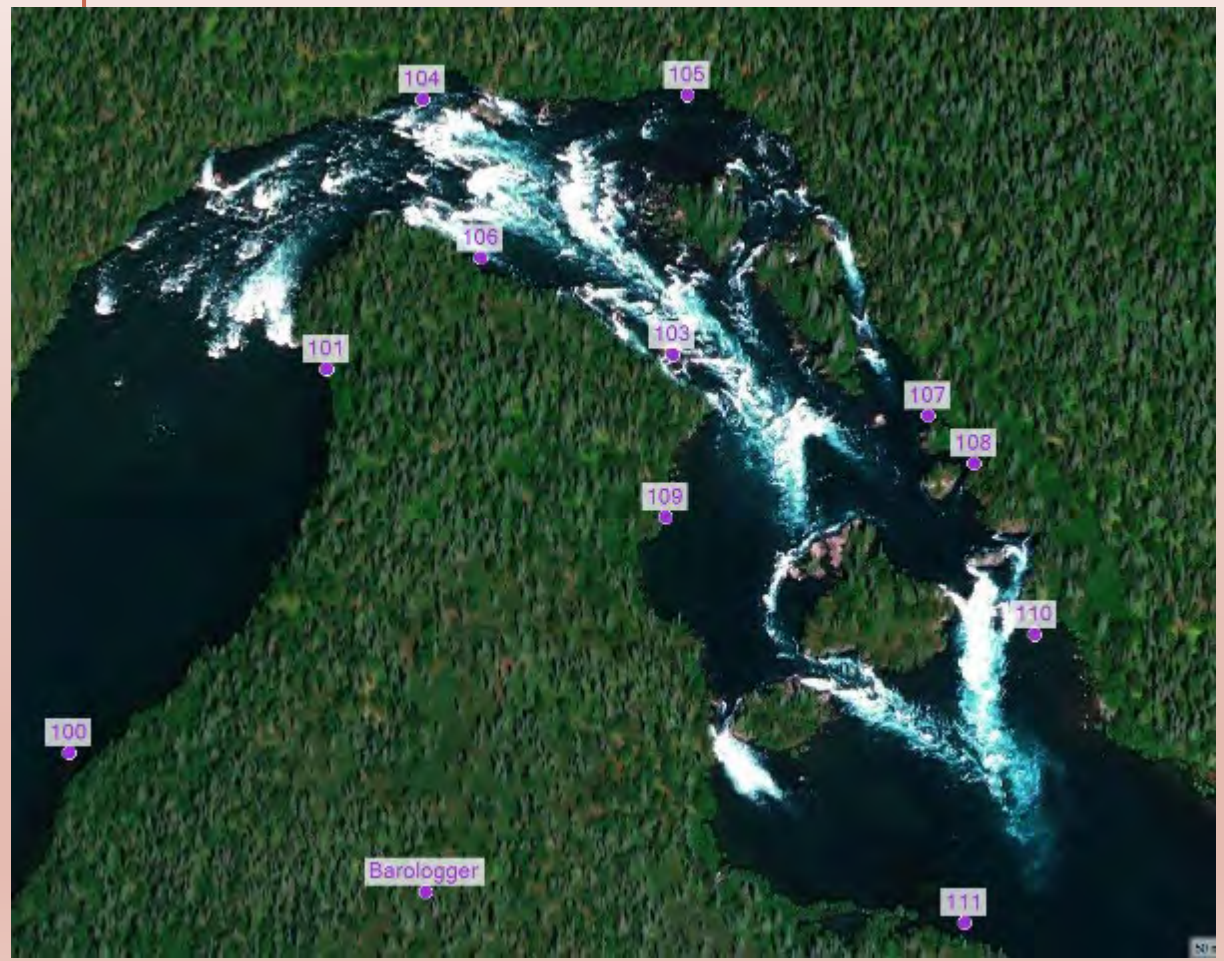
2D Hydraulic [Habitat] Modeling Methods

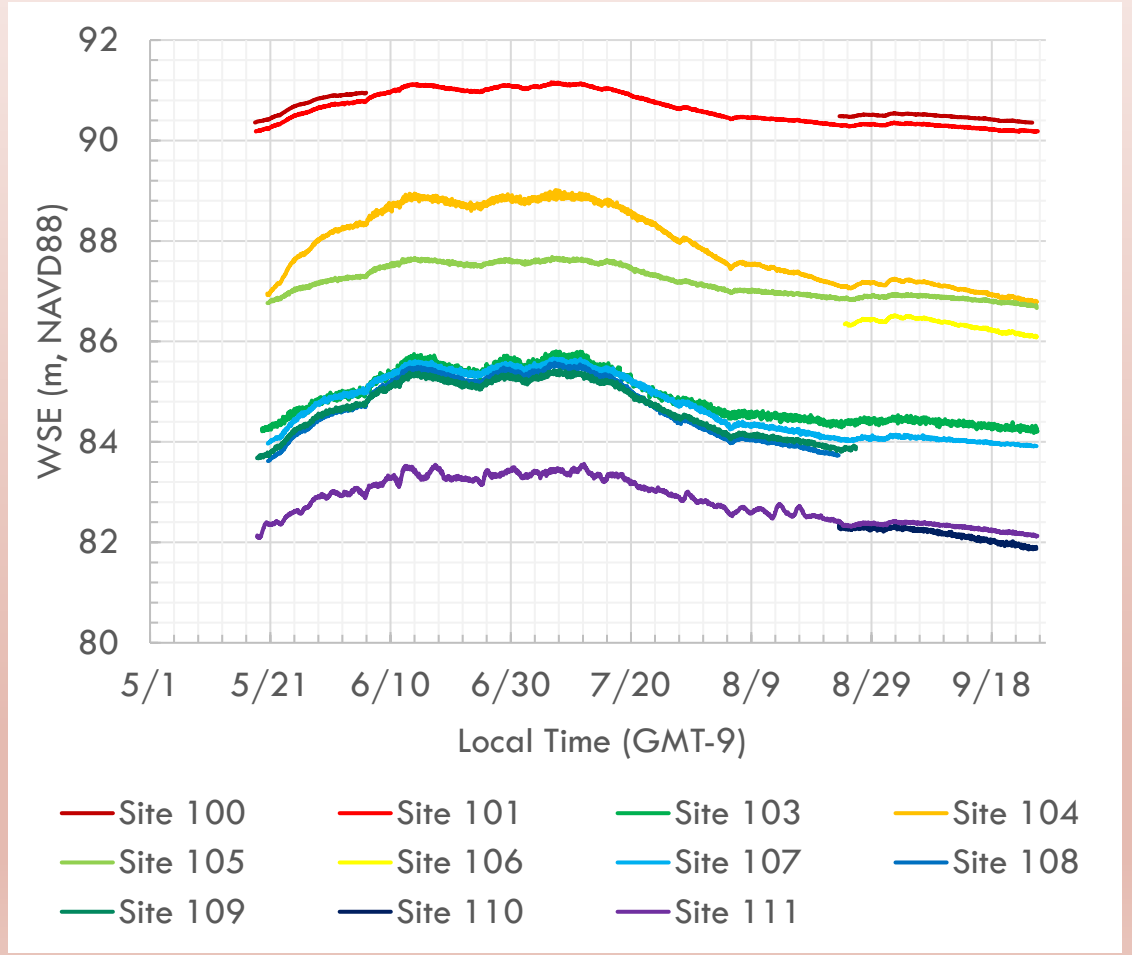
Methods: Fish passage habitat model

- 1. Establish boundary conditions
- 2. Update fish species periodicity
- 3. Construct 2 dimensional model
  - Feld data on flow, stage-discharge relationship, and water surface elevation
  - Develop a rating curve
  - Incorporate LiDAR

FALLS FISH PASSAGE STUDY

Preliminary 2D Hydraulic [Habitat] Modeling Results



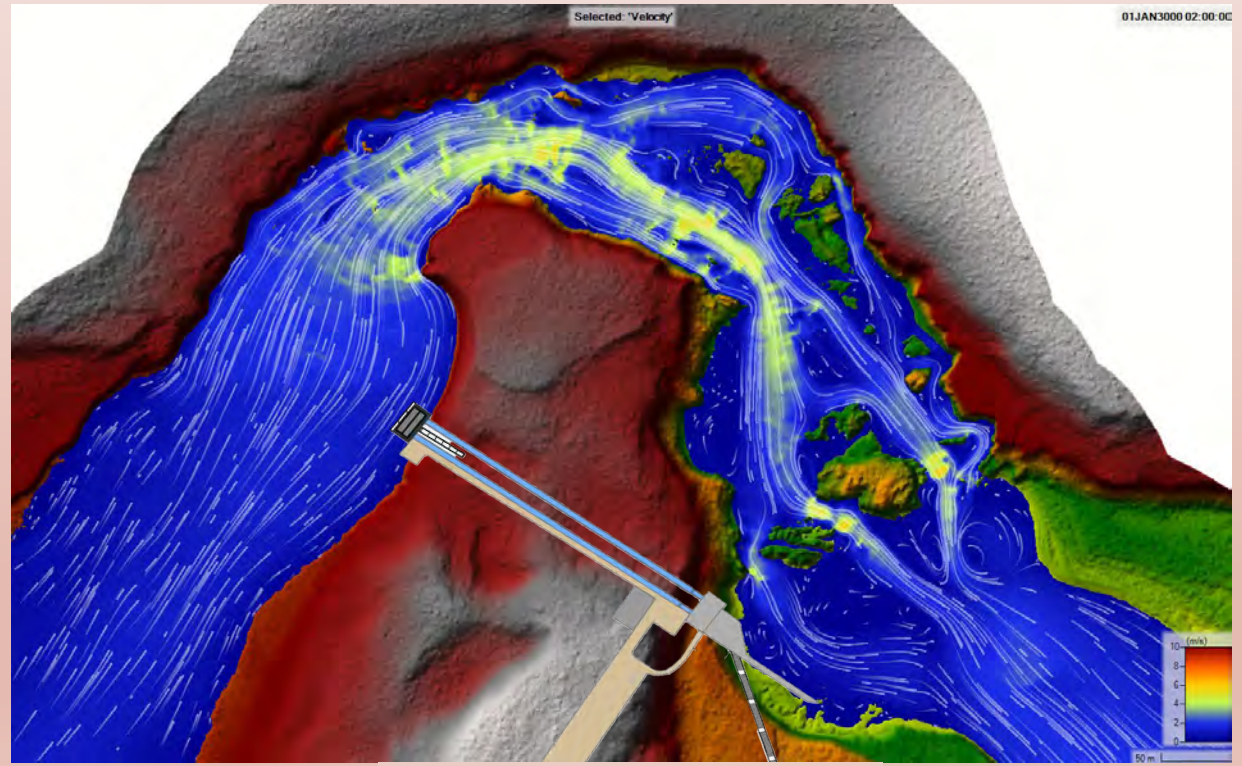


Water surface elevation calibration field data collection results

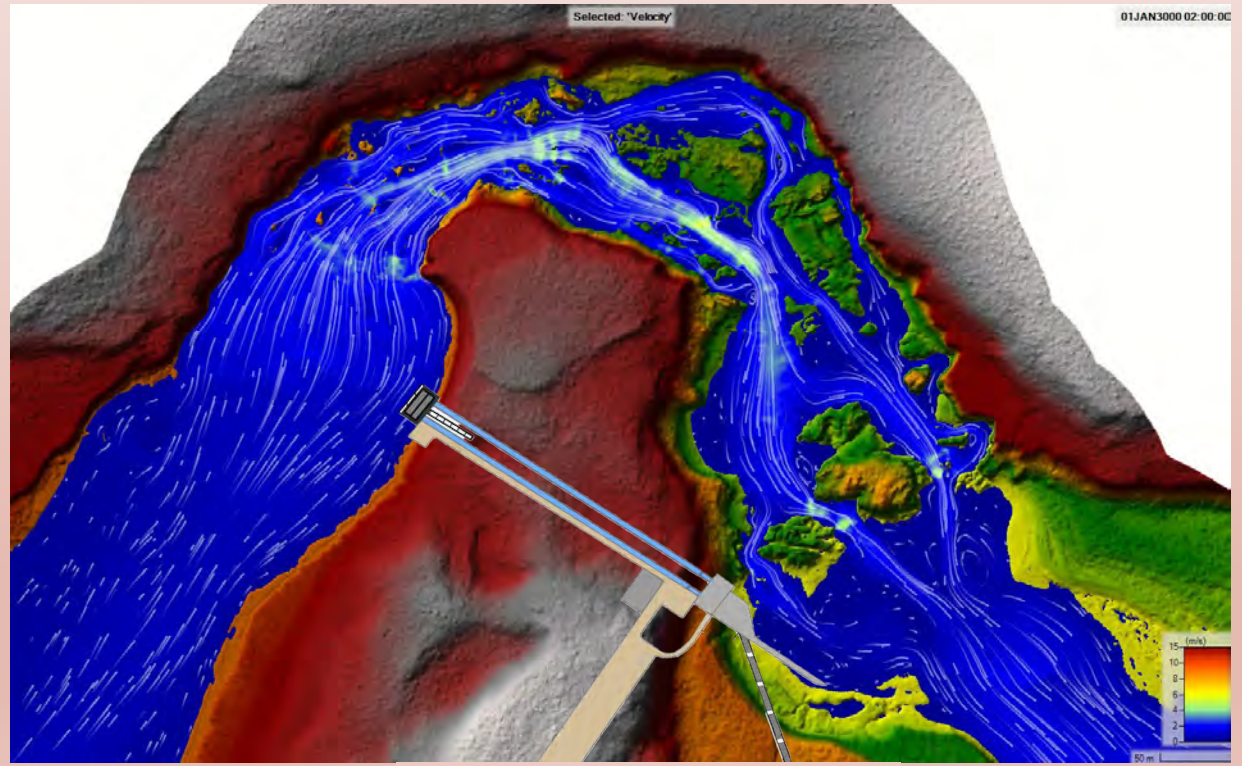
FALLS FISH PASSAGE STUDY

Preliminary 2D Hydraulic [Habitat] Modeling Results

HIGH FLOW



LOW FLOW



FALLS FISH PASSAGE STUDY

ABM Modeling Methods

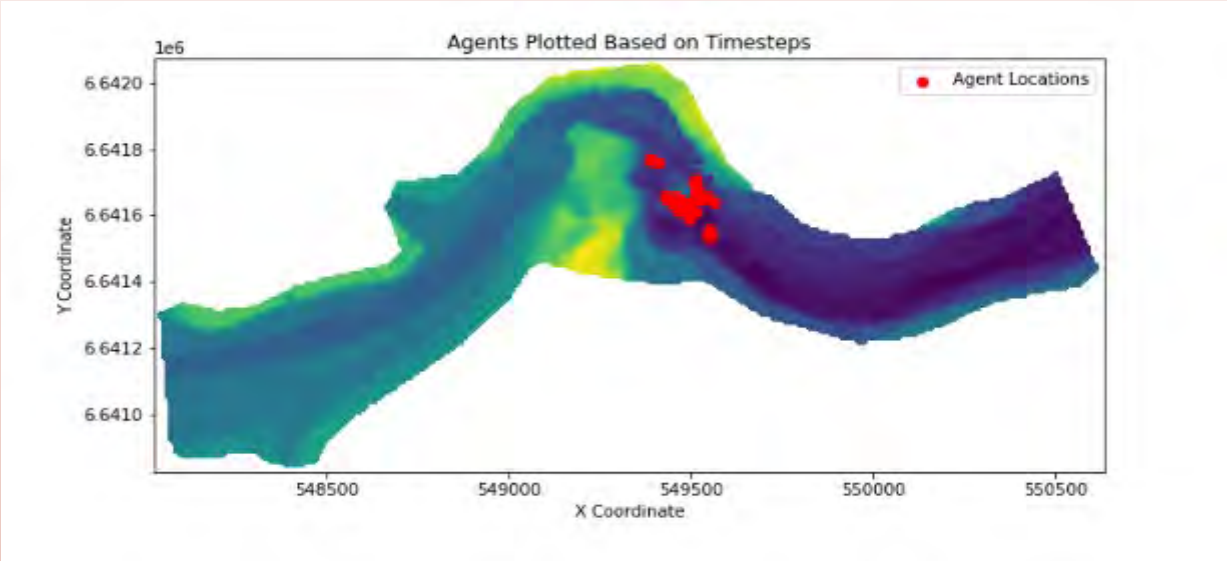
- Developed ELAM-type Agent-Based-Model to understand Sockeye Salmon passage over cascade reach
  - Written in Python 3.9.x and licensed open source
  - Incorporates models and parameters from literature with preference given to species specific and regional citations
  - Goal is to validate model with telemetry data and expert opinion

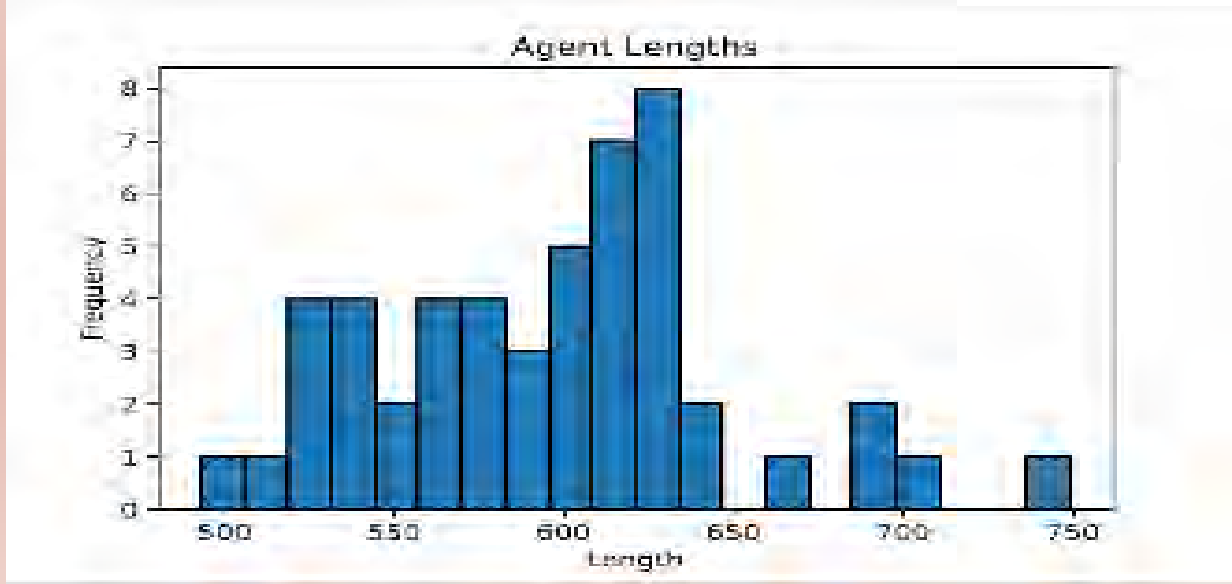
FALLS FISH PASSAGE STUDY

ABM Modeling Results

- Proof of concept complete, however too slow for models with sufficient number of agents. (unit tests complete)
- Refactoring to Structure-of-Arrays architecture to support vectorized operations and potentially GPU processing (unit tests and debugging ongoing)
- Summary functions complete, able to:
  - Calculate passage success, survival, rates
  - Identify passage routes
  - Identify areas of refuge, etc.
- On going:
  - Debugging & QC identified need for PID controller to modulate thrust
  - Validation pushed back to Q1 ’24

FALLS FISH PASSAGE STUDY





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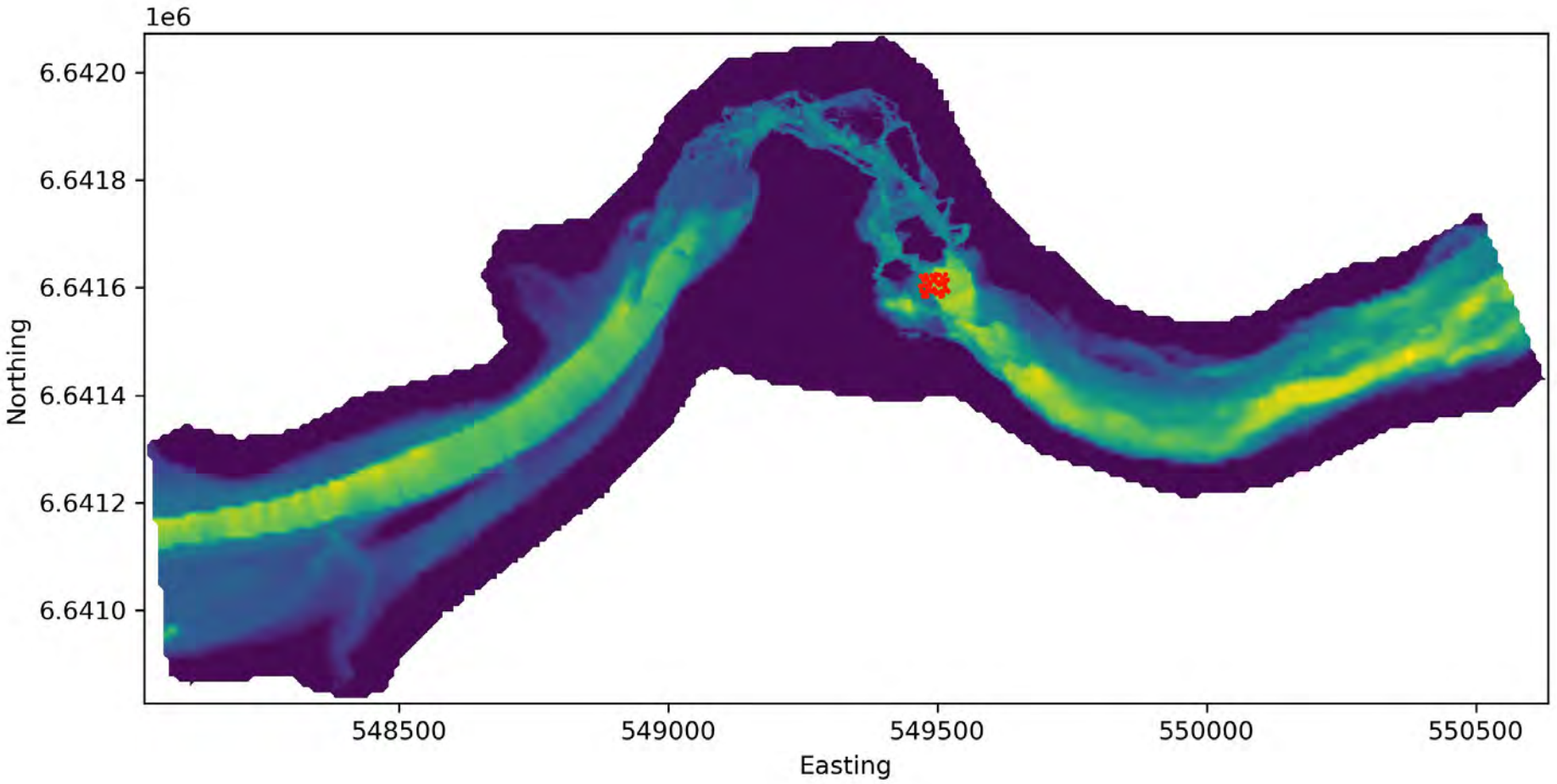


ENTRAINMENT AND IMPINGEMENT STUDY

Methods

1. Conduct a literature review of hydroelectric diversion projects to inform the risk of and ability to avoid fish injury and mortality.
2. Use 2D model output to evaluate approach velocities at the intake and flowlines resulting from groin alternatives.
3. Conduct an analysis of potential injury and mortality that may be associated with entrainment or impingement at the Project or passage through the Falls under altered flow conditions.

This study will make use of Year 1 (2023) study results from Fish Community and Fish Passage studies including operational and bypass flow projections, fish distributions, and the updated fish periodicity

ENTRAINMENT AND IMPINGEMENT STUDY

Results

- As this study relies on results from Year 1 studies, only literature review has been initiated and there are no results to present at this time.

TAILRACE FALSE ATTRACTION EVALUATION

Methods

Study steps.

1. Conduct a review of available information on existing tailrace designs to minimize potential for false attraction.
2. Conduct a brainstorming session with the ARWG to select 2 or 3 conceptual design alternatives.
3. Use the 2D flow model to evaluate feasibility and compare alternatives.
4. Conduct the preliminary design of tailrace exclusion refinements as needed after alternative analysis.

➢This study will make use of Year 1 (2023) study results from Fish Community and Fish Passage studies including operational and bypass flow projections, fish distributions, and the updated fish periodicity.

TAILRACE FALSE ATTRACTION EVALUATION

Results

- As this study relies on results from Year 1 studies, there are no results to present at this time.

CHINOOK AND SOCKEYE LIFE CYCLE MODELING

Methods

- 2023

- Collaboration with the ARWG on key inputs and necessary results

- Literature review

- Data assessments from other regional systems

- Development of “straw man” LCM for refinement during the remainder of the study and feasibility period, based on site-specific fisheries data collection

CHINOOK AND SOCKEYE LIFE CYCLE MODELING

Results

- Straw man constructed
- Current version of the model
  - Reviews and summary of existing data from other sources
    - Chignik
    - Afognak
    - Kvichak
  - Harvest of returning salmon
  - Escapement estimates
  - 30-year outlook currently, but will be modified to reflect longer time periods as site-specific data is input and analysis are conducted in 2024
  - Placeholders for the data collected this year and 2024

CHINOOK AND SOCKEYE LIFE CYCLE MODELING

Next Steps

- Per the RSP and based on the utilization of site-specific fisheries data collected in 2023 and 2024
  - Further data acquisition and input into model
  - Continued model calibration
  - Development of expected Project effects
  - Incorporate future climate and water flow scenarios
  - Evaluate Project effects

INTEGRATED RISK ASSESSMENT OF FISH POPULATIONS

Methods

- IRA proposed to evaluate potential project impacts to fisheries resources at the fish population/community level
- Intent is to integrate accumulated knowledge and anecdotal observations from regional experts to members of the community
- At the very least the framework accounts for uncertainty by estimating the likelihood and magnitude of risks
- Final analytical framework determined from management objectives – hierarchical, system impacts, etc.

INTEGRATED RISK ASSESSMENT OF FISH POPULATIONS

Results

- Put forth a strawman list of management objectives, risk sources, their elements, and receptors (species at risk).
- Put forth an example risk calculation spreadsheet for a single receptor with example risk matrix
- Management objective workshop (December 06, 2023)
  - Identify management objectives, and possibly receptors and stressors
- From this workshop, develop an objective function (optimization), and advise on an analytical approach

INTEGRATED RISK ASSESSMENT OF FISH POPULATIONS

Results

Risk Source:			
			Cor
	Passage Efficiency Objective (1)		
	Objective Scores		-13
Risk Element	**Magnitude**	**Likelihood of Occurrence**	**Risk Score**
False attraction	Minor Negative	Likely	-4
Quantity of Suitable Upstream Passage Habitat	Minor Negative	Likely	-4
Quality of Suitable Upstream Passage Habitat	Major Positive	Likely	8
Change in relative abundance of spawners upstream of the project	Major Negative	Possible	-6
Change in adult delayed mortality through the project	Minor Negative	Possible	-3
Quantity of Suitable Downstream Passage Habitat	Minor Negative	Likely	-4

Risk Matrix

		Maintain a similar or better upstream and downstream passage efficiency (survival, success, time to passage) for returning adult Sockeye salmon and out-migrating juvenile Sockeye. Nexus 1,4.	Maintain a similar or better quantity and quality of upstream migratory, downstream migratory, and juvenile rearing, and spawning habitat for sockeye. Nexus 1,2,3,4.
Risk Sources	Construction and Operation of a hydroelectric project	-13	-4
	Fishing Pressure (Recreational and Commercial)	0	0
	Climate Change - direct and indirect effects	0	0

Note: the classifications made of magnitude and likelihood of occurrence are for illustrative purposes only and are intended to demonstrate how the end user can update classifications and how their choices affect the risk matrix.

QUESTIONS?

WATER RESOURCES

DISSOLVED OXYGEN AND WATER TEMPERATURE

Study Goals and Objectives

- Collect baseline, continuous dissolved oxygen(DO) data during periods of peak water temperatures (July – August) for a minimum of 72 hours. Determine if DO concentrations are substantially different above and below Nuyakuk Falls.
- Collect baseline, continuous water temperature data for a minimum of one calendar year (January – December).
- Compare the study results to DO and water temperature criteria established by the Alaska Department of Environmental Conservation (ADEC).

Methods

- Deployed calibrated U26-001 DO and U22-001 ProV2 water temperature loggers above and below Nuyakuk Falls.
- DO calibration and field procedures followed manufacturers specifications while water temperature loggers adhered to techniques described in Ward (2011).

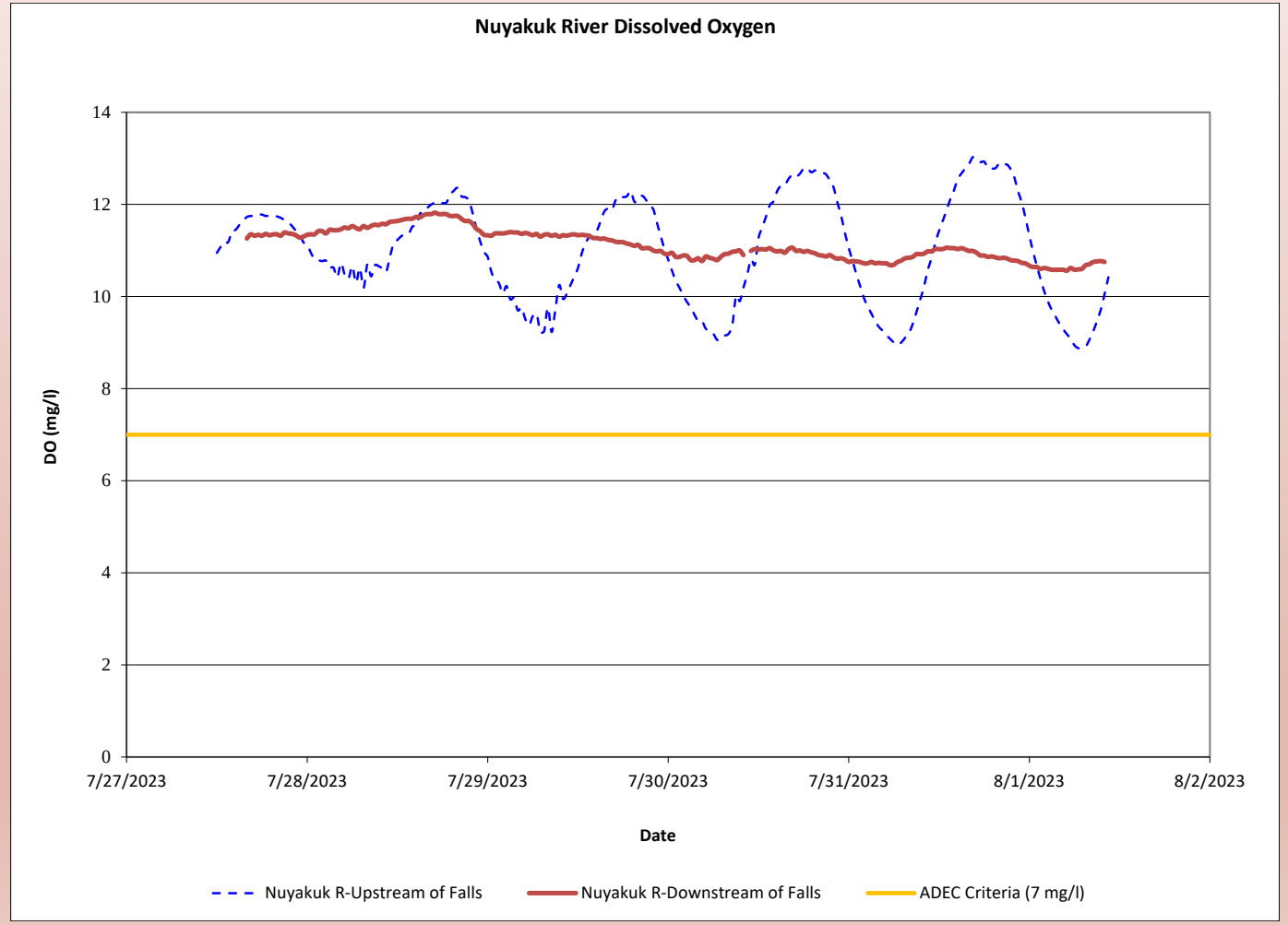
DISSOLVED OXYGEN AND WATER TEMPERATURE

Results – Dissolved Oxygen

ADEC criteria for water use category (C)*

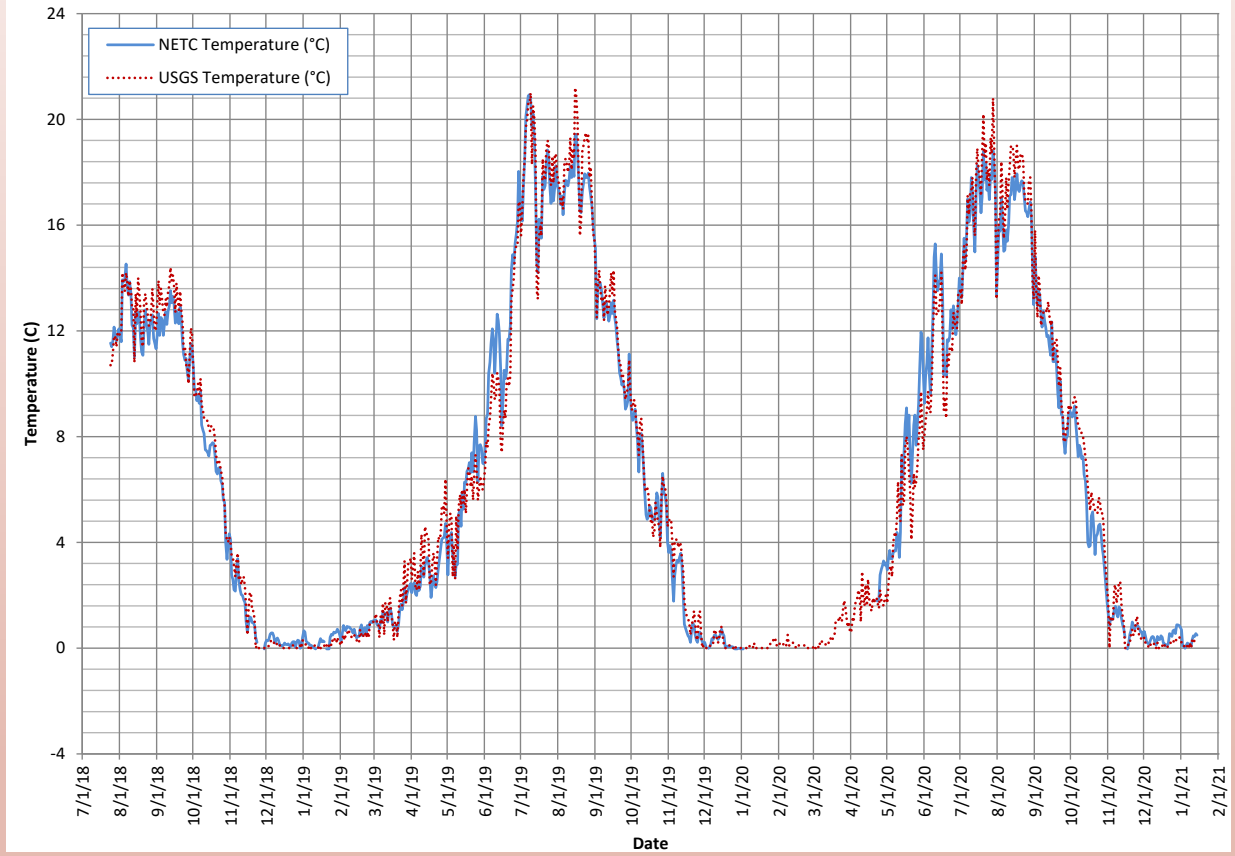
Parameter	Criteria
Dissolved Oxygen	greater than 7 mg/l
Temperature	May not exceed 20°C at any time. The following maximum temperatures may not be exceeded, where applicable: Migration routes 15°C Spawning areas 13°C Rearing areas 15°C Egg & fry incubation 13°C

**growth and propagation of fish, shellfish, other aquatic life and wildlife.*

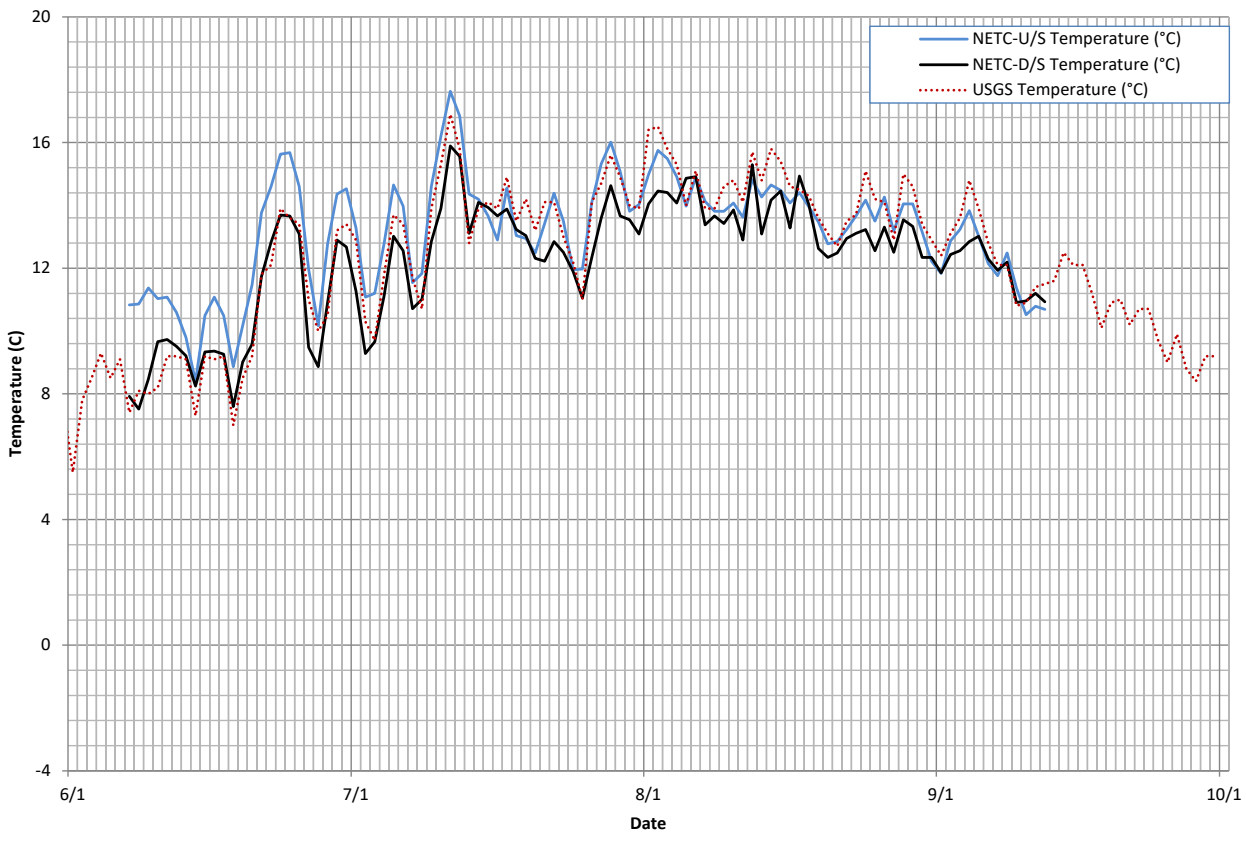


DISSOLVED OXYGEN AND WATER TEMPERATURE

Results-Water Temperature



Nuyakuk River Daily Maximum Water Temperatures (July 24, 2018 – January 4, 2021)



Nuyakuk River Daily Maximum Water Temperatures (June 1 – September 30, 2022)

DISSOLVED OXYGEN AND WATER TEMPERATURE

Year 1 Study Summary

- DO concentrations met ADEC criteria of 7 mg/L.
- Intra-daily DO levels fluctuated upstream of the Falls but mean daily DO concentrations were nearly identical above and below Nuyakuk Falls.
- Water temperatures met the 20°C daily maximum criteria in 2018 and 2022
- One exceedance of 20°C was noted in 2019 from July 5-11.

Year 2 Study Efforts

- At the request of Alaska Department of Fish and Game, continuous DO monitoring for 3-5 days will occur a during period when large schools of sockeye are staging at base of Nuyakuk Falls (typically late June to mid-July).
- Continue water temperature monitoring through the fall of 2024.

FLOW DURATION CURVE/STATIONARITY ASSESSMENT

Study Goals and Objectives

- Evaluate changes in the flow duration curve for the Nuyakuk River that have happened during the United States Geological Survey (USGS) gage 15302000 record which spans 70 years (1953-2023).
- Develop a discharge record at the Project site so that all flow duration curves, as well as additional hydrologic and hydraulic data assessments (e.g., 2-D model) are based on accurate flow volumes.

Methods

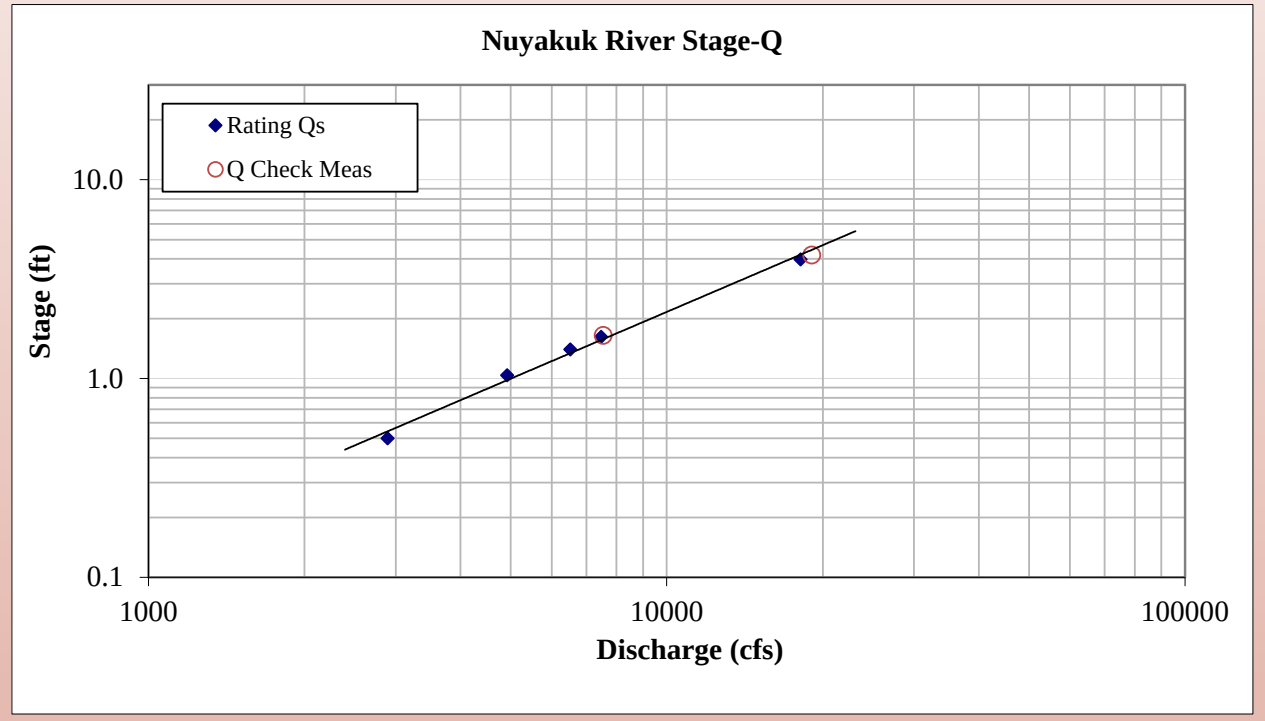
- Installed, maintained, and calibrated a stream gage utilizing standard USGS stream gaging techniques (Rantz, et al, 1982).

FLOW DURATION CURVE/STATIONARITY ASSESSMENT

Results

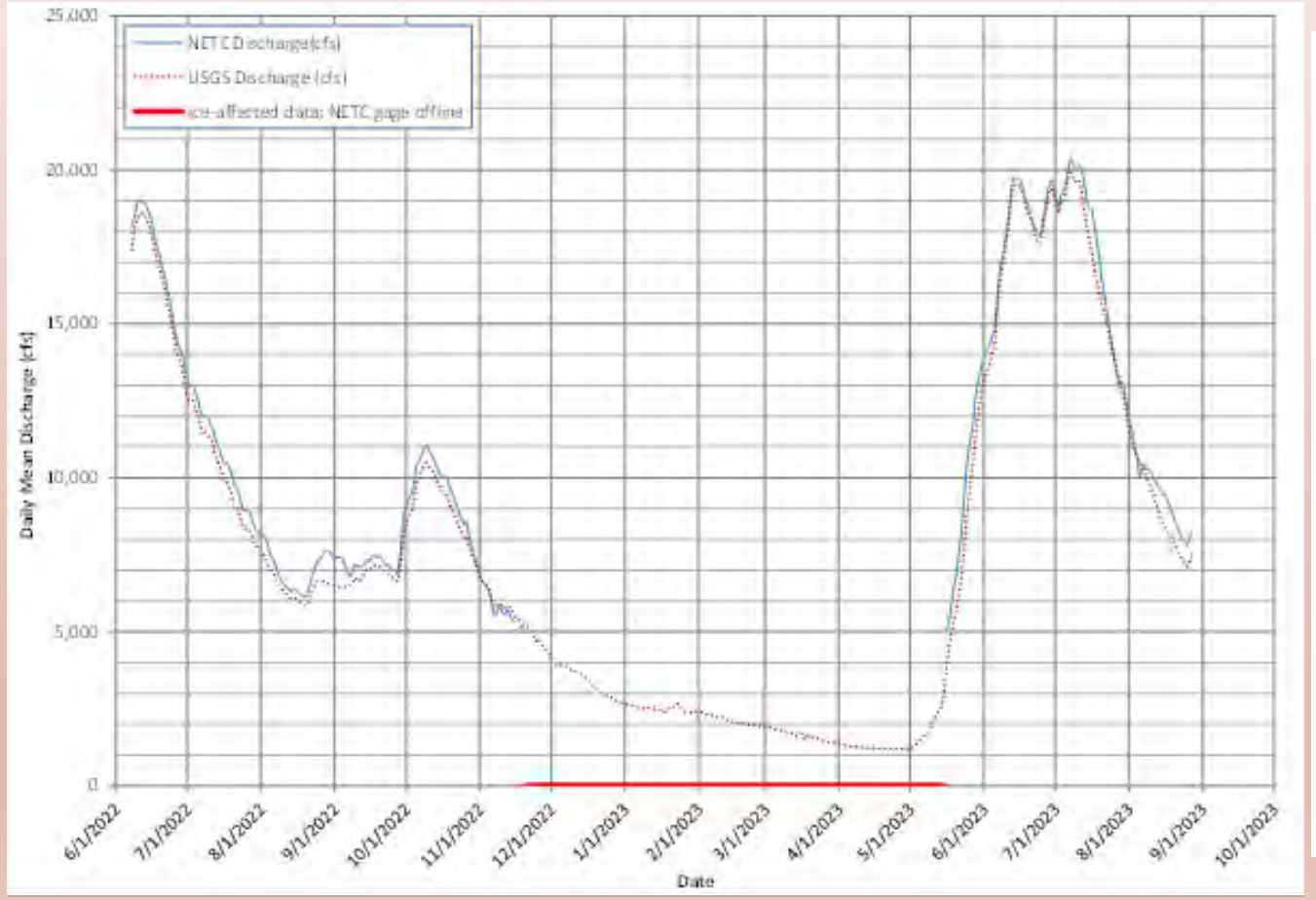
Discharge Summary Table at the Nuyakuk River Project Site.

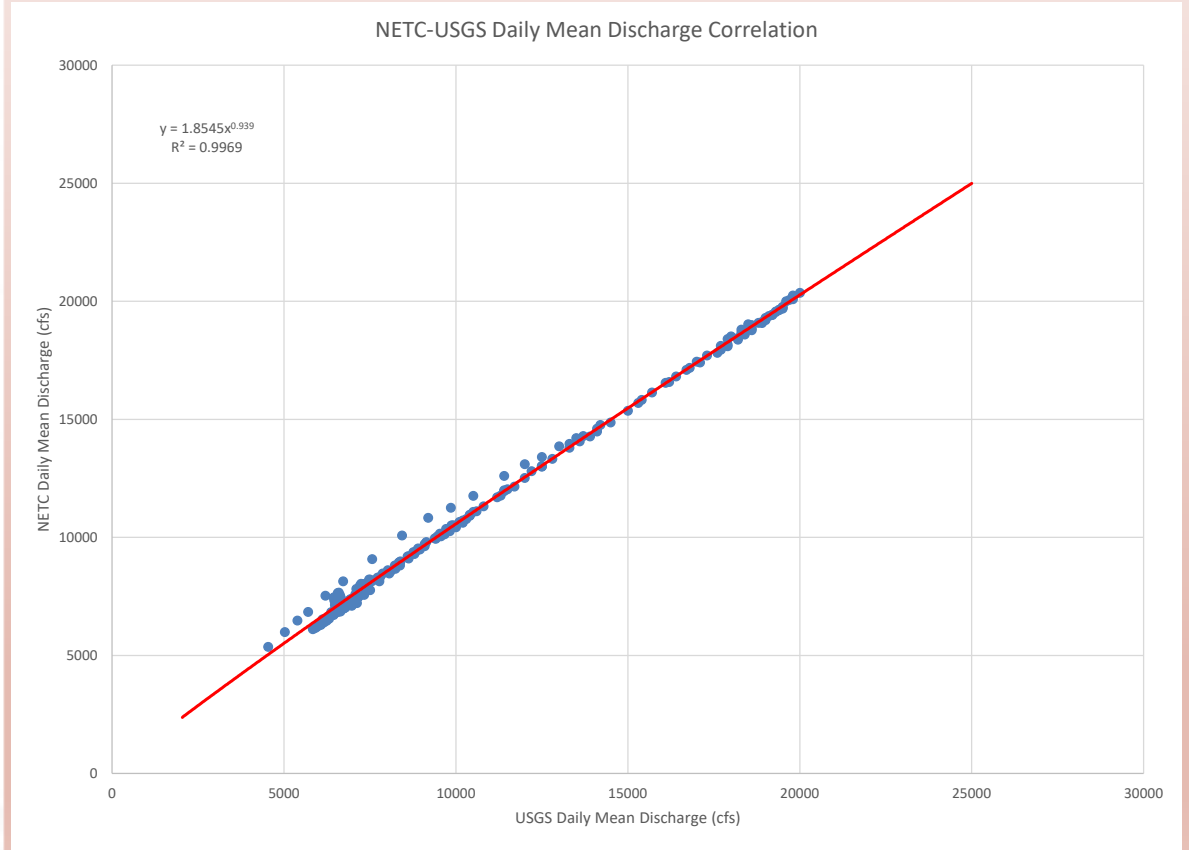
Meas. No.	Date	Stage (ft)	Measured Discharge (cfs)	Rated Discharge (cfs)	Percent Difference
1	5/12/2023	0.50	2,893	2,882	0.4%
2	5/16/2023	1.04	4,921	4,997	-1.5%
3	5/19/2023	1.40	6,510	6,480	0.5%
4	5/21/2023	1.62	7,476	7,410	0.9%
5	6/21/2023	3.98	18,124	18,160	-0.2%
6	7/3/2023	4.19	19,041	19,169	-0.7%
7	8/24/2023	1.65	7,537	7,538	0.0%
Rating 1: Flow = 3338.63*(Stage + 0.38)^1.1502 (based on meas. No. 1-5)					



FLOW DURATION CURVE/STATIONARITY ASSESSMENT

Results





FLOW DURATION CURVE/STATIONARITY ASSESSMENT

Year 1 Study Summary

- The installation of a stream gage at the Project site in June of 2022 was successful, providing an excellent correlation to USGS gaging station 15302000 during periods of ice-free operation (R2 of 0.9969).
- Accretion (i.e., flow increases) from the USGS station downstream to the Project ranged from 97.1 cfs to 1650 cfs with an average of 509 cfs.

Year 2 Study Efforts

- Continued operation of the Project site stream gage to develop a winter discharge record and build on the ice-free dataset.
- Run the non-stationarity detection tool with the model provided by the United States Army Corps of Engineers (Version 1.1, January 2016)
- Provide flow duration curve summaries based non-stationarity outputs (i.e. periods of similar hydrologic data)

FUTURE FLOWS STUDY

Study Objectives

- Evaluate changes in hydrology in the Nuyakuk watershed under future climate conditions
  - Snow accumulation and melt
  - Magnitude and timing of hydrograph peak
  - Changes in monthly flows and flow duration

- Provide data to inform Nuyakuk Falls Hydropower evaluation
  - Implications for fish habitat
  - Implications for hydropower generation

FUTURE FLOWS STUDY

Methods

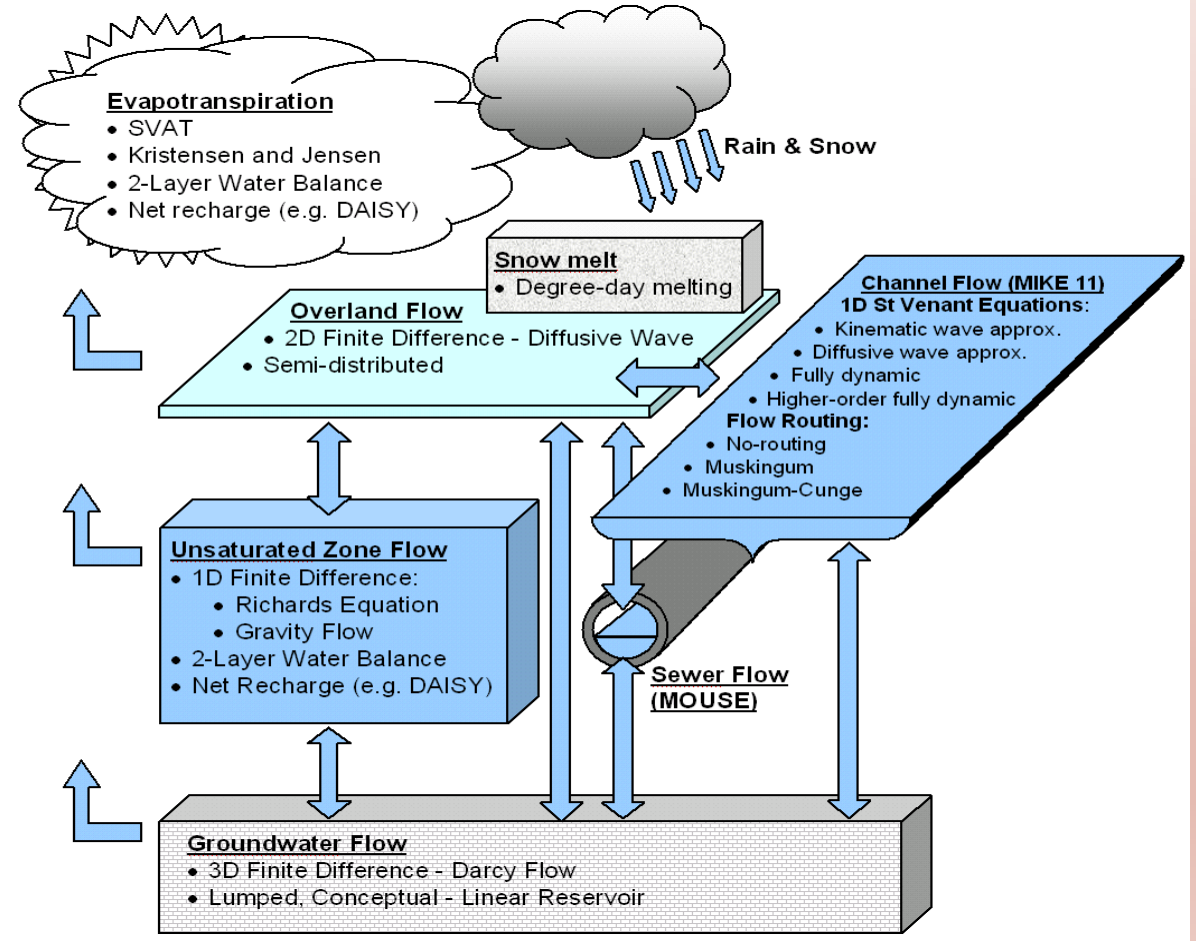
- Use of appropriate components from the GCM dataset
  - Made as site-specific as possible

- Hydrologic Modeling
  - MIKE/SHE model utilized
  - Compatibility
    - BBNC and BBRSD funded a Nushagak watershed model using the MIKE/SHE system

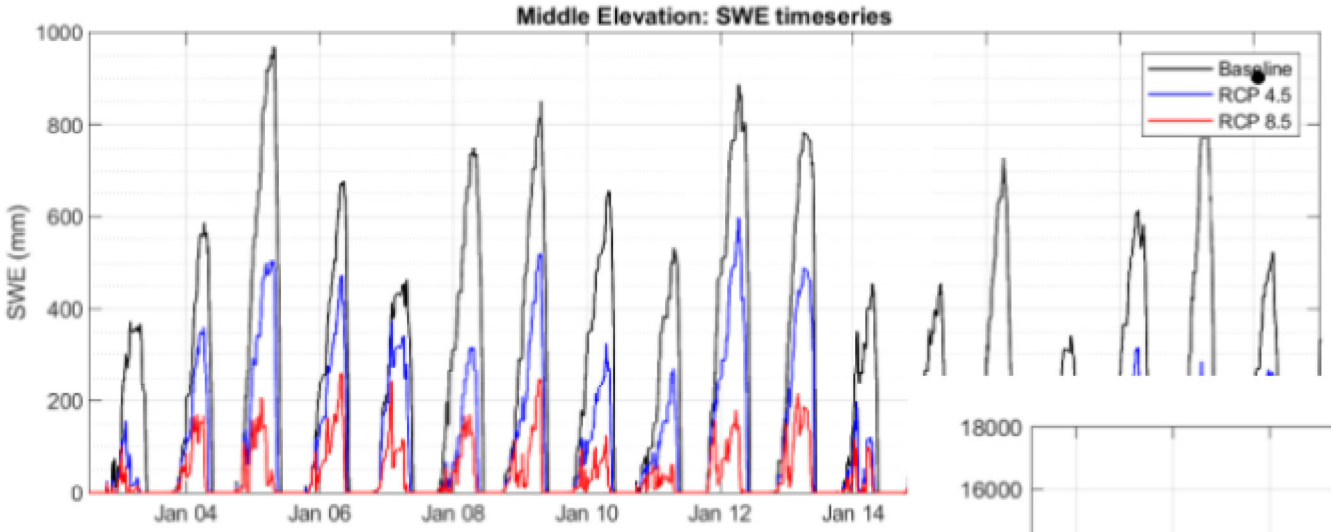
- Technical Memo
  - Summarizing potential climate change effects in the Project area
  - Potential impacts to long-term Project operational capabilities
  - Incorporated into the USR and the overall Project feasibility assessment

FUTURE FLOWS STUDY
(MODEL: MIKESHE/MIKE HYDRO)

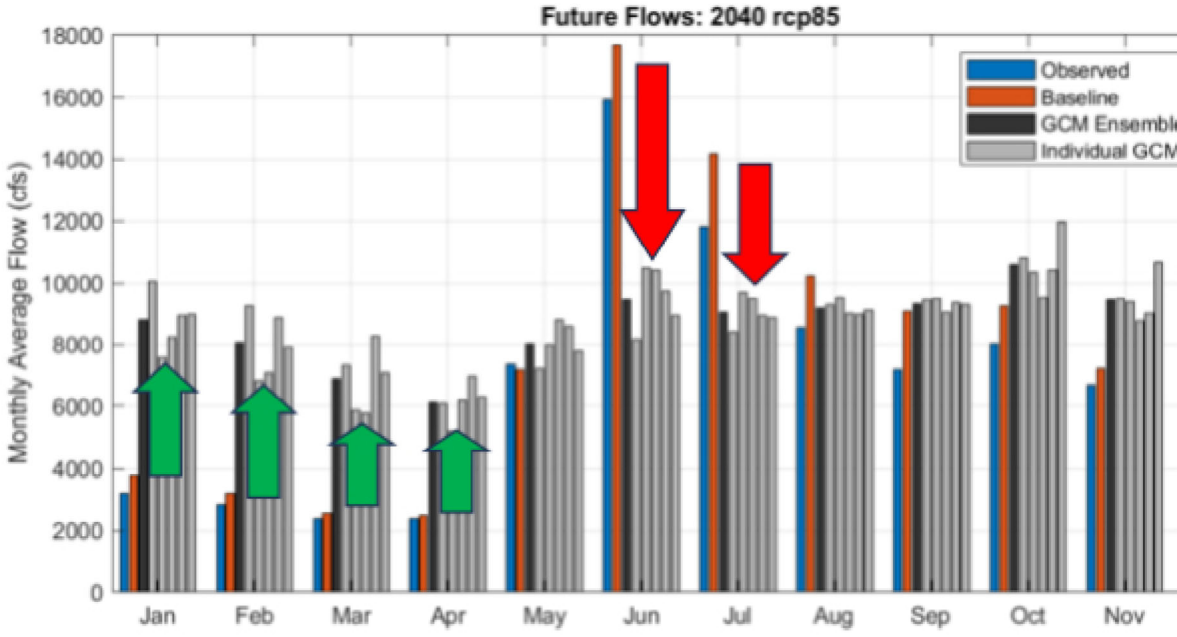
- Flexible, integrated surface water-groundwater model
- Groundwater flow – similar to MODFLOW.
- FEMA-approved surface water hydraulic model (MIKE Hydro)
- Choice of spatial and temporal scales (depends on processes)
- Simple to complex solution options



Initial Results – Snow and Flow



Projected warming REDUCE winter snowpack since more storms now fall as rain…



…leading to INCREASED winter flows and DECREASED summer runoff

FUTURE FLOWS STUDY

Next Steps

- Site-specific results from relevant hydrologic studies in 2023 and 2024 will be utilized
- Run natural future flow scenarios
- Run project-related future flow scenarios
- Comprehensive results and climate change impact assessments will be provided in the USR

ICE PROCESSES ASSESSMENT

Study Goals and Objectives

- Desktop assessments of satellite imagery to evaluate historical icing conditions near the proposed Project intake.
- Information gathering from nearby hydroelectric projects (e.g., Tazimina Falls Project P-11316) on how they mitigate for icing conditions that could impact operations and infrastructure.
- Collect site-specific imagery near the proposed intake to assess frazil ice formation and ice breakup conditions.

Year 1 Study Summary

- Deployed cameras in 2022 failed to log photos over the winter.
- Preliminary meetings with George Hornberger, General Manager of the Iliamna Newhalen Nondalton Electric Cooperative (INNEC) occurred on October 23, 2023. INNEC owns and operates the Tazimina Falls Project.

ICE PROCESSES ASSESSMENT

Year 2 Study Efforts

- Updated and re-deployed cameras in the fall of 2023 at two locations viewing the Project intake.
- Additional meetings with INNEC to discuss design options and operational techniques to operate over the winter during intermittent icing events.
- Summarize and log historical satellite imagery available from https://www.sentinel-hub.com/ (example image provided below).
- All study efforts to be summarized and presented in the USR (December of 2024).

Satellite Imagery of Nuyakuk River Falls on April 18, 2023


2016/12/21


2018/03/19

QUESTIONS?

TERRESTRIAL

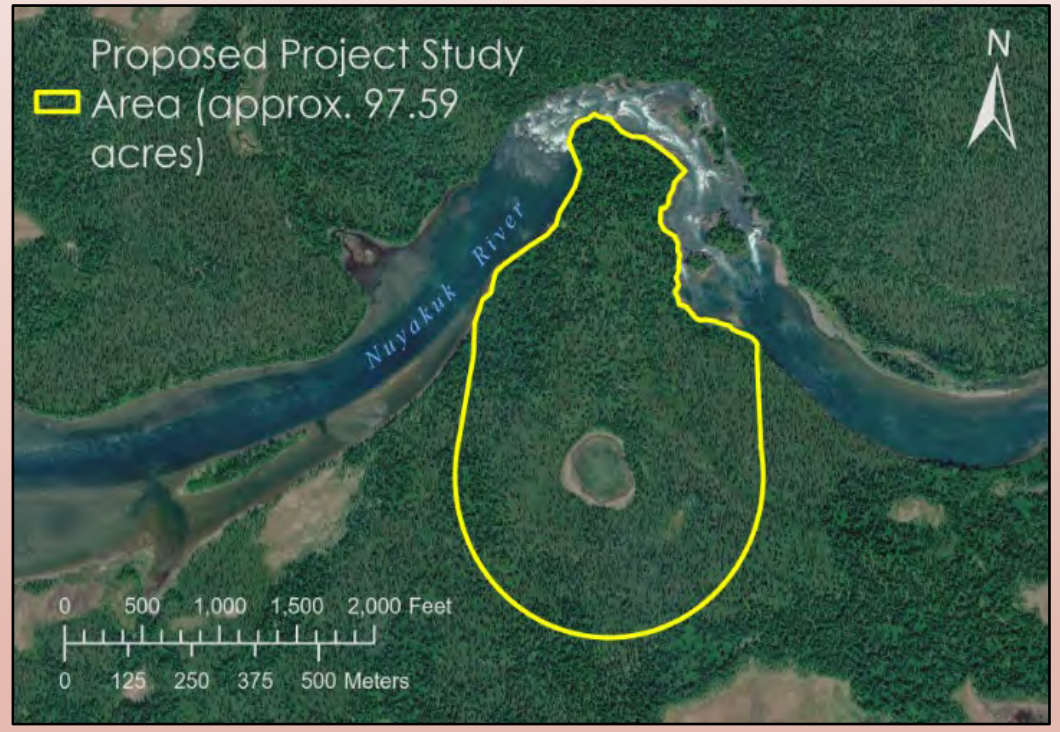
BOTANICAL IMPACT ASSESSMENT

Objective

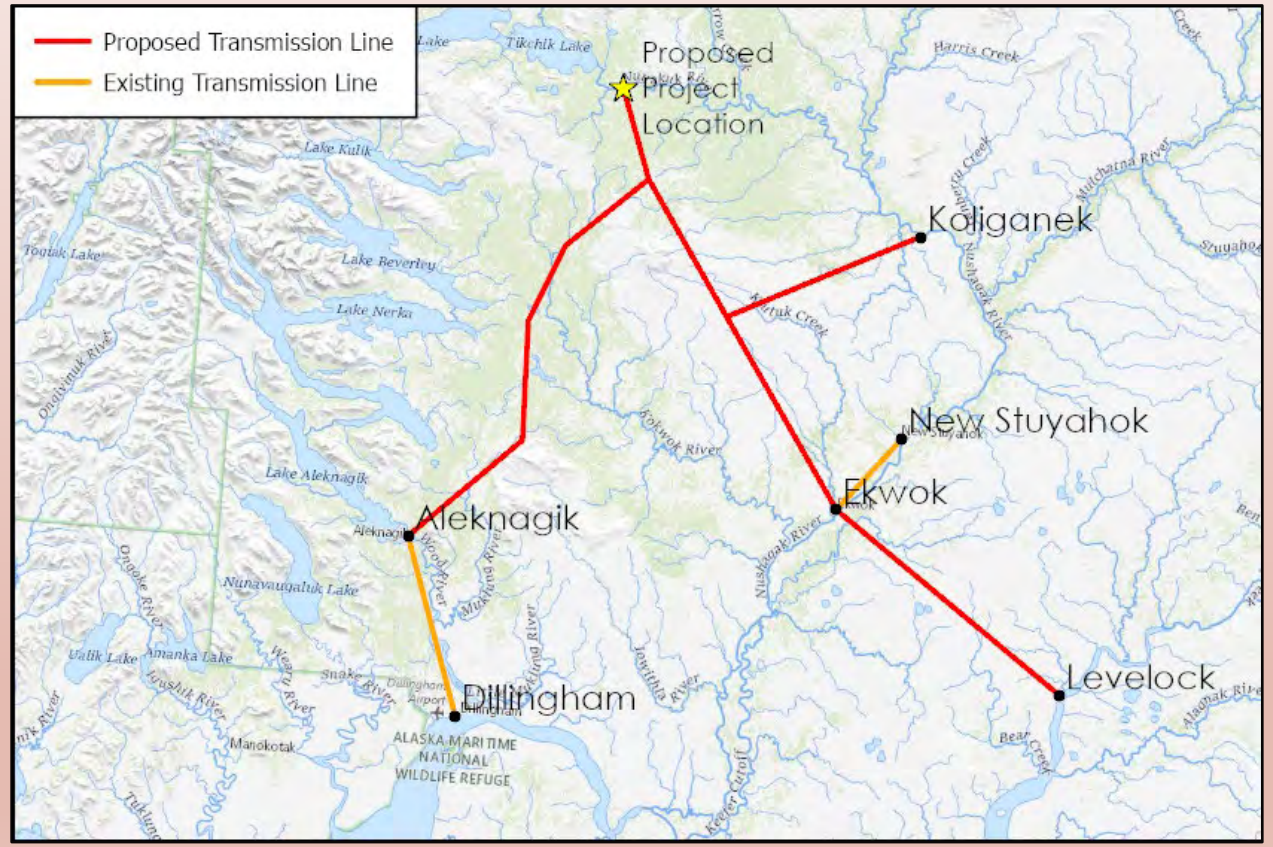
- Classify and prepare maps in the proposed Project boundary.
  - Desktop study of vegetation mapping
  - Wetlands and waters of the US (WOTUS)
  - Special status and invasive plants

BOTANICAL IMPACT ASSESSMENT

Study Areas



Project Facility Study Area



Transmission Line Study Area

BOTANICAL IMPACT ASSESSMENT

Methods

- Preliminary mapping of botanical and wetland areas using available data
  - i.e., federal and state resources
- No USFWS National Wetland Inventory coverage
- Alaska Center for Conservation Science
  - Sphagnum moss
  - Sedge
- U.S. Geological Survey
  - Hydrology
  - Satellite-derived contours
- Adjusted map selection after field survey of Project facility study area.

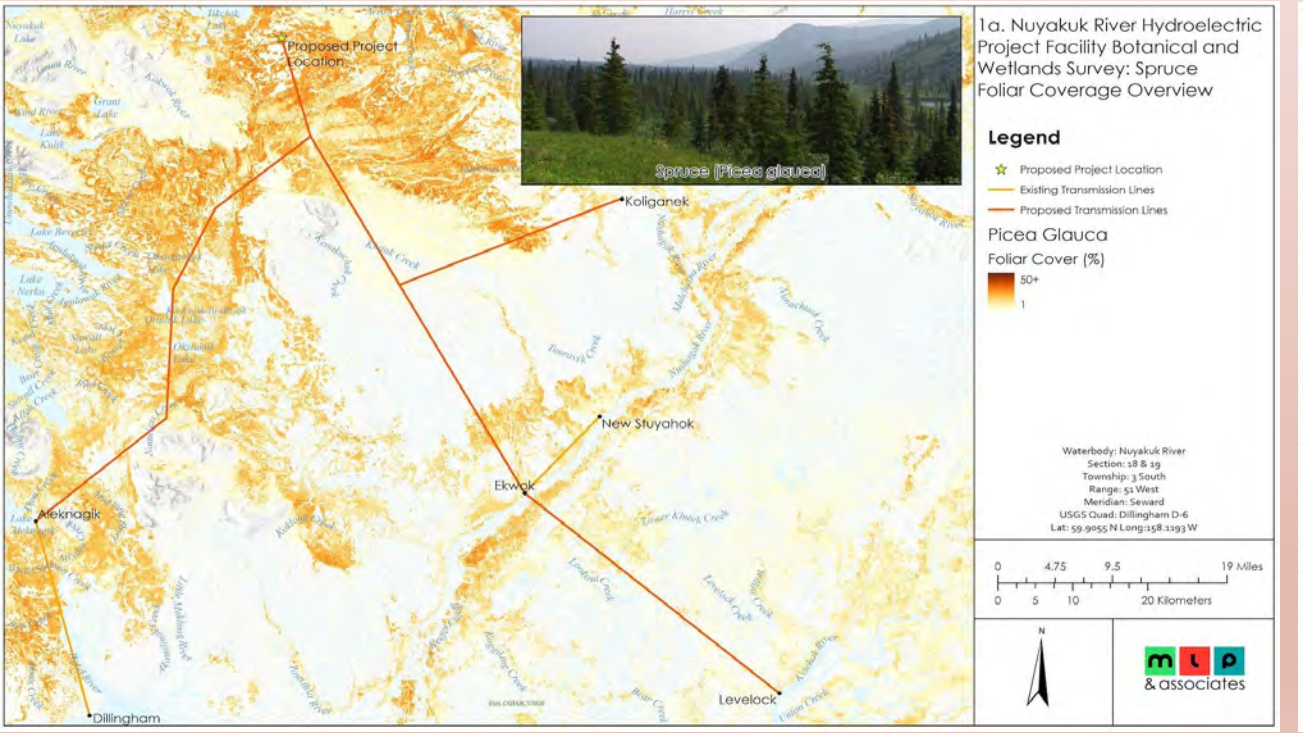
Mapped Plant Species

Scientific Name	Common Name
Picea glauca	white spruce
Alnus spp.	alder shrubs
Rhododendron spp.	Labrador teas
Empetrum nigrum	crowberry
Sedge spp.	sedges

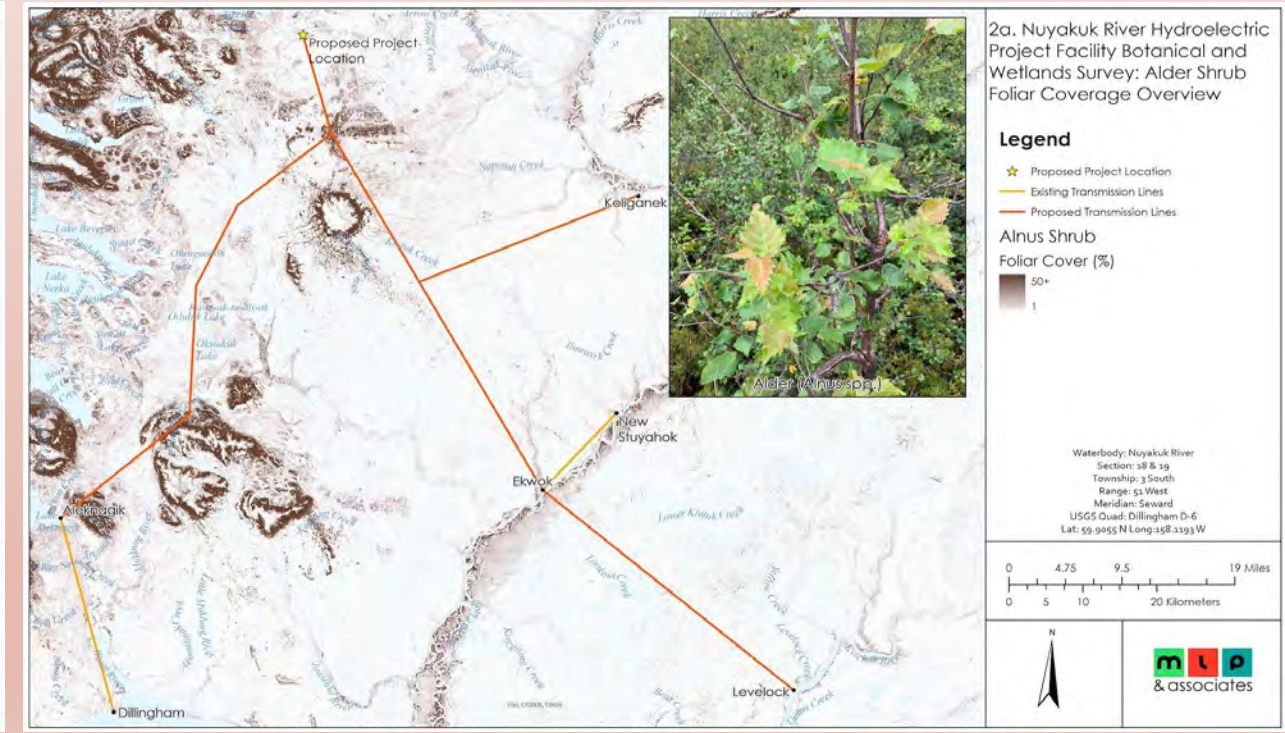
BOTANICAL IMPACT ASSESSMENT

Results

- Lower probability of wetlands in areas of high white spruce and alder likelihood
- Poor correlation between other species mapping and wetlands (widespread and adaptable)



White spruce

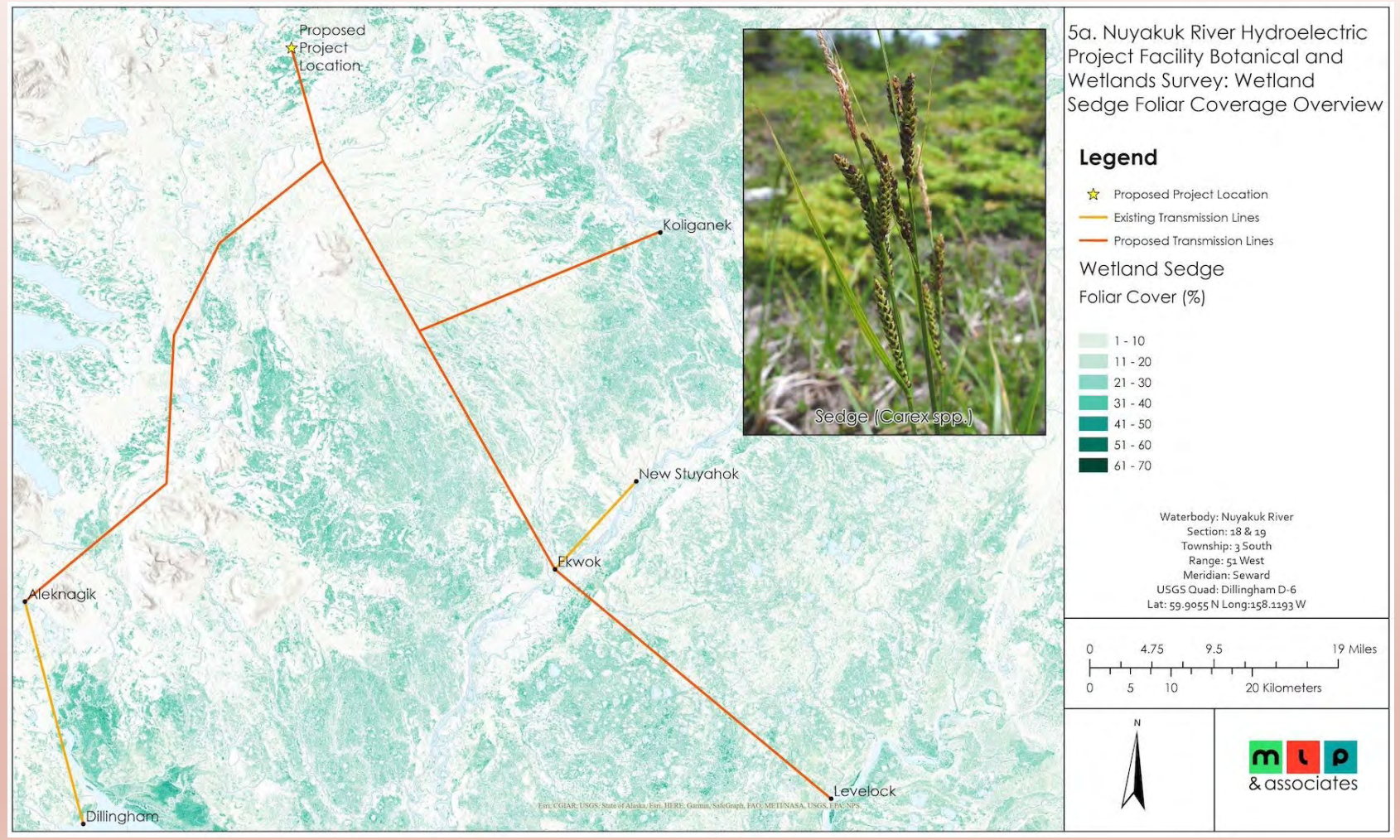


Alder species

BOTANICAL IMPACT ASSESSMENT

Results

- Good correlation between sedge mapping and field-verified emergent wetlands (but not scrub-shrub wetlands)



WETLANDS IMPACT ASSESSMENT

Objective

- Wetlands delineation in the Project Facility Study Area
- Identify BLM Alaska Special Status plant species
- Identify Non-native plants

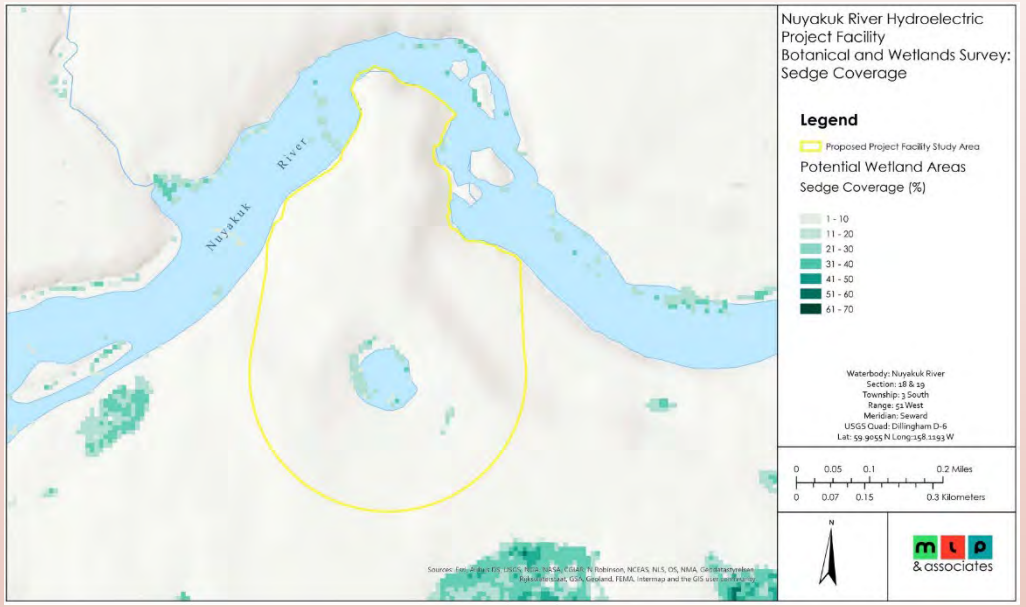
WETLANDS IMPACT ASSESSMENT

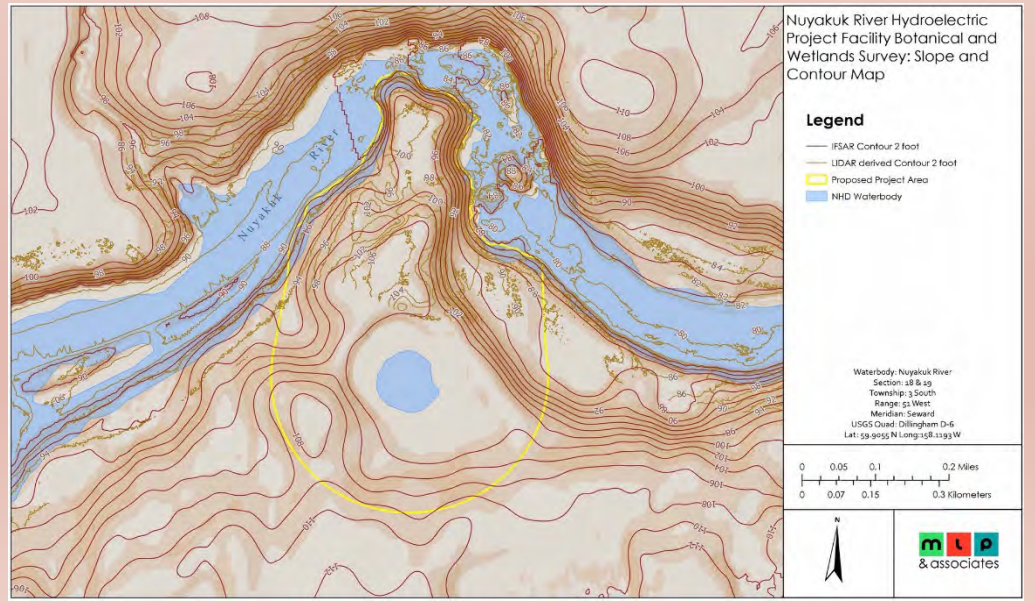
Project Facility Study Area

WETLANDS IMPACT ASSESSMENT

Methods

- Desktop study of available data in the Project Facility Study Area
  - ACCS Sphagnum moss
  - ACCS Sedges
  - USGS Hydrology
  - USGS Satellite-derived contours
- Revised map selection after field survey





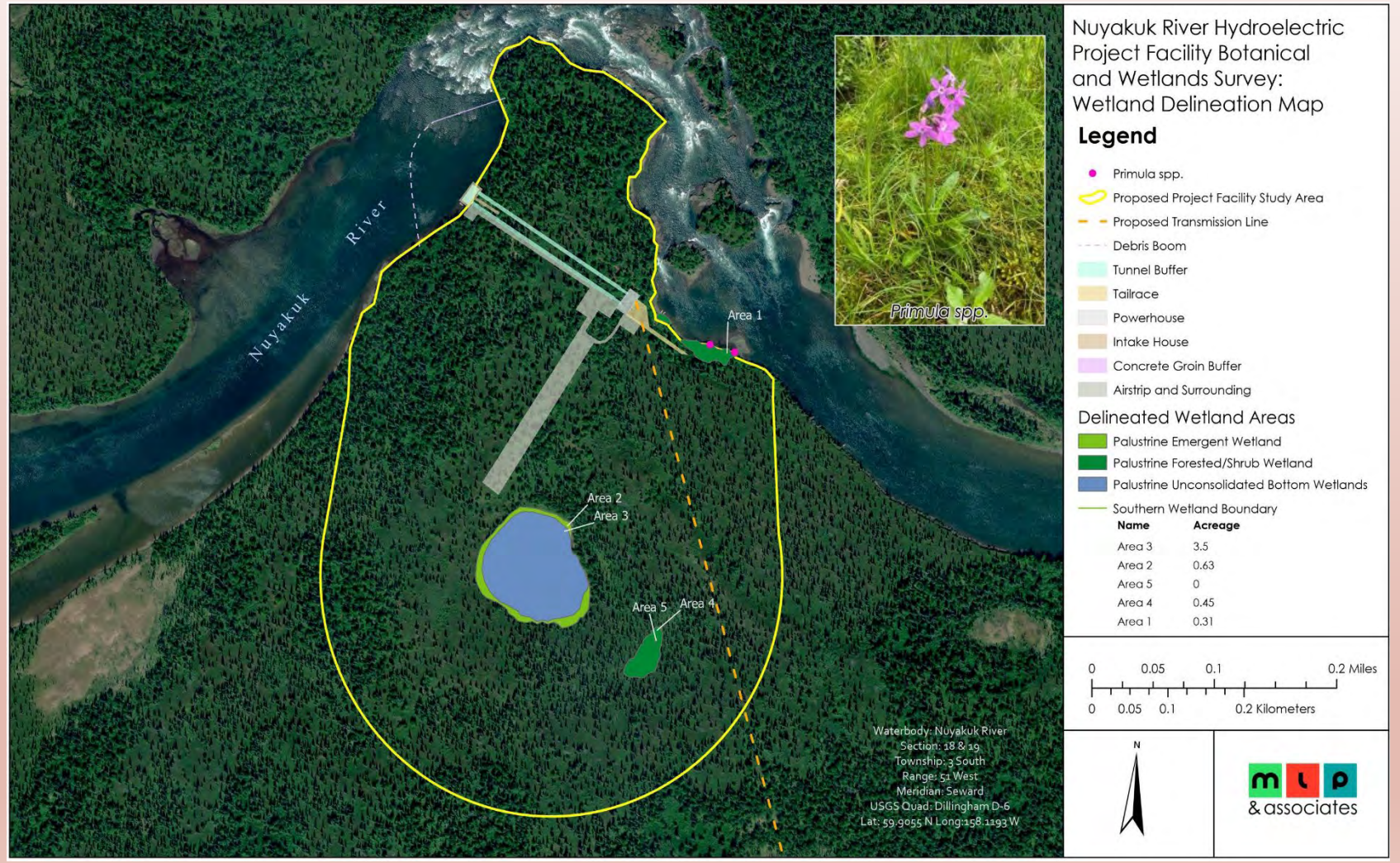
WETLANDS IMPACT ASSESSMENT

Wetland Delineation – Field Survey

WETLANDS IMPACT ASSESSMENT

Results

- 5 wetland areas
- 3 wetland types
  - Palustrine Emergent (PEM)
  - Palustrine Scrub-Shrub (PSS)
  - Palustrine Unconsolidated Bottom (PUB)
- Rare Plants
  - *Primula spp.*
  - *P. tschuktschorum or P. pumila*
- Non-native Plants
  - None observed



CARIBOU POPULATION EVALUATION

Objective

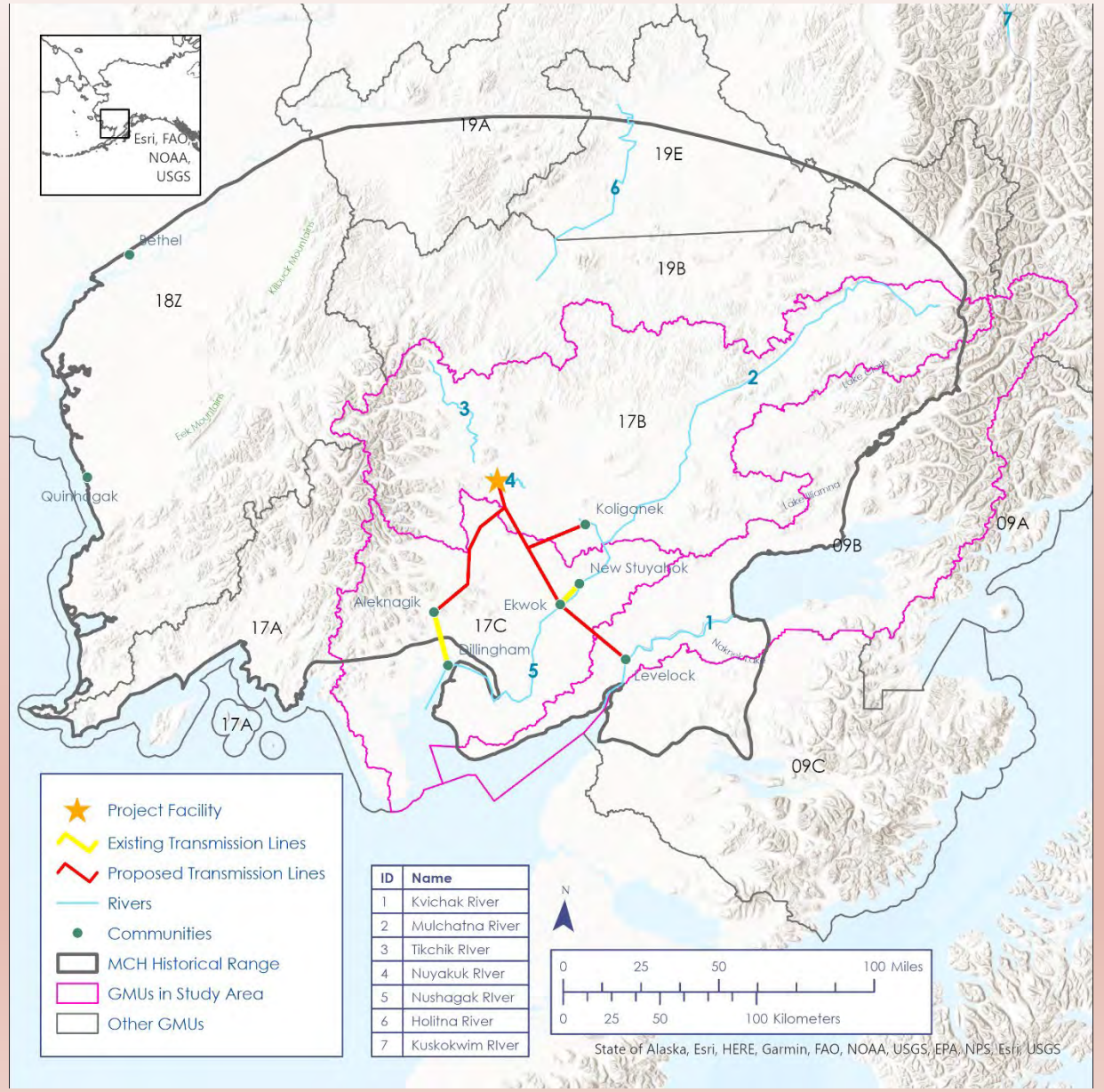
Evaluate potential impacts of the proposed Project development on the Mulchatna Caribou Herd (MCH) within the study area.

CARIBOU POPULATION EVALUATION

Study Area

- State Game Management Units
  - 17B – Project Facility
  - 17C – Transmission Line
  - 9B – Transmission Line

- Study Area
  - ~63,500 km^2
  - ~24,500 mi^2



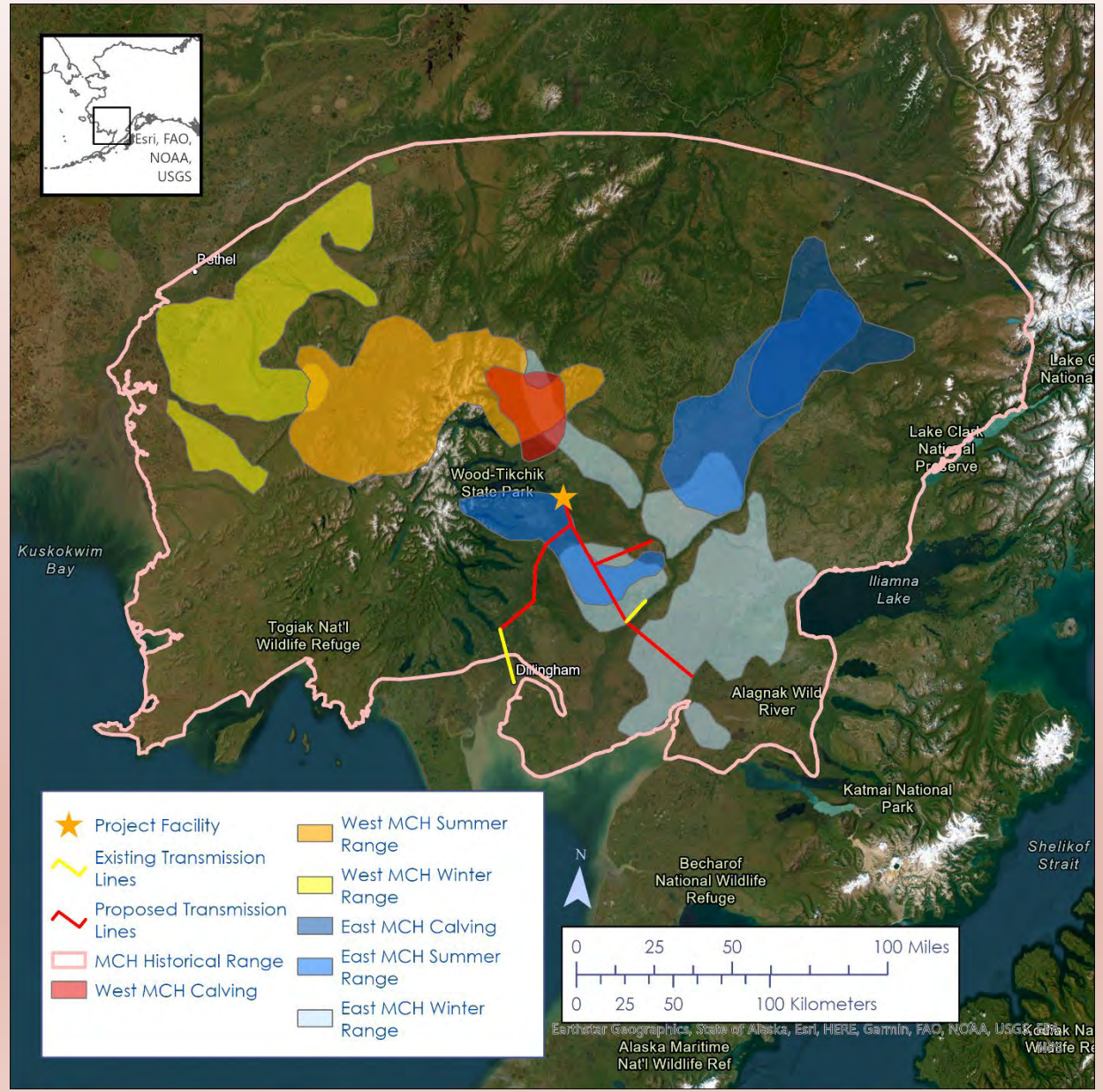
CARIBOU POPULATION EVALUATION

Methods

- Literature Review
  - Peer reviewed and gray literature

- ADFG Reports-Survey and Inventory (S&I) Program
  - Extracted data from ADFG reports
  - Overlaid historical and seasonal distribution data (shapefiles) with the study area

CARIBOU POPULATION EVALUATION



Results

- Direct habitat loss (Project footprint)
  - ~1% of MCH habitat
  - West Segment
  - Does not transect
- East Segment
  - Transects summer and winter range
- Does not overlap current calving areas

Moving Forward

- Form a working group
- Continue to evaluate impacts
- Potential limited impacts may include:
  1. Habitat fragmentation/loss
  2. Behavior Responses
  3. Physiological Responses
  4. Increased Predation
  5. Increased Anthropogenic Activities

CULTURAL

SUBSISTENCE STUDY

Goals and Objectives

Goal

- Document traditional and contemporary subsistence harvest and use in the Project area

Objectives

- Utilize existing ADFG data to assess current subsistence use and document any potential impacts associated with Project development
- Comprehensive efforts to communicate with the public in Dillingham, New Stuyahok and Koliganek
  - In-person meetings/workshops
  - Proactive communication to all locations will occur to ensure as much participation as possible

SUBSISTENCE STUDY

Results/Next Steps

- Proactive efforts in 2023 to identify appropriate specialist and define methods
- As planned initially, study to be completed in 2024
- Results and analysis to be incorporated into the USR

SECTION 106 EVALUATION

Methods

- The goal of the study was to: 1.) Identify historic properties that could be eligible for the National Register of Historic Places and 2.) Assess potential effects of the Project on any such properties.
- Prior to fieldwork, the desktop study identified high probability areas using topography, aerial imagery, previously reported sites, and ethnographic and historic data.
- The field study included pedestrian survey and shovel testing within a 90-acre area. Shovel testing focused on high probability areas but also sampled other zones.

SECTION 106 EVALUATION

Results

- The survey and shovel testing identified a portage trail (DIL-00272), a pre-contact archaeological site (DIL-00271), and two possible cache pits (DIL-00270 and DIL-00273).
- The Nuyakuk Falls Portage Trail (DIL-00272) and archaeological site DIL-00271 are likely significant enough to be eligible for the National Register.
- DIL-00271 radiocarbon dates as old as 3477 BP (1527 BCE)

SECTION 106 EVALUATION

Results

- Constructing the Project as currently proposed would likely not constitute an adverse effect on either potentially significant site.
- Consultation will occur over the winter of 2023 and into 2024 to identify any intangible cultural resources such as traditional cultural properties and cultural landscapes.

SECTION 106 EVALUATION

- Possible cache pit (DIL-00273)

SECTION 106 EVALUATION

- Portage trail (DIL-00272)
- Archaeological site (DIL-00271)

QUESTIONS?

RECREATION AND AESTHETICS

NOISE STUDY

Methods

- Measure overnight sound levels at 4 locations:
  - 1: Project Site
  - 2: 11,000 feet west of Project
  - 3&4: Royal Coachman Lodge (RCL)
- Model future sound levels
  - General construction
  - Construction blasting
  - Air traffic
  - Operations
- Evaluate the potential impact / change in sound level

NOISE STUDY

Measurement Locations

Loc.1 Project Site

NOISE STUDY

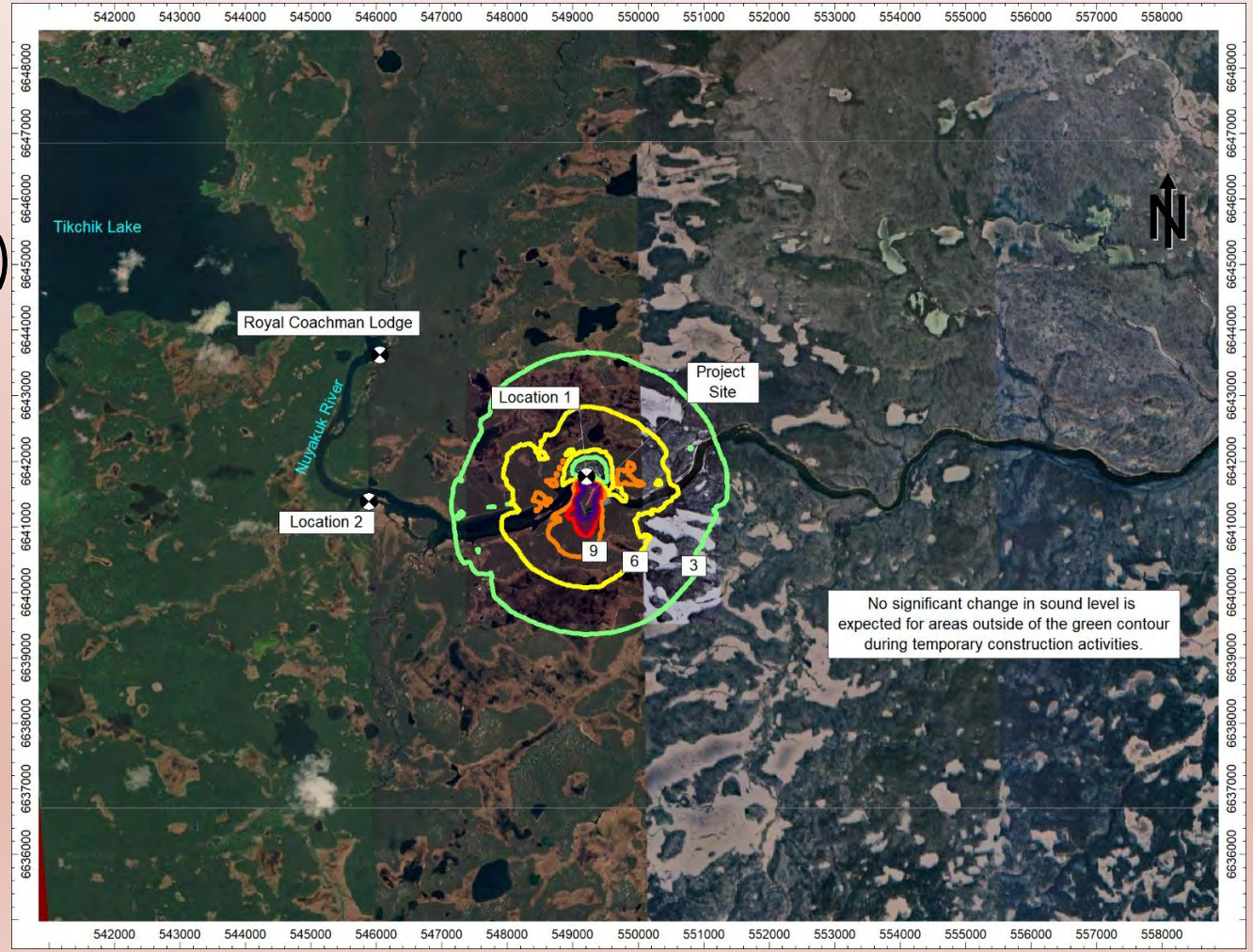
Impact Assessment – General Construction (Temporary)

- Daytime only
- 5 dBA increase (noticeable) at edge of project area
- 1.1 dBA increase (imperceptible) at 11,000 feet
- No increase at Royal Coachman Lodge

3 dBA (barely perceptible),

6 dBA (noticeable), and

9 dBA (twice as loud) impact contours are shown ⇨



NOISE STUDY

Impact Assessment – Construction Blasting and Aircraft (Short-term)

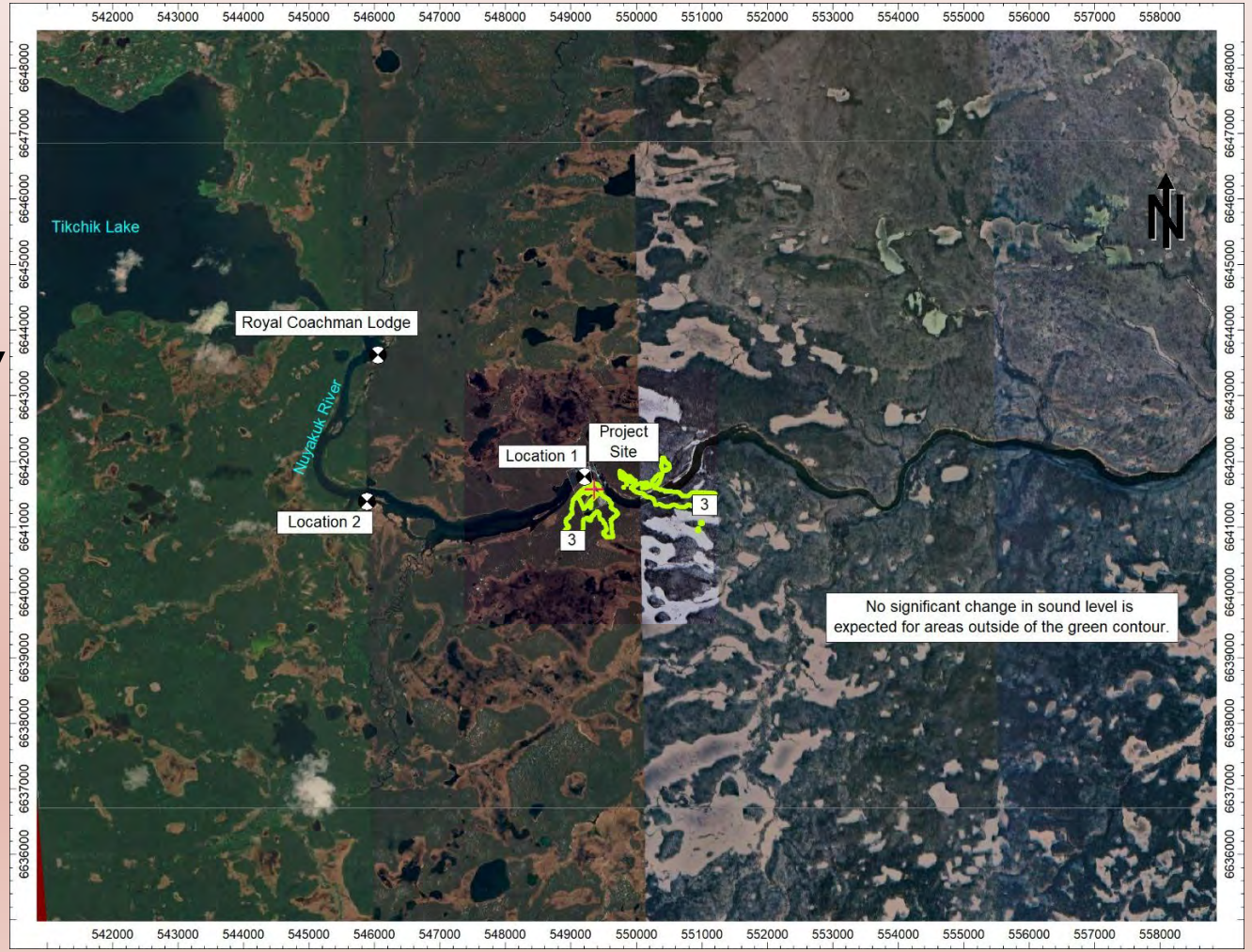
- Blasting during construction
  - No specific blasting plan has been developed given feasibility stage
  - Blasting will be infrequent and during daytime hours
  - Depending on the criteria selected, charge weights will be selected to ensure that the criteria sound levels are met

- Aircraft Operations
  - Typical aircraft will be used
  - At the RCL, aircraft sound levels will be significantly lower than existing aircraft operations due to distance (36 dBA Project vs. 80 dBA existing)

NOISE STUDY

Impact Assessment – Operations (Permanent)

- Only significant noise sources are the power-house ventilation fans
- Only a very small area would see a greater than 3 dBA (barely perceptible) increase
- 3 dBA increase area is shown inside the green contour ⇨



RECREATION INVENTORY

Methods - 2023

- On Site Field Observation & Intercept Surveys at Nuyakuk River Falls
  - July 14th -19th, 2023

- Engagement with Tikchik Narrows Lodge and Royal Coachman Lodge

RECREATION INVENTORY

Results

- Activities observed in the study area occurred at the Lower Falls:
  - Fishing/Angling
  - Scenic Viewing
  - Motorized Boating
    - One instance of rafting & camping was observed by non-rec study staff in August
  - Photography
- 38 total visits, 27 unique client-visitors observed
  - Visits by guided fishing groups are regular, almost daily
- All observed recreators on land or in the water were part of a guided fishing experience with Tikchik Narrows Lodge or Royal Coachman Lodge
  - Tikchik Narrows Lodge accesses the lower falls via float plan & staged motorized boat downriver
  - Royal Coachman Lodge boats downriver to above the falls, hikes Portage Trail to lower falls

RECREATION INVENTORY

Results

- 8 Intercept Survey Responses:
  - Primary recreational activity and purpose was sport fishing/angling
  - All males over 55 years of age
  - Expected to visit the falls only once during their entire trip (ranging from 9 to14 day durations)
  - Experiences rated as "important" or "very important" *(as rated on a 5-point scale where 1="not at all important" and 5="very important")*:
    - Experiencing new and different things (mean = 4.57)
    - Enjoying the sights and smells of nature (mean = 4.25)
    - Being with friends, getting away from the usual demands of life, and being away from crowds (mean = 4.125)

RECREATION INVENTORY

2024 Methods

- Resident Surveys
  - Paper & online surveys will be developed & distributed in the communities of Dillingham, Aleknagik, Ekwok, New Stuyahok, Levelock, & Koliganek
  - Community Visits in Spring to conduct surveys & in Fall to report results

- Recreational Business Operator Data Collection & Analysis
  - Data collection form will be distributed to collect at a minimum 2023-2024 data, with a request for information from 2018-2024

RECREATION INVENTORY

QUESTIONS?

CONCEPTUAL DESIGN/POTENTIAL OPERATIONS

PROJECT SIZING

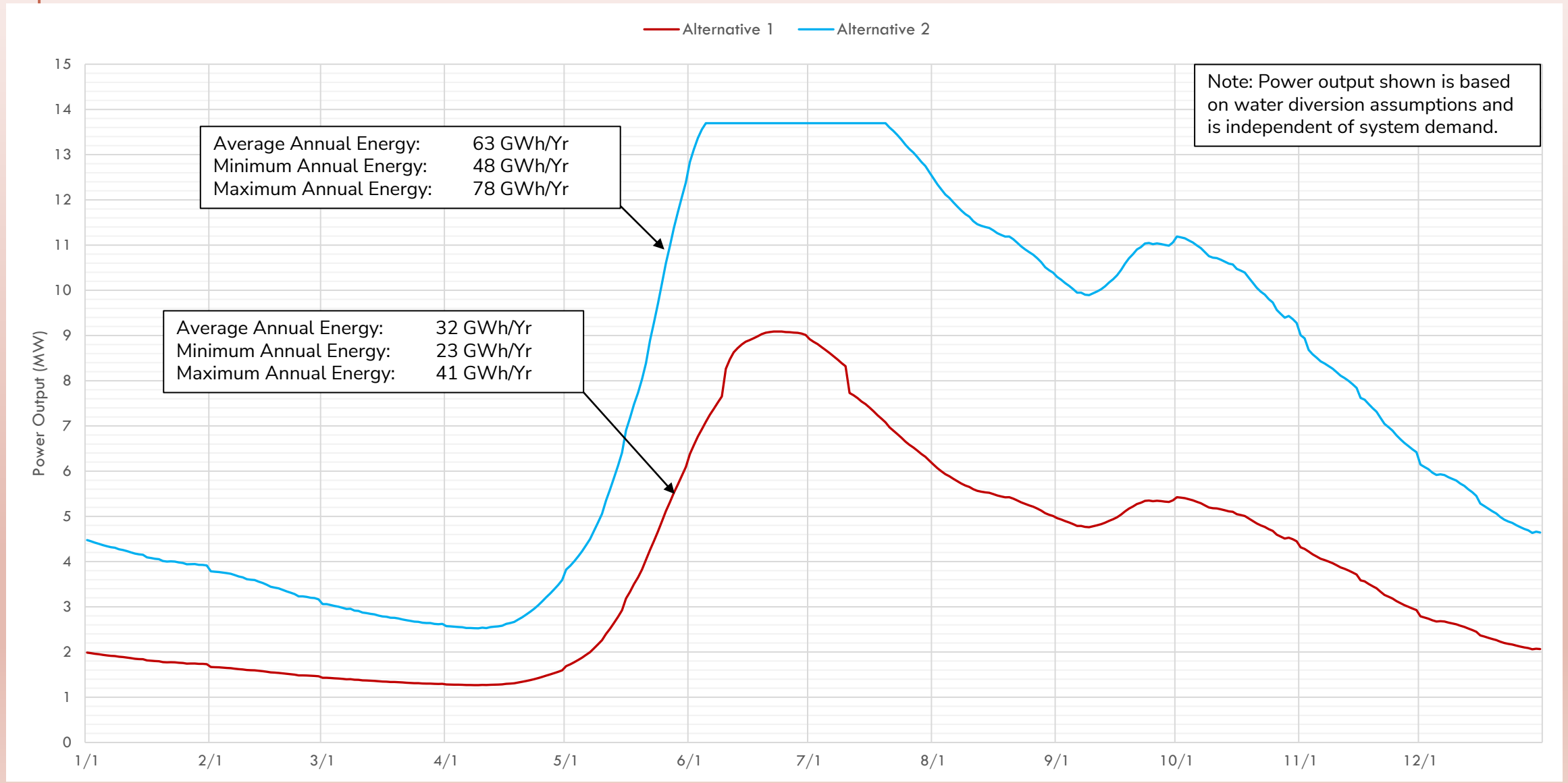
Alternative 1:

- Sized to utilize 30% of the flow in the falls for generation purposes (est. 9 MW Peak)

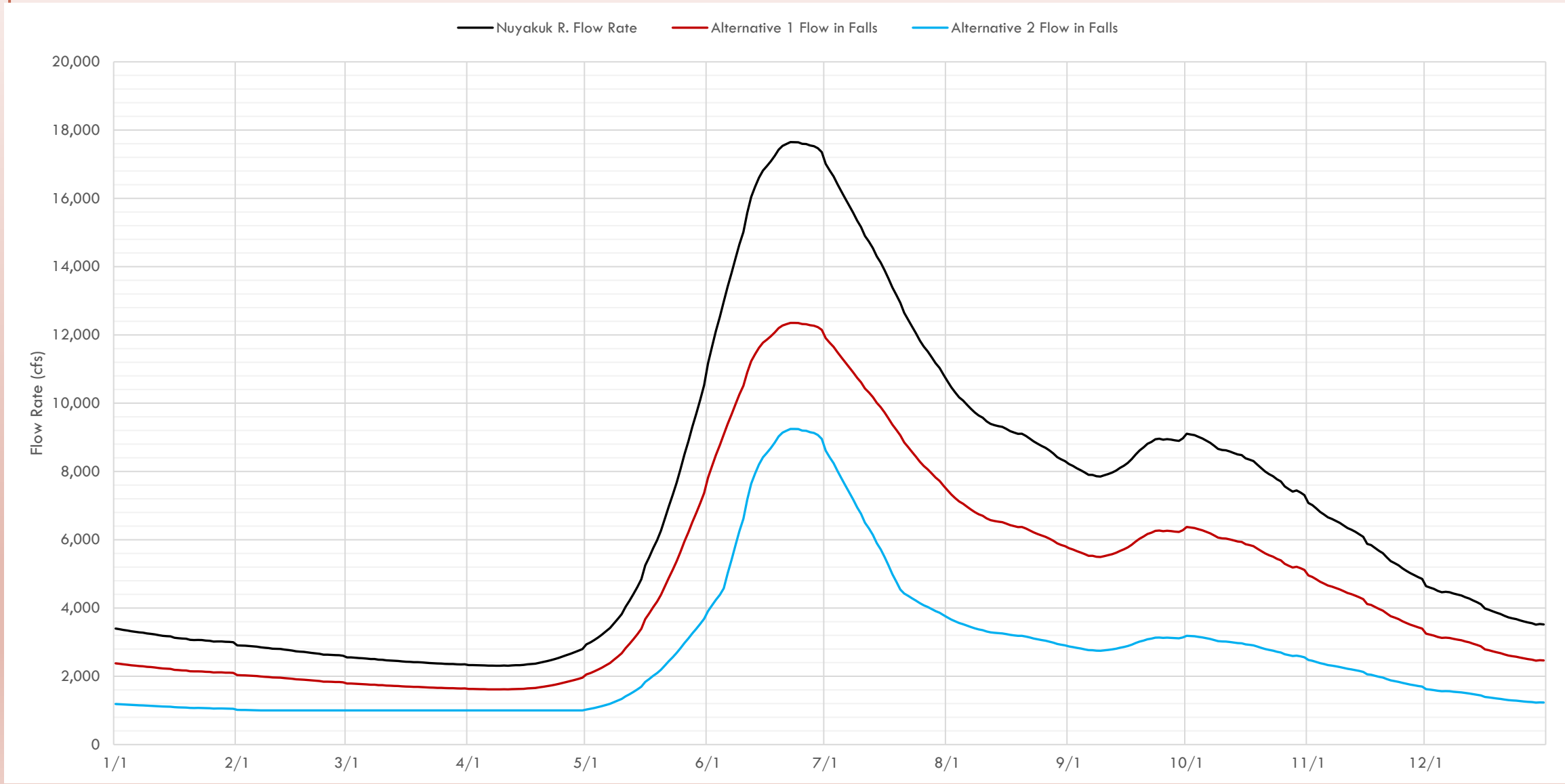
Alternative 2:

- Sized based on projected future regional power needs (Est. 14 MW Peak)
- Investigated to better understand water diversions based on maximum seasonal demand

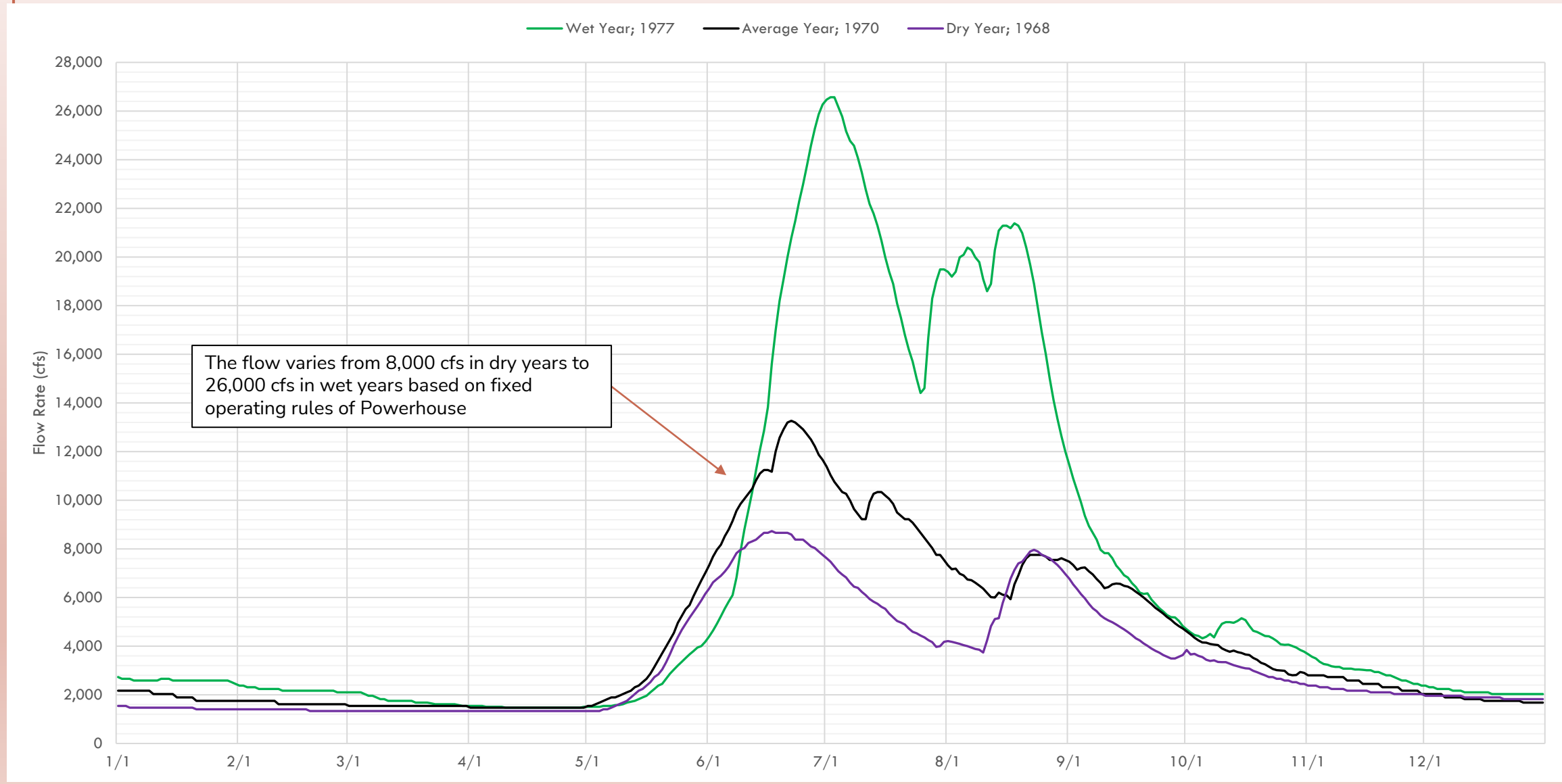
SEASONAL POWER OUTPUT – AVERAGE YEAR



FLOW REMAINING IN FALLS – AVERAGE YEAR



FLOW REMAINING IN FALLS – DRY / AVERAGE/ WET YEAR



QUESTIONS?

TECHNICAL WORKING GROUPS

- Cooperative forming 3 additional Technical Working Groups (TWG)
  - Terrestrial
  - Cultural (formation in process)
  - Recreation
- Assess 2023 results relative to overall study program and discuss need for any methodological modifications currently defined in the RSP
- Provide consistent status reports on study implementation, results and respective impact assessments
- Bi-monthly meetings (virtual) during 2024
- Sign-up sheets for in-person attendees and ljohnson@mcmillen.com or meeting chat, for those attending virtually

OVERALL PROJECT LICENSING SCHEDULE

Key FERC Milestones*

- Comprehensive Study Seasons – 2023 and 2024
- Study Reporting – 2023 and 2024
- Study Reporting Meetings – 2023 and 2024
- Ongoing Infrastructural and Site Analysis and Design – 2023-2024
- Further Geotechnical Analysis –2024
- Preliminary Licensing Proposal – 2024/early 2025
- PLP Comment Period – 2024/early 2025
- Final License Application – 2025
- FERC input – Matt Cutlip

**Both mandated and informal commenting periods will be available throughout.*

ISR COMMENTS AND COMMUNITY INPUT

ISR Comments

- Comments on ISR due to FERC on/before January 30th (Tuesday)
  - e-Filing encouraged, any questions, reach out

- If questions arise during review, reach out to the Cooperative via:
  - ljohnson@mcmillen.com

General Community Input on Potential Project Benefits and Concerns

- As communicated in mid-November and per request, survey created to receive input on the Project
- Not required by FERC process (separate), Cooperative is genuinely interested in public input
- https://form.jotform.com/233195473949066

- Responses may be left anonymously or with contact information
- Great objective input received thus far, thank you!

IN CLOSING, THE WHY

Documents, Plans and Reports

Alaska Fuel Price Report: Current Community Conditions

Bristol Bay Energy Policy and Energy Crisis Recovery Plan

Implementation Strategies for the Bristol Bay Energy Policy and Energy Recovery Plan May 6, 2008

A Winter Energy Saver Tip!

Bristol Bay Energy Policy & Implementation Strategies -Status Report–Update–2014

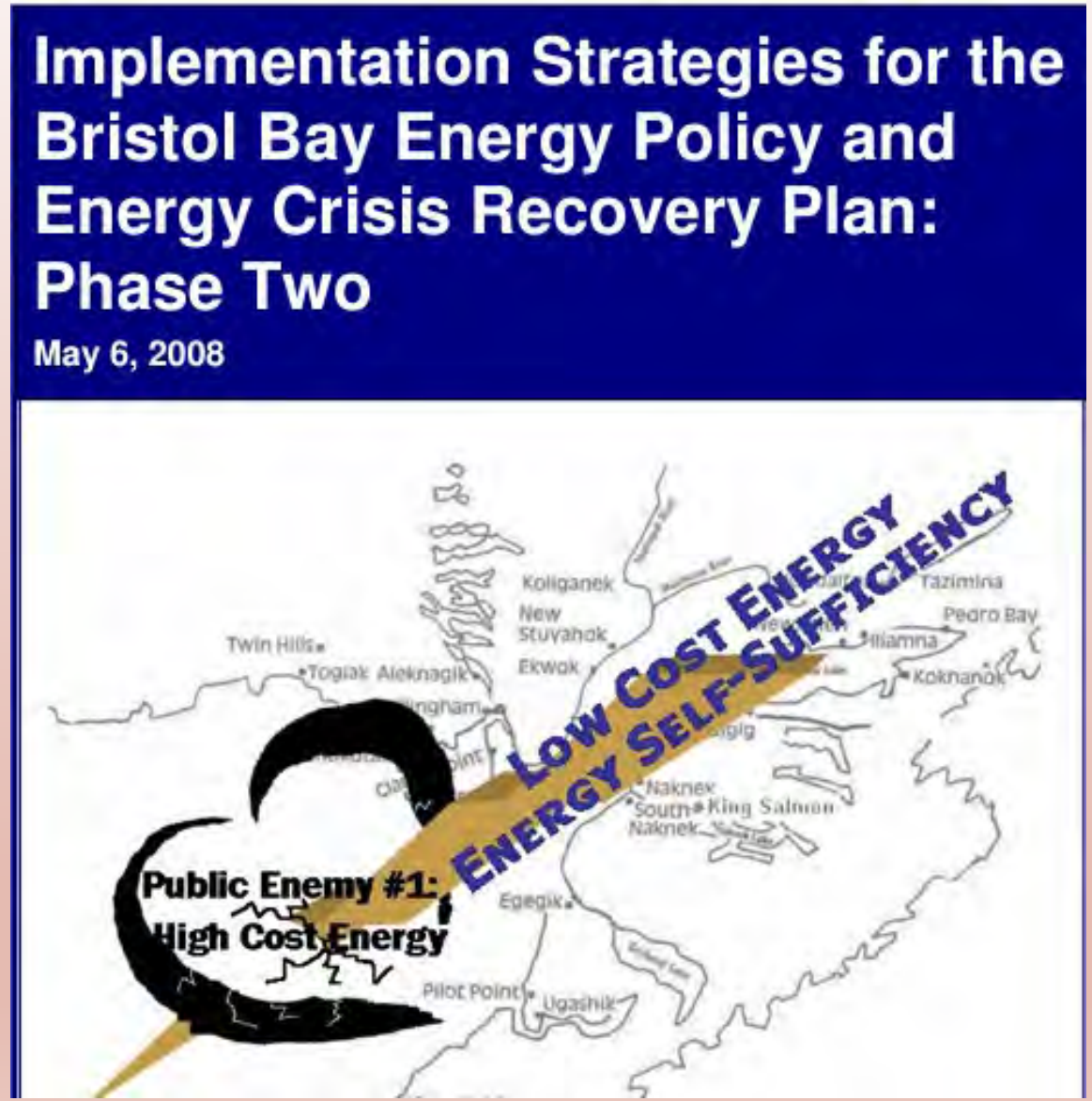
Alaska Strategic Energy Plan & Planning Handbook August 2013

Alaska Fuel Price Report – January 2015

Bristol Bay Regional Energy Plan

Phase I Resource Inventory Report November 2013

Phase II Stakeholder Engagement September 2015

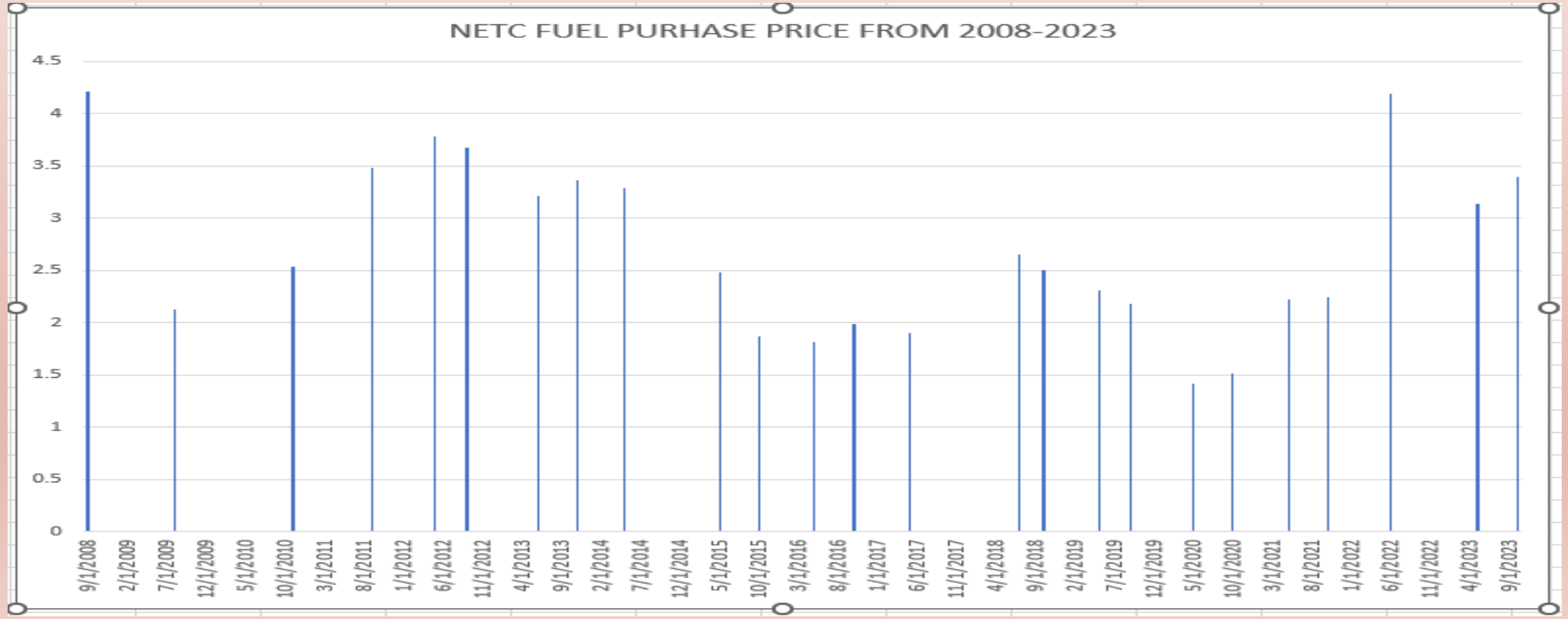


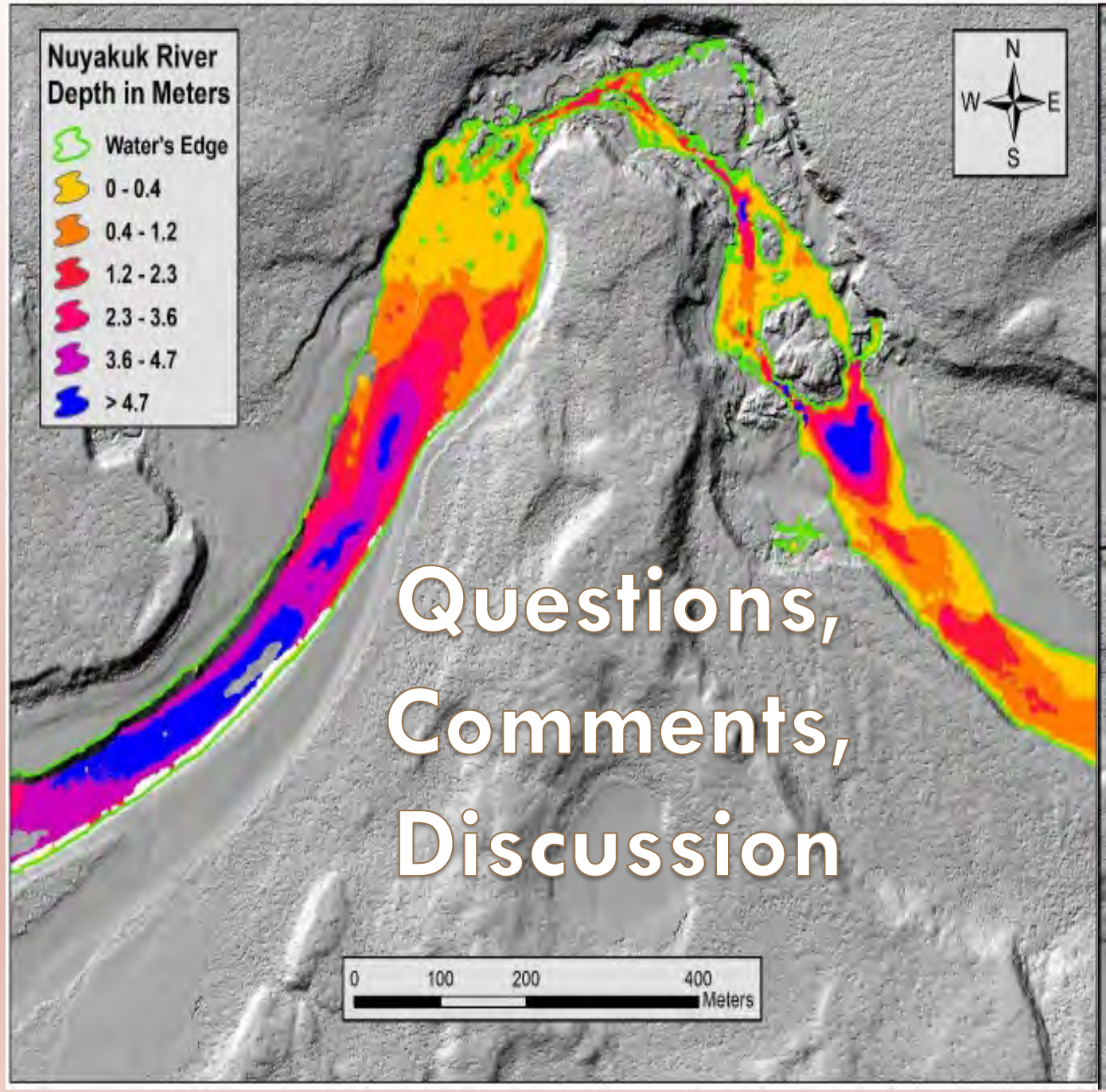
OPERATING COSTS

Annual maintenance on the diesels and fuel systems approximately $400,000

Consulting ,source testing, and spill plan compliance approximately $300,000.

During the peak of Salmon processing we can use up to 5,000 gallons daily.





Questions, Comments, Discussion