

Nuclear Waste Management Organization (NWMO)

ESRI / KISTERS Partnership Showcase

Jens Proche and Steve Elgie – KISTERS North America

Project Background – Nuclear Energy in Canada

Existing Assets

Nuclear energy is produced primarily in Ontario by Ontario Power Generation at 3 facilities in Southern Ontario.

- It accounts for ~60% of energy production.
- It has been implemented since the late 60's and has produced an estimated 1500 tons per year of radioactive waste.
- Long term storage has been a contentious issue for the past three decades and studies to identify suitable storage locations have been ongoing for nearly as long.



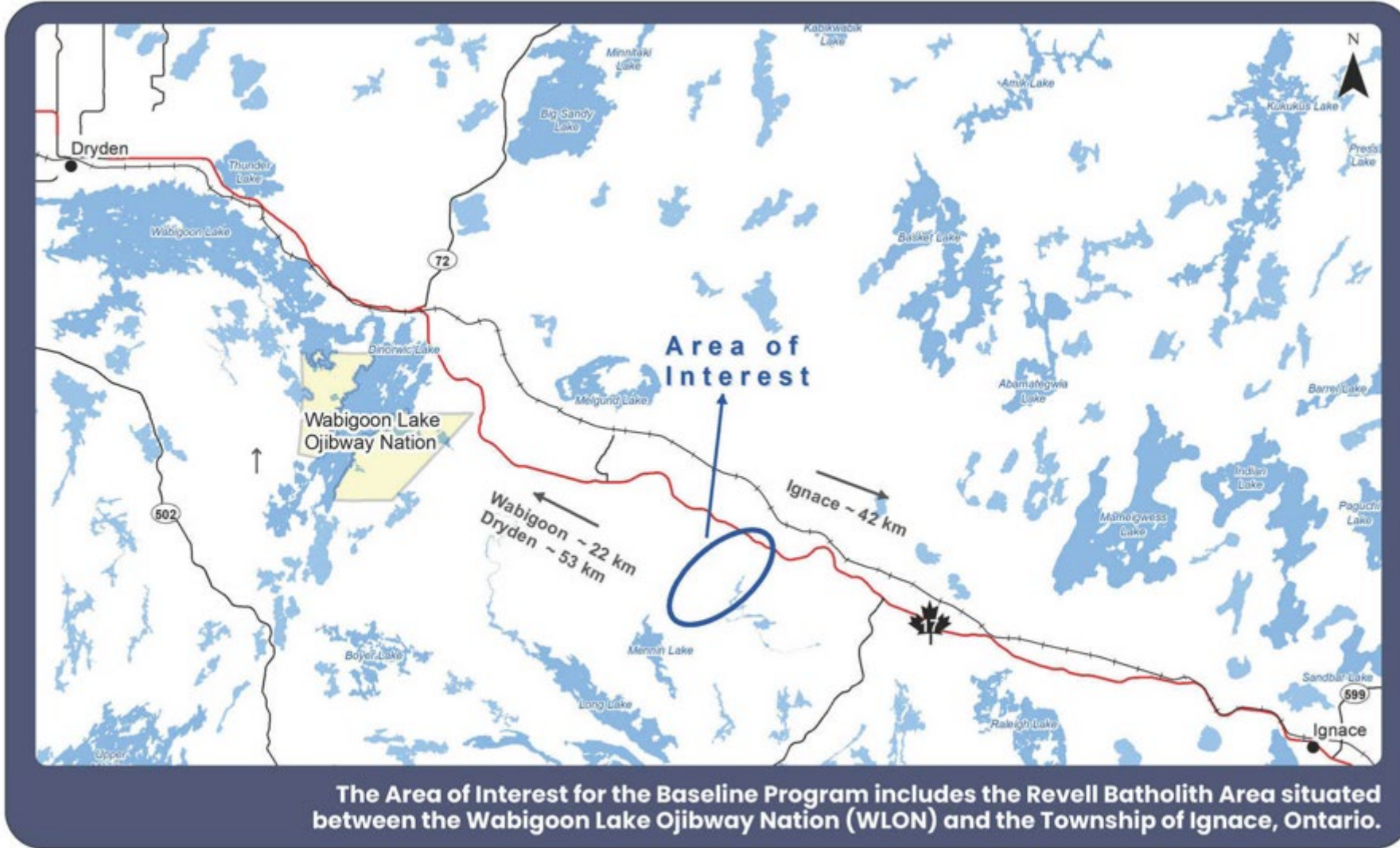
Project Background – Nuclear Energy in Canada

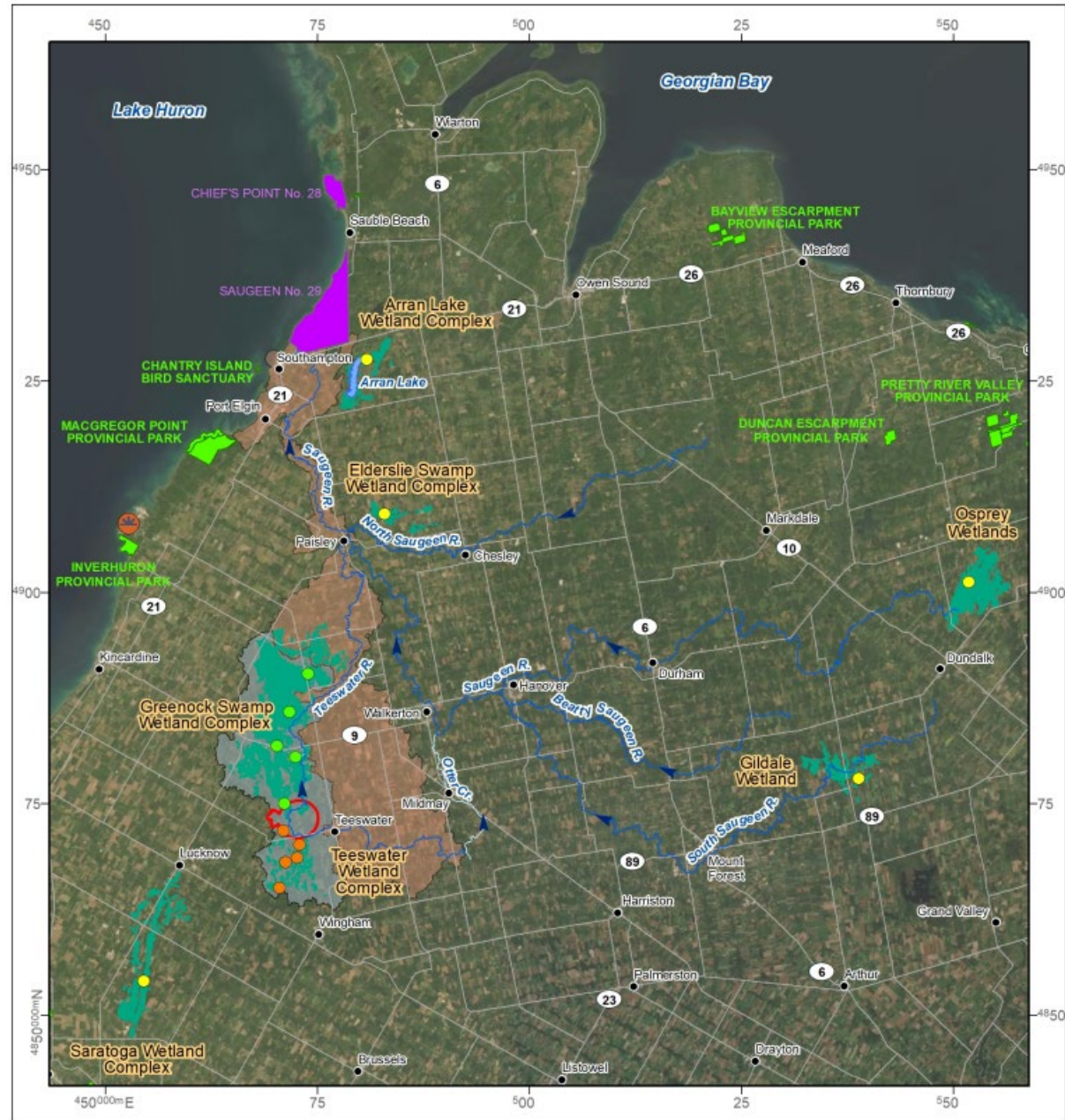


The Shortlist

The results of the environmental, social, and economic studies have identified two potential long-term storage locations:

- Iqaluit, Ontario – Located in the far north (even for Ontarians). This site has very strong support from local residents and largely, the rest of the public.
- Bruce County, Ontario – Located in SW Ontario near an existing nuclear facility off the shores of Lake Huron. This proposal also has local support but is more contentious due to its proximity to the water supply.





Map Sources: Esri, et al. "World Imagery"; NRC "Canvec 1:1M - Administrative and Transport Features"; NRC "Canvec 1:50K - Hydro Features"; Nuclear Waste Management Organization "AOI", "LSA".

Project Background – Nuclear Energy in Canada



Expansion Across Canada

The decision to find a long-term location is critical as Ontario begins to export its nuclear technology to other Provinces as Small Modular Reactor (SMR's) become an avenue to offset carbon emissions.

- So far, two Provinces that are rely on 'traditional' energy sources (NB and SK) have signed initial agreements to begin the SMR implementation process.
- Ontario **must** lead by example and provide a full solution before offloading technology to these Provinces.
- So how can we be confident in the decision that is made?

NWMO Monitoring Project



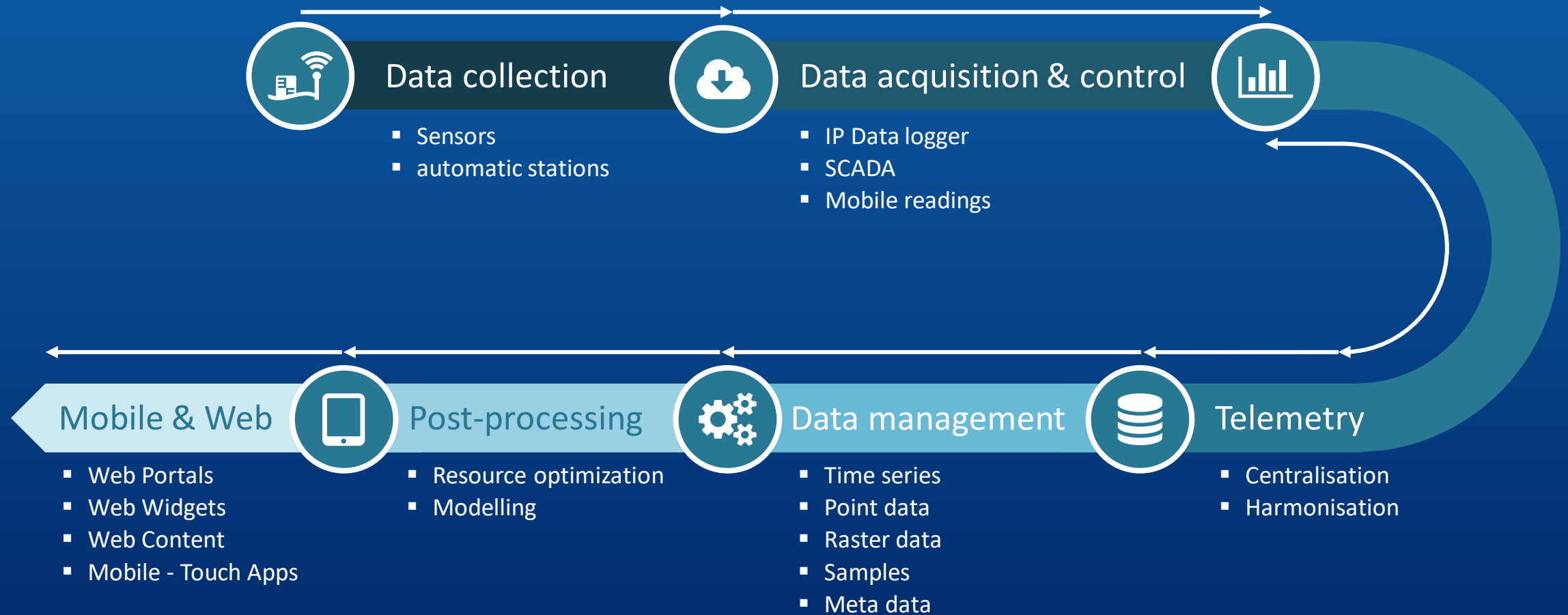
The “Forever” Project

With the shortlist identified, NWMO is collecting **all** data related to these sites to establish a baseline to compare their monitoring against.

- An RFP was released to secure a flexible environmental data solution that could store, analyze, visualize, and report on any of the data collected by this agency.
- Flexible = we don't know what we'll be collecting in the future; assume the kitchen sink is included.
- KISTERS and Esri Canada submitted a joint proposal that focused on the use of WISKI + AGOL / Field Tools, which was successful.

The Full Solution

Integration of private and public networks



NWMO Monitoring Project

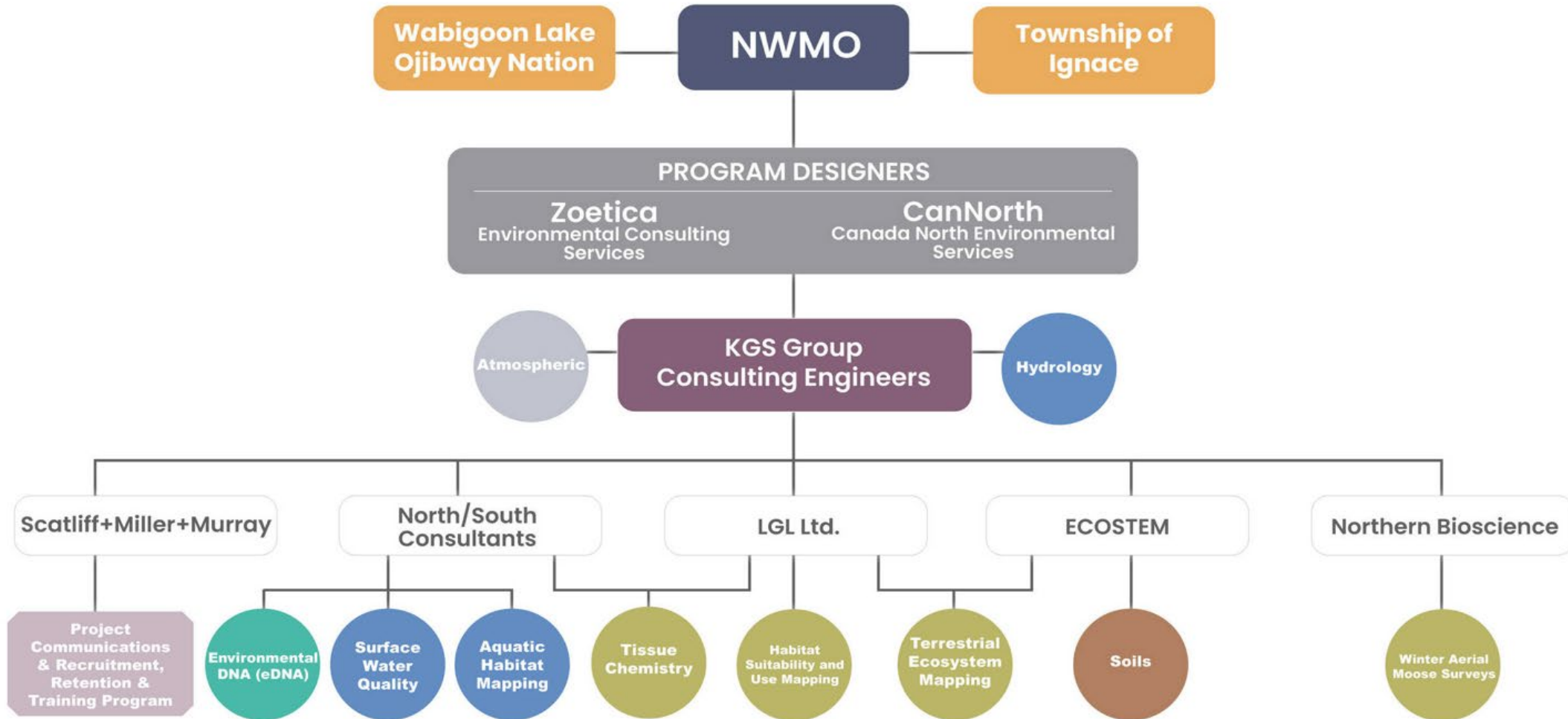


Project Scope Recap

- The Highlights:
 - Highly spatially variable data
 - Extremely high resolution (spatial and temporal) required for data collection
 -
 - Full integration with anyone with relevant environmental data, including Provincial Ministries, hydropower producers, mining sites, citizen science networks, traditional knowledge from Native bands, and others.
 - Maintaining Transparency with the public is paramount.

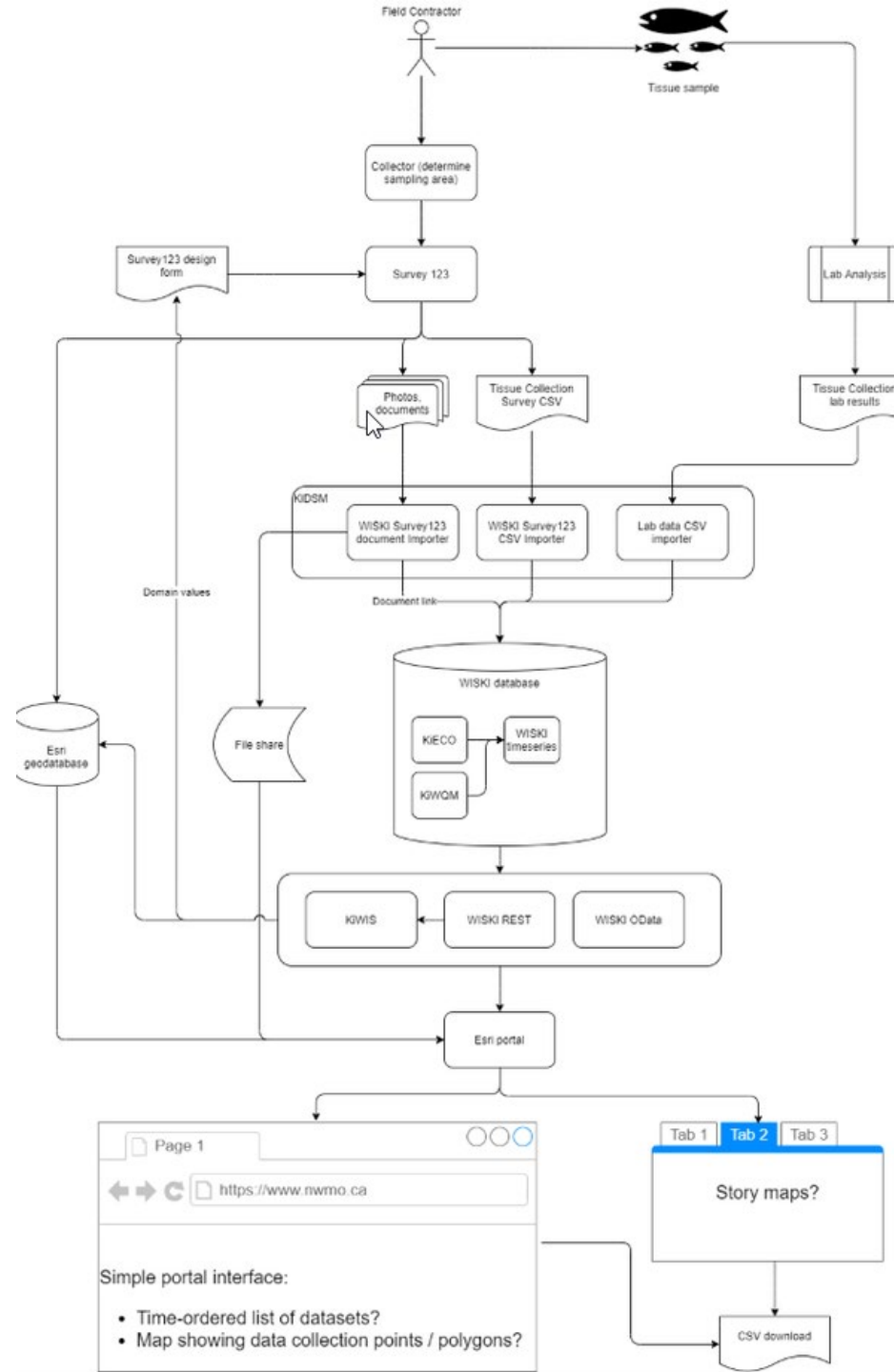
Meet the Baseline Monitoring Program Team

ERS



Technical Architecture

The real one



Page 1

https://www.nwmo.ca

Simple portal interface:

- Time-ordered list of datasets?
- Map showing data collection points / polygons?

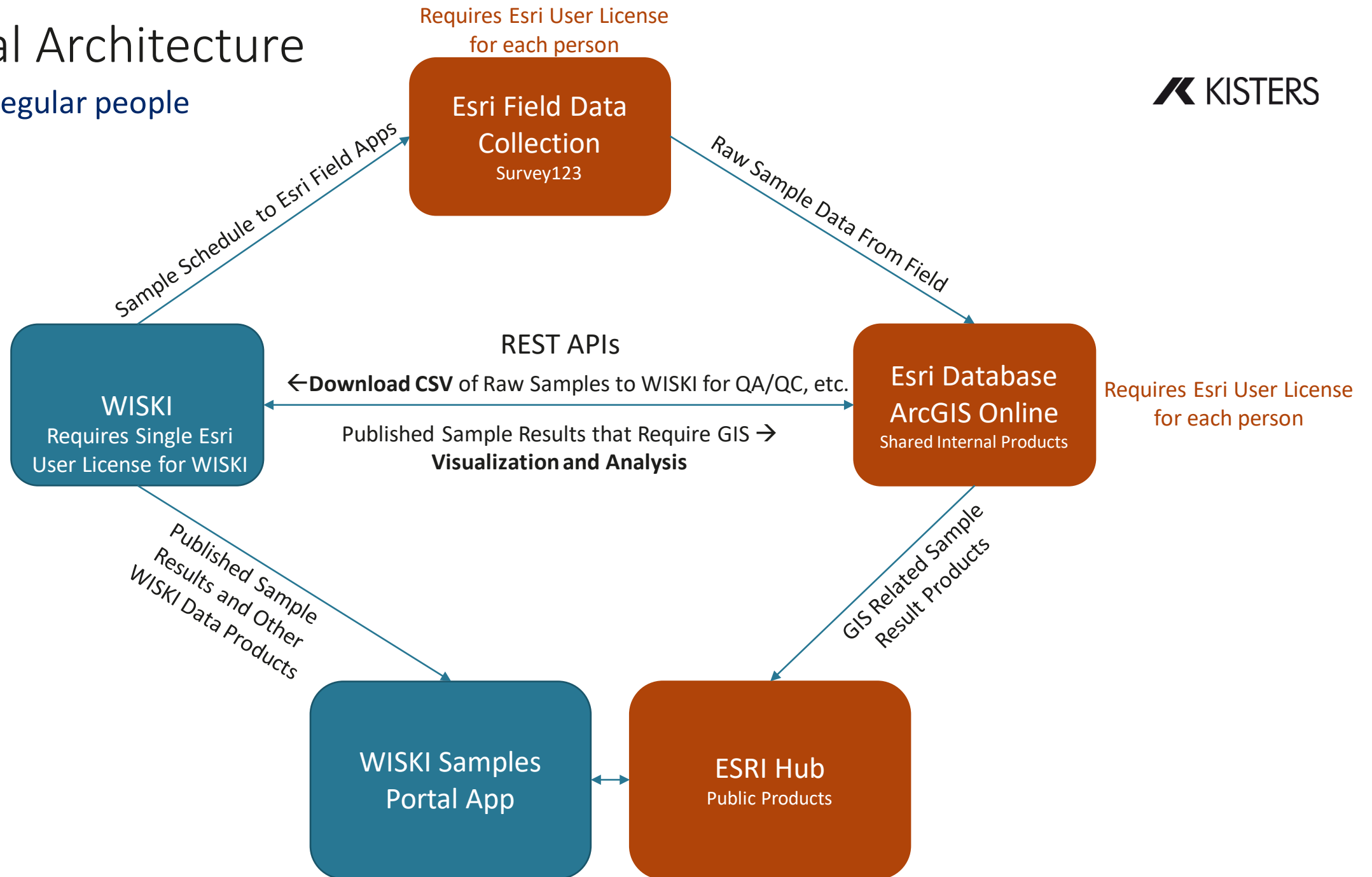
Tab 1 Tab 2 Tab 3

Story maps?

CSV download

Technical Architecture

The one for regular people



4

What we accomplished in 2021

15
Sites Visited

SOIL QUALITY



39
Sites Visited


SURFACE WATER QUALITY



140
Samples Collected

153
Sites Visited

eDNA



467
Samples Collected

287
Sites Mapped

AQUATIC HABITAT MAPPING



146
Wetlands



13
Ponds



42
Lakes



86
Rivers + Streams

600
Sites Mapped




TERRESTRIAL ECOSYSTEM MAPPING



HABITAT SUITABILITY & USE MAPPING

HYDROLOGY



FLOW METERING + BATHYMETRY

11
Lake Bottoms Mapped

6
River/Stream Flows Measured

Over 400km of bathymetric data transects on 11 lakes

Learn about the studies

2021 + 2022



Soils

Study Lead: ECOSTEM

This study tracks and collects samples for soil quality.



2022



Tissue Chemistry

Study Lead: LGL Ltd. & North/South Consultants

This study tracks and collects terrestrial and aquatic tissues for laboratory analysis, including the following:

- small and large mammals
- vegetation (plants and berries)
- birds and water fowl
- fish and insects
- frogs and tadpoles

2021 + 2022

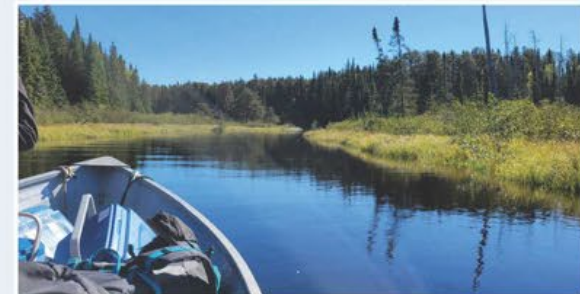


Hydrology

Study Lead: KGS Group

This study tracks and collects data on the following:

- estimate flow in small streams and large rivers
- survey lake bathymetry and water levels
- aerial Survey



Learn about the studies

2021 + 2022



Surface Water Quality

Study Lead: North/South Consultants

This study tracks and collects samples of the following:

- surface water quality
- plankton
- sediment quality
- benthic invertebrates



2022



Atmospheric

Study Lead: KGS Group

This study tracks and collects data on the following:

- baseline air quality
- noise
- light monitoring



2021 + 2022



Terrestrial Ecosystem Mapping

Study Lead: LGL Ltd., supported by ECOSTEM



This study collects vegetation and soil data used to improve the understanding of the ecology of the Baseline Program study area. A key use for this ecosystem mapping will be to support future studies and modeling initiatives.

Learn about the studies

2021 + 2022



Habitat Suitability and Use Mapping

Study Lead: LGL Ltd.

Habitat suitability and use mapping helps determine the quality of habitats for various species at different times of the year and life history requisites.



2021 + 2022



Winter Aerial Moose Surveys

Study Lead: Northern Bioscience

This survey utilizes helicopter flights to gain a better understanding of the baseline moose population within the study area. Results obtained from these studies will support the development of species population and demographic monitoring programs to address environmental, regulatory and stakeholder/rights-holder concerns regarding decreases in the number of moose, to support the biodiversity impact assessment.

2021



Aquatic Habitat Mapping

Study Lead: North/South Consultants

This study characterizes the presence and distribution of fish habitats used for spawning, rearing, migration or overwintering in wetlands ponds, lakes and streams. This data will also be used to identify suitable sites for potential future fish and aquatic food web studies.



Completion to Date



Front-Load Esri Design

- Survey123/Collector/Field App forms, maps, and geodatabase design have been completed.
- Several large change requests have gone through to support additional phases as monitoring needs change.
- We are (finally!) at the point of designing/implementing the WISKI schema to provide long-term storage and analysis.
- A big shoutout to Parik Ranade (Esri Canada) and Scott Digweed (Kisters North America) as the PM's for this project. They have meshed very well and have continued to deliver incredibly high quality work in a changing environment.
- Project is scoped until late 2024 with current change order values; will likely continue *indefinitely*.

Thank you for your time!