Environmental Baseline Program and Change Assessments

Presented by:
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NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

October 2023

Agenda

- **NWMO Environment Program Introduction**

- **Environmental Media Baseline Program**
  - Baseline Summary – *what have we done so far?*
  - Change Assessment – *how are we considering potential impacts?*

- **Biodiversity Impact Studies**
  - Baseline Summary – *what have we done so far?*
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- **Questions and Feedback**

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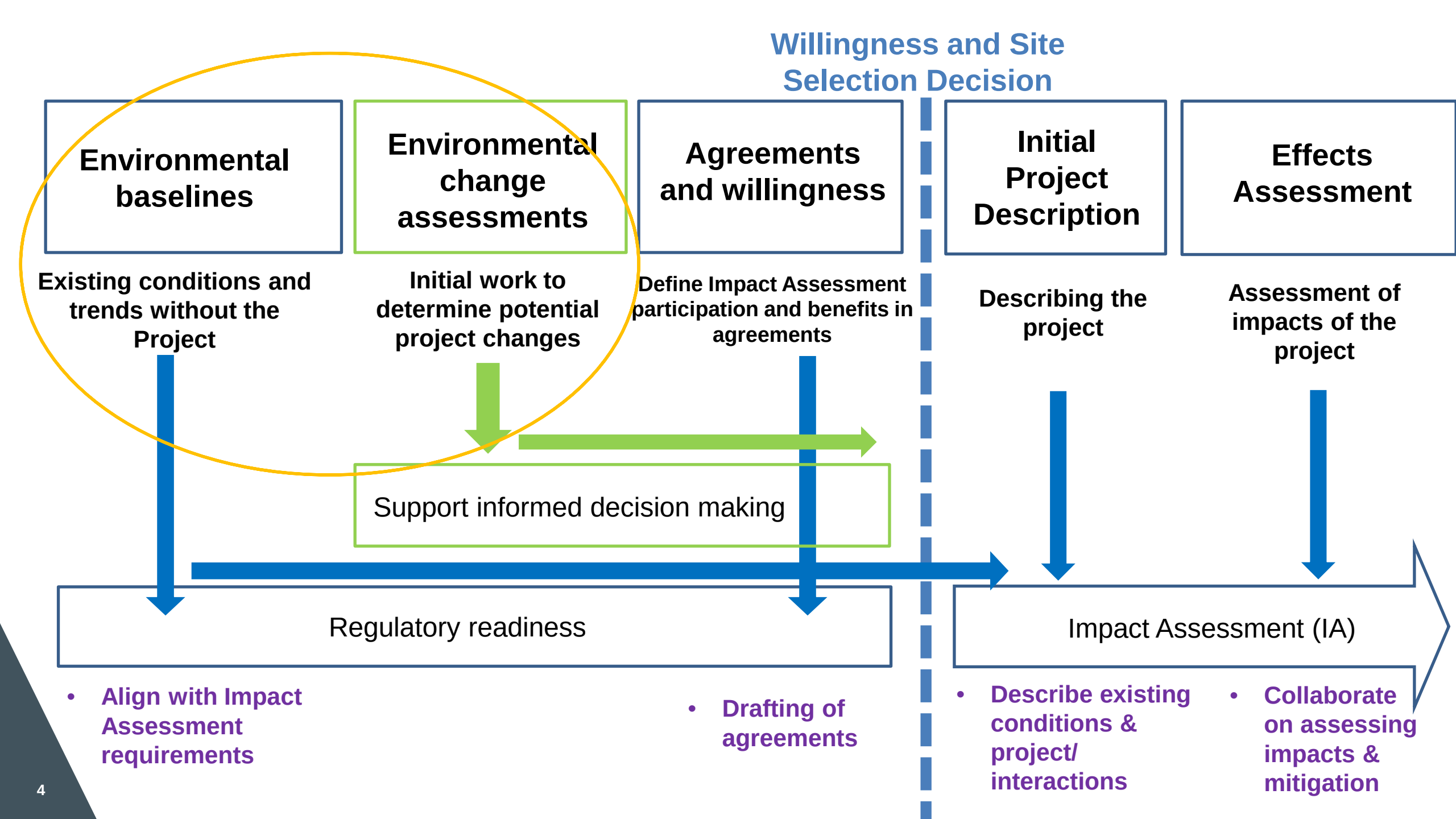
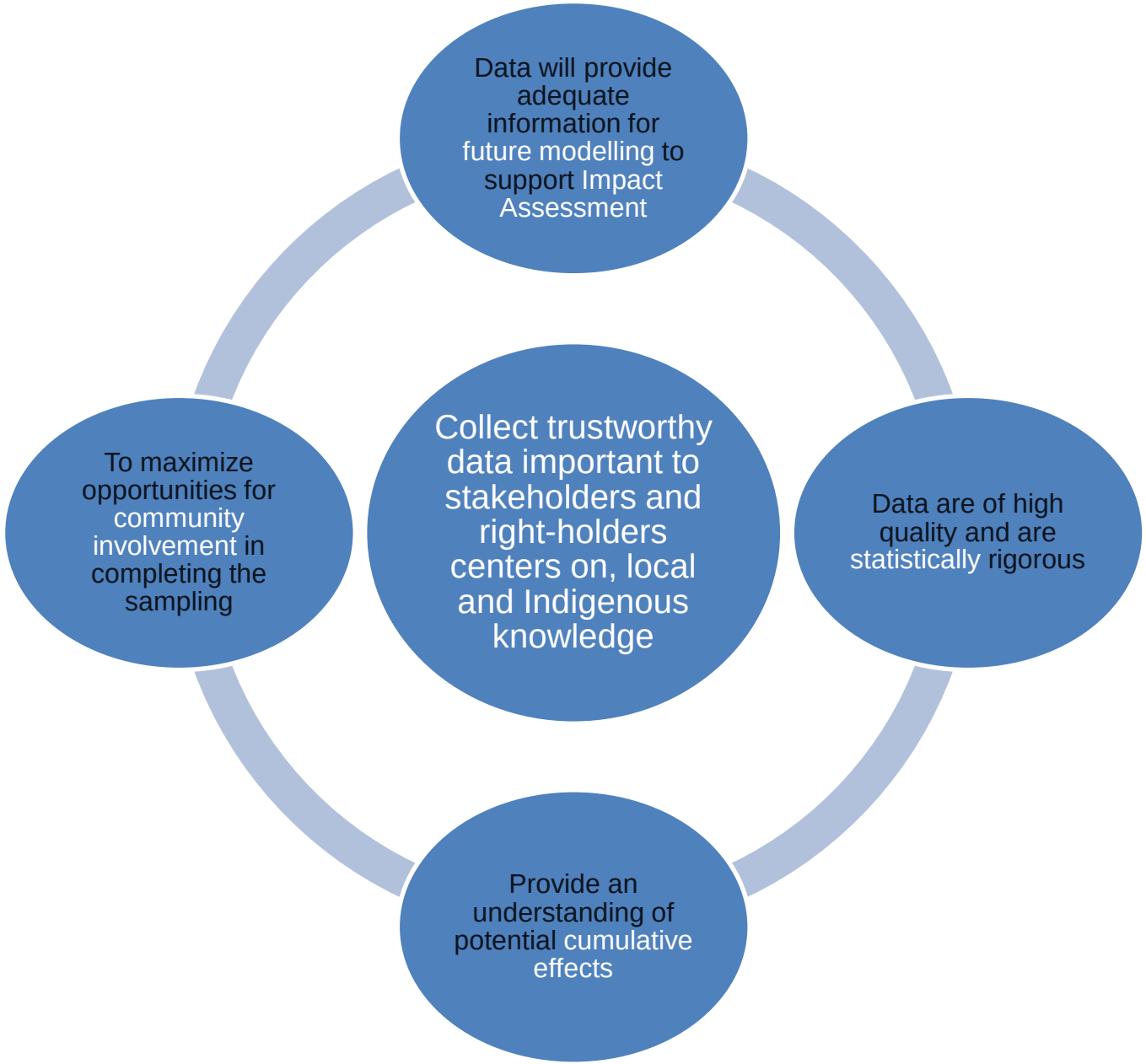

Willingness and Site Selection Decision
Environmental baselines
Environmental change assessments
Agreements and willingness
Initial Project Description
Effects Assessment
Existing conditions and trends without the Project
Initial work to determine potential project changes
Define Impact Assessment participation and benefits in agreements
Describing the project
Assessment of impacts of the project
Support informed decision making
Regulatory readiness
Impact Assessment (IA)
• Align with Impact Assessment requirements
• Drafting of agreements
• Describe existing conditions & project/ interactions
• Collaborate on assessing impacts & mitigation

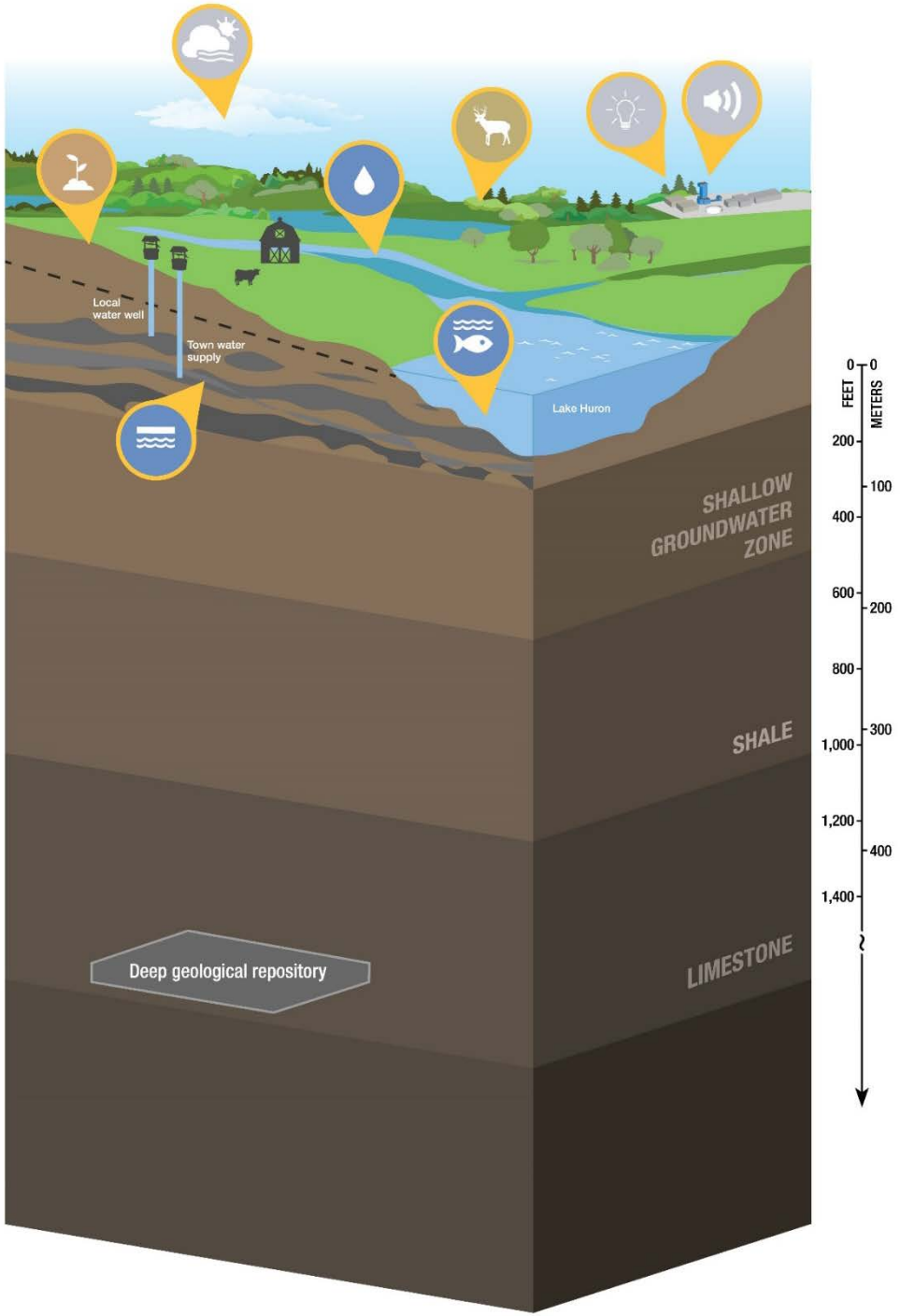
What is the purpose of the Baseline Program?

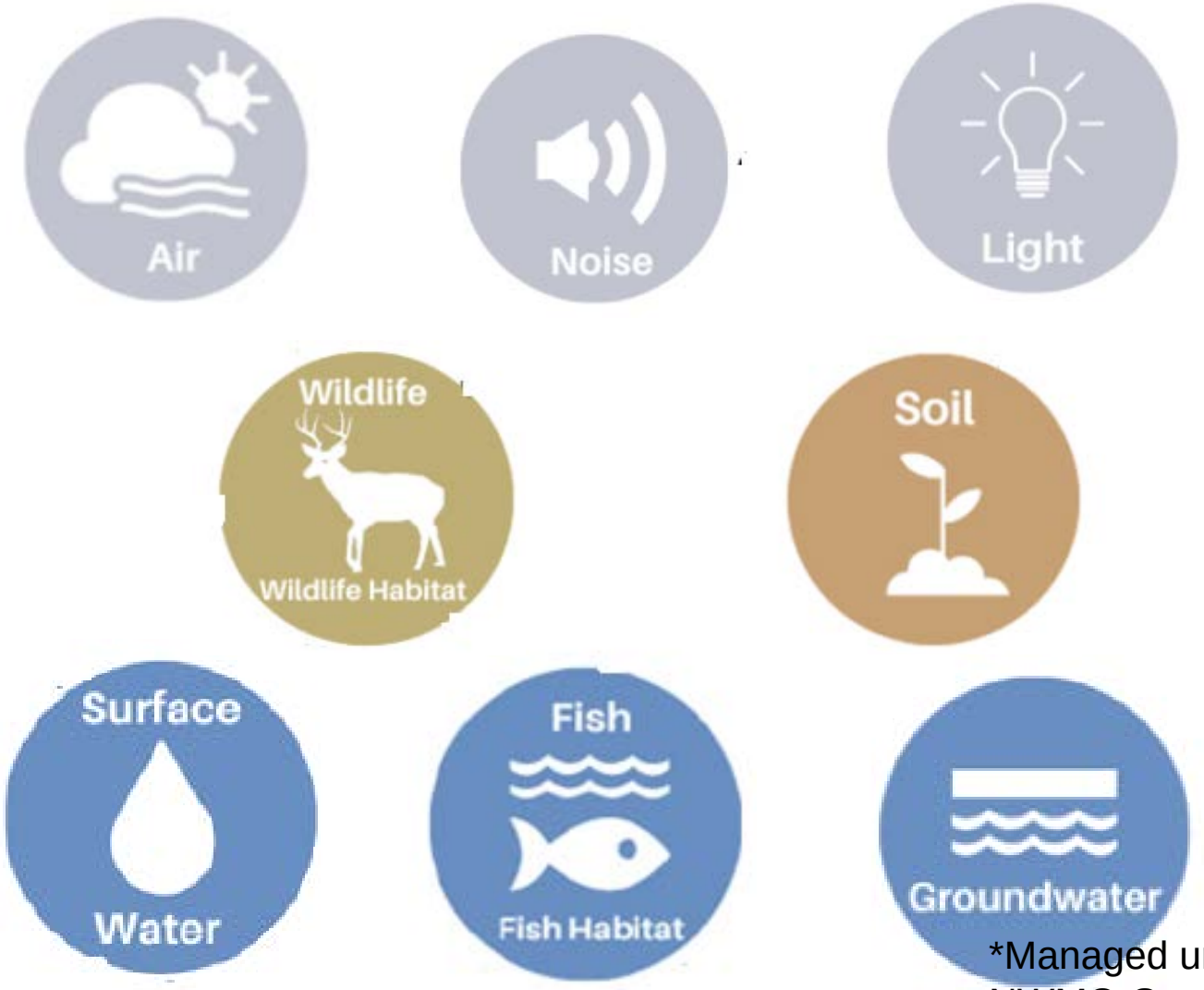
- Collect data to describe **existing conditions** of many features of the environment
- With a good understanding of baseline conditions, predictions can be made on how the project may impact the environment
- Measures can then be explored to **manage, mitigate,** and in some cases **eliminate** impacts

What are the goals of the Baseline Program?



What do we study?





*Managed under NWMO Geosciences

How do we organize the work?

	Environmental Media Baseline Studies	Biodiversity Impact Studies - Baseline
	Physical and chemical properties What's in the water, soil and air?	What species are found here? What are the habitats and ecosystems made up of?
Air		Atmospheric
Land		Tissue Chemistry Soil Quality
Water		Surface Water Quality Hydrology

Habitat Suitability and Use Mapping

Terrestrial Ecosystem Mapping

Aquatic Habitat Mapping

Environmental DNA (eDNA)

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- **Questions and Feedback**

Learn about the studies and what we found

Environmental Media Baseline Studies

2021 + 2022 + 2023

Surface Water Quality

Study Lead: SVCA

This study tracks and collects samples of the following:

- Surface water quality
- Plankton
- Sediment quality
- Benthic invertebrates

36 *Sites visited*

SURFACE WATER QUALITY

220	65	60
Water Samples	*Benthic Invertebrates Samples*	*Sediment Samples*

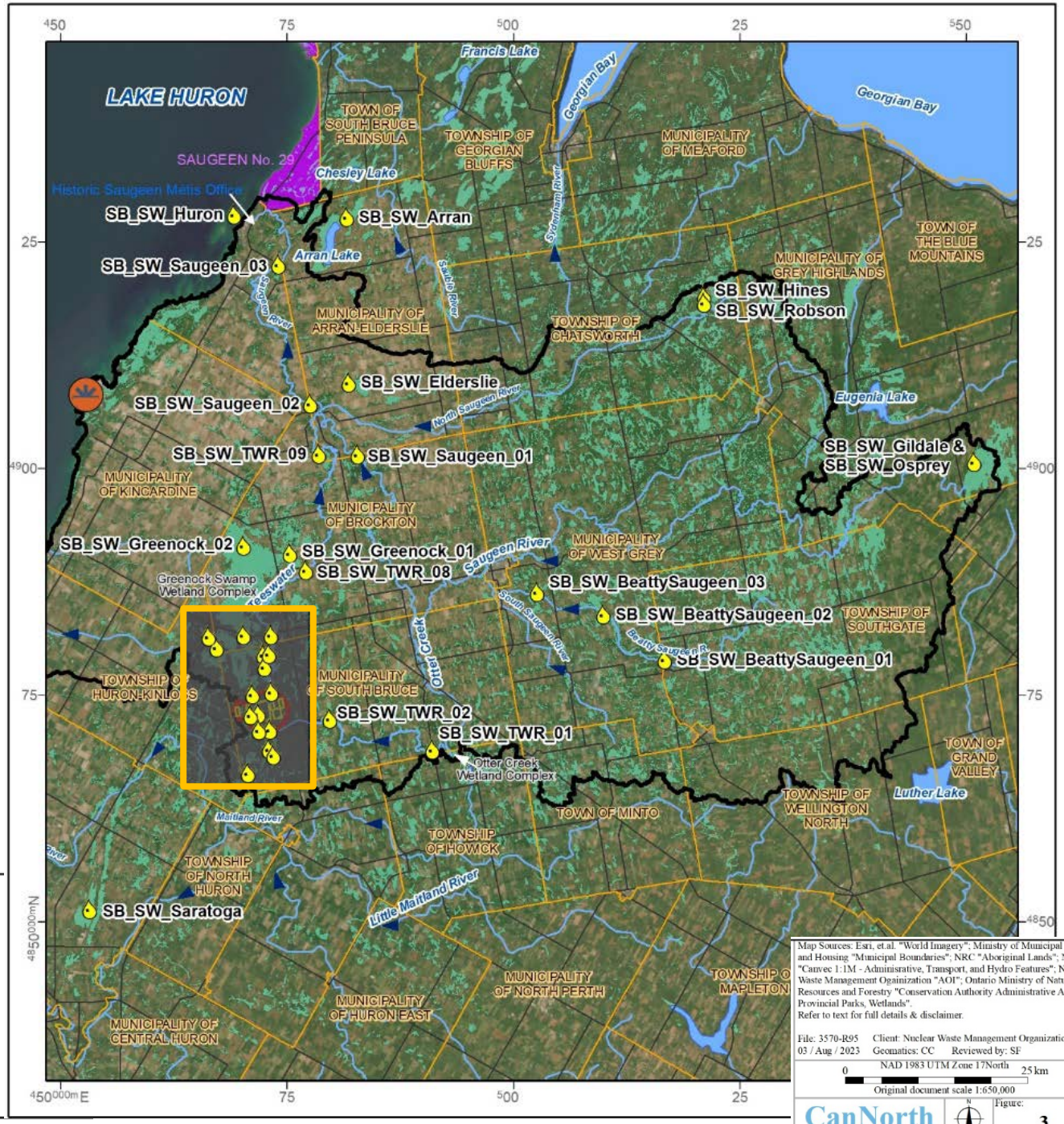
Surface Water Quality

Study Lead: North/South

Year 1 Results

What did we sample?

- 36 locations including lakes, ponds, rivers and wetlands during each season
- **Field measured** water quality parameters (limnology)
- **Laboratory analysis**: nutrient levels, bacteria, metals & trace elements, organic compounds and radionuclides



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Learn about the studies and what we found

Environmental Media Baseline Studies

Surface Water Quality

Year 1 Results

What did we find?

- Field and laboratory results show that most analyte measurements were low and below applicable water quality guidelines

- Exceptions are:
  - Nitrogen species – ammonia, nitrate
  - Total phosphorus
  - Fluoride
  - Bacterial counts
  - Manganese
  - I-129 (in Hines Lake)

What does this mean?

- These results illustrate that some parameters are found at higher levels in the study area before development of the Project, which is important to establish during the baseline period.

Learn about the studies and what we found

Environmental Media Baseline Studies

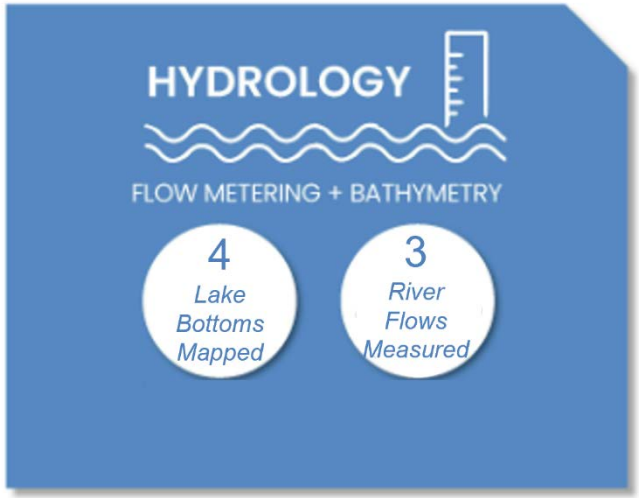
2021 + 2022 + 2023

Hydrology

Study Lead: SVCA

This study collects and tracks data on the following:

- Flow in the Teeswater River
- Water levels in lakes and wetlands
- Bottom profiles of lakes (bathymetry)
- Weather pattern (precipitation, snow depth etc.)



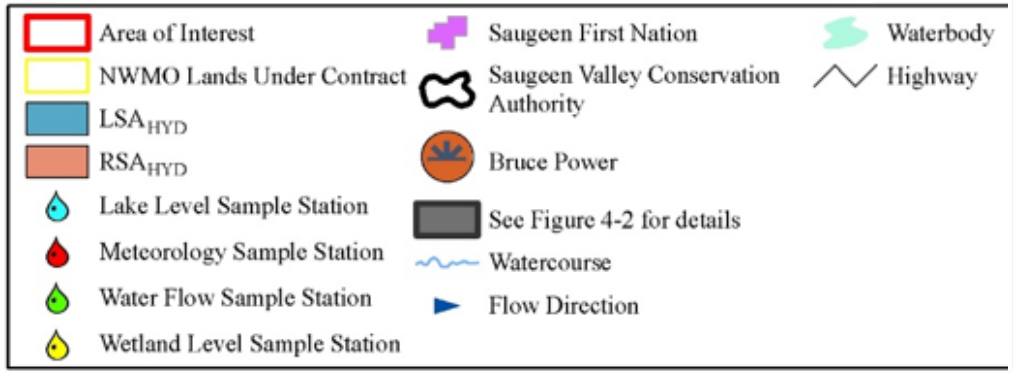
Hydrology

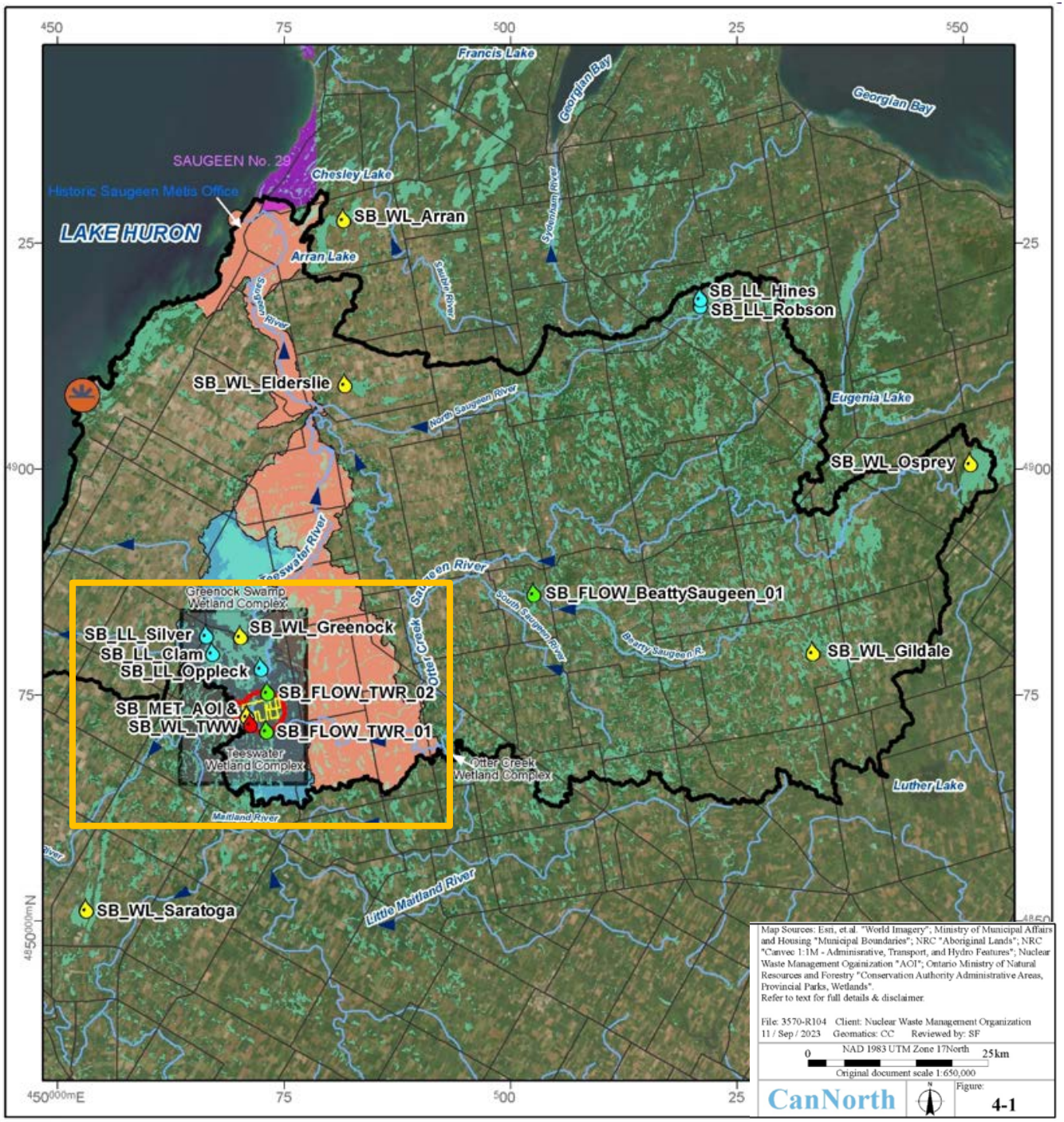
Study Lead: KGS Group

Year 1 Results

What did we measure?

- Continuous water level and **flow measurement** on the Teeswater River
- **Discrete water levels measurements** in lakes and wetlands
- **Bathymetry** survey of lakes
- Continuous **meteorological** measurement





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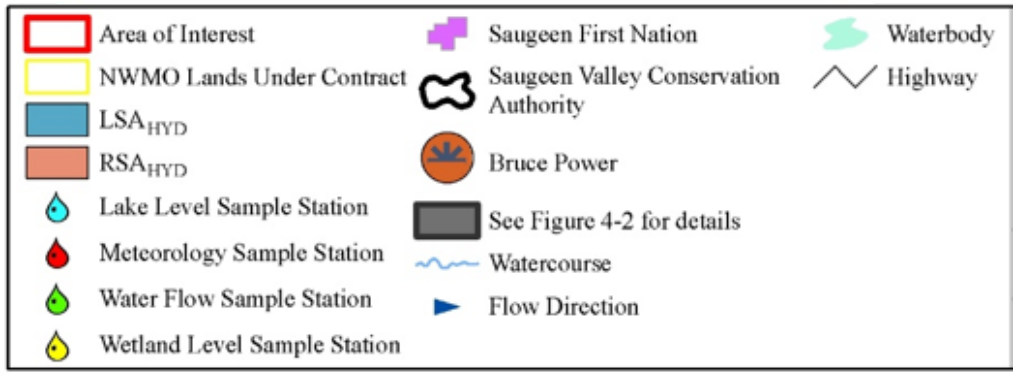
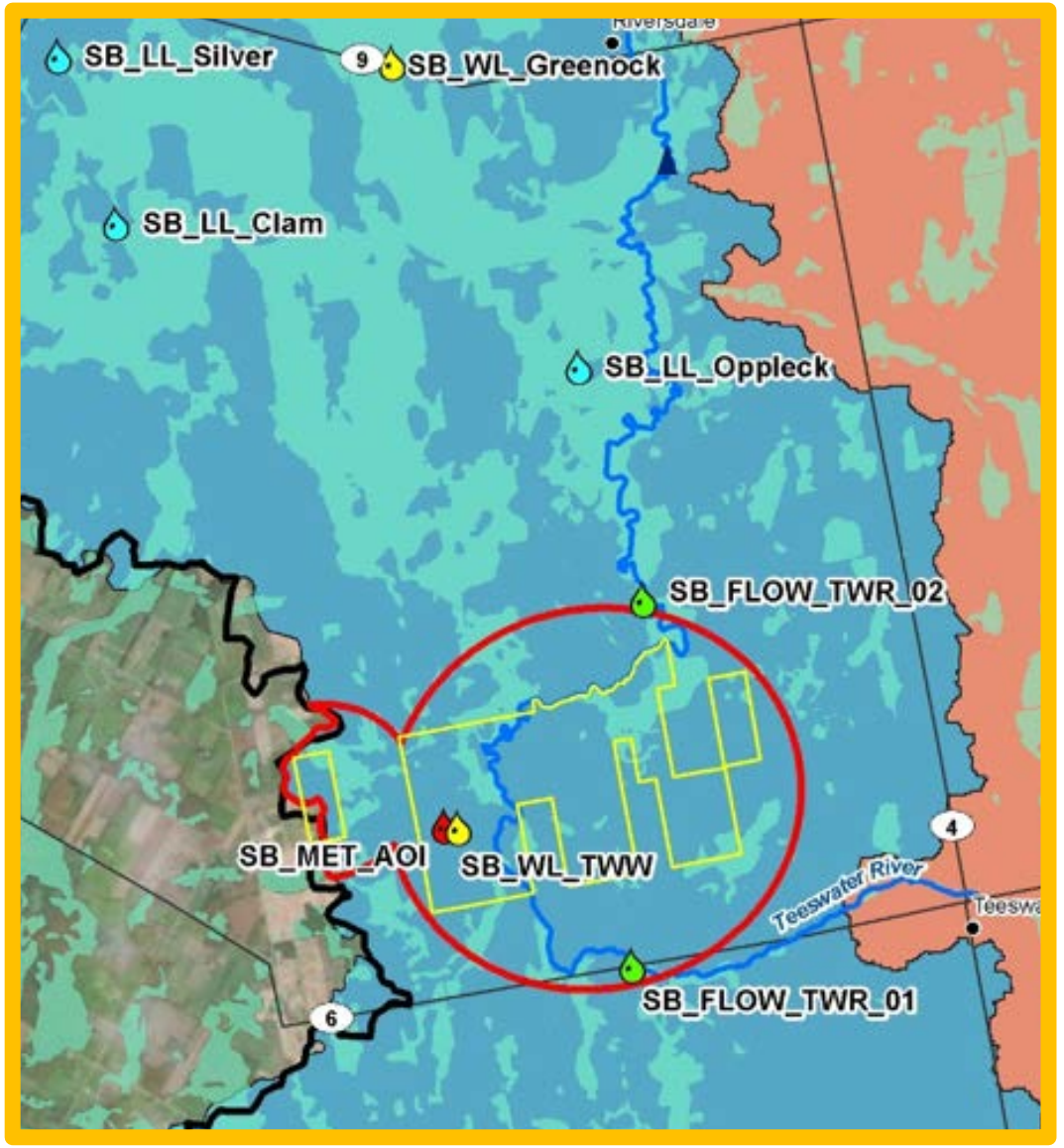




Learn about the studies and what we found

Environmental Media Baseline Studies

Hydrology

Year 1 Results

What did we find?

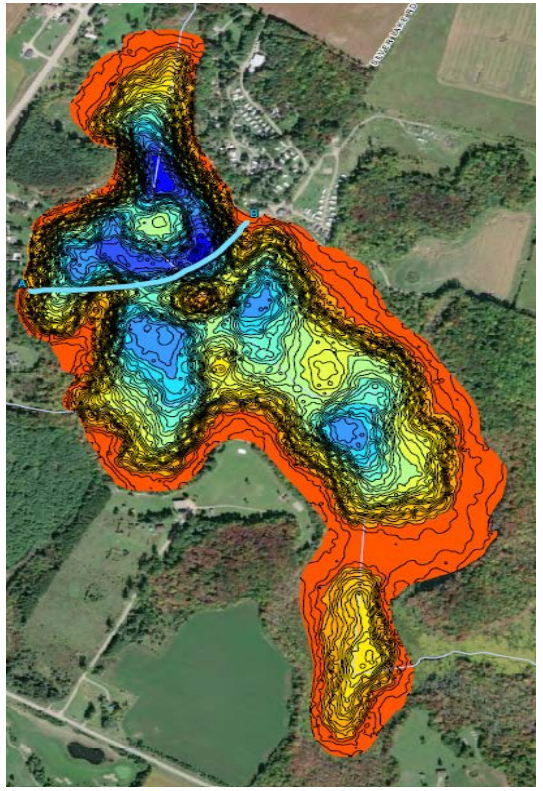
- Bathymetry of lakes
- Seasonal variation of water level in lakes
- Seasonal variation of flow on the Teeswater River
- A year of meteorological data

What are the next steps?

- Continue the monitoring program on the waterbodies and weather patterns in the study area

Depth Measurement

Velocity Measurement



Bathymetric Survey

Learn about the studies and what we found

Environmental Media Baseline Studies

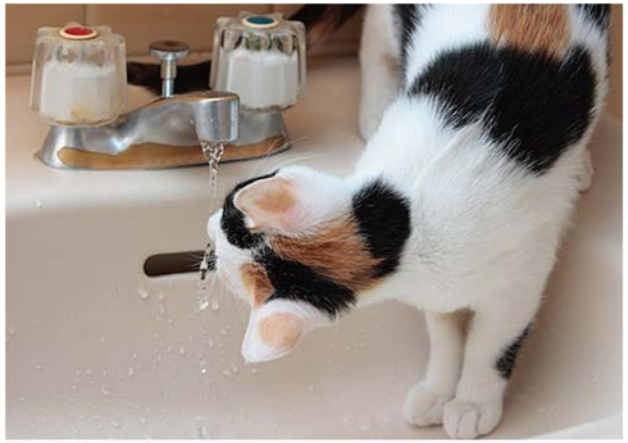
2021

Drinking Water Quality Program

Study Lead: TULLOCH

This study evaluates baseline conditions in private well drinking water sources by collecting:

- Drinking water samples from homes in AOI



Learn about the studies and what we found

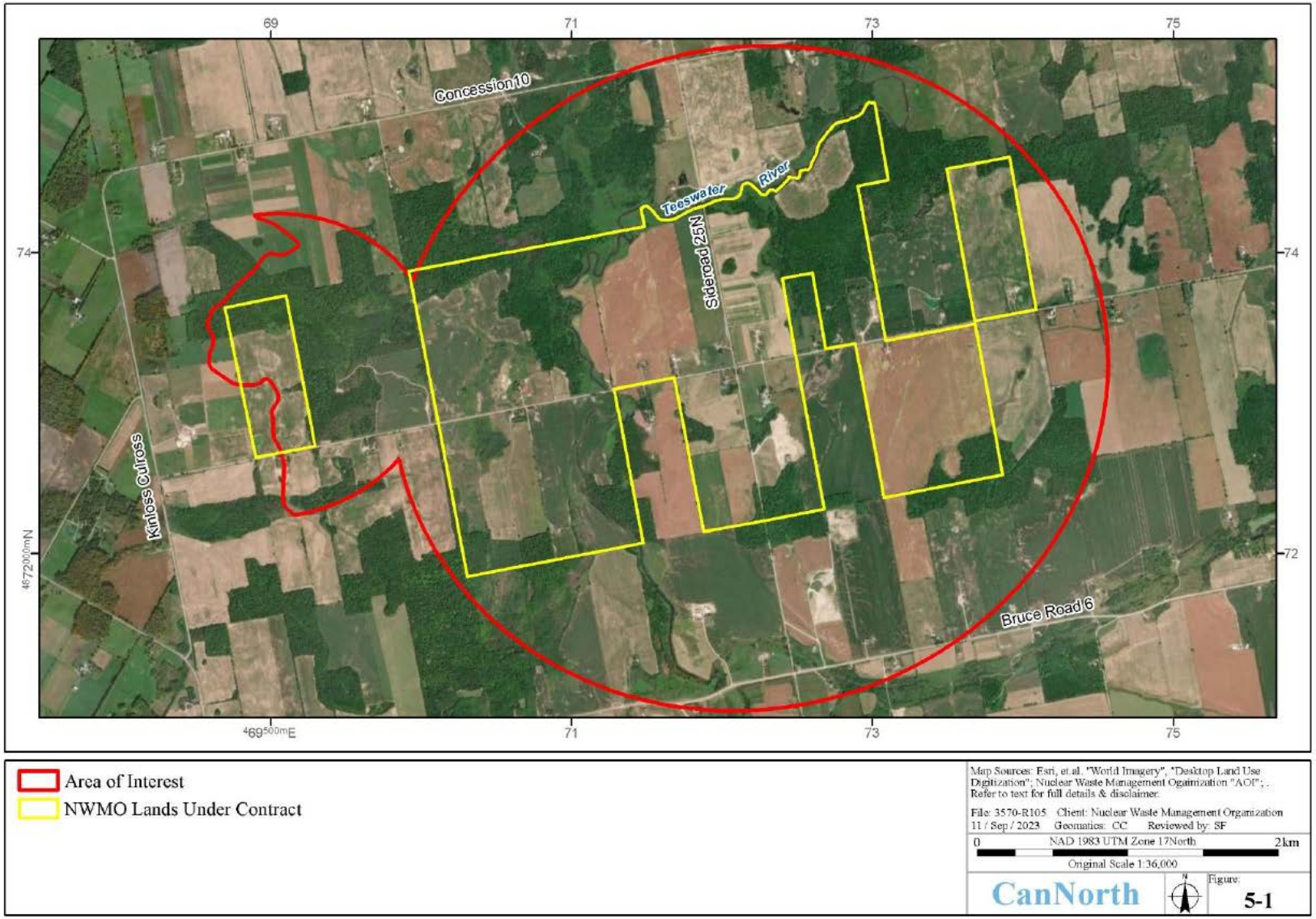
Environmental Media Baseline Studies

2021 Drinking Water Quality Program

Study Lead: TULLOCH

What did we sample?

- 10 Landowners within AOI volunteered to participate
- **Field measured** water quality parameters
- **Laboratory analysis**: pesticides and herbicides, nutrients, bacteria, PCBs, metals & trace elements, organic compounds and radionuclides



Learn about the studies and what we found

Environmental Media Baseline Studies

Drinking Water Quality Program

Year 1 Results

- Data from each well was shared with individual landowner
- All results were reported to landowners and they were referred to local health unit if they wanted to follow up on implications of the results
- Aim is to continue to sample these wells yearly for next couple of years to get baseline drinking water quality assessment

What did we find?

- Field and laboratory results show that most analyte measurements were low, below detection limits, and below applicable drinking water quality guidelines and standards
- Exceptions are:
  - Chloride
  - Sodium
  - Iron
  - Total coliforms
  - Fluoride
- Two wells had detections of radioactivity as gross beta and one of those was above the applicable water quality guideline

What does this mean?

- These results illustrate that some parameters are found at higher levels in the study area before development of the Project, which is important to establish during the baseline period.

Environmental Media Baseline Studies

Learn about the studies– planned or in progress

Soil Quality

2023

Study Lead: Tulloch

This study collected samples and recorded information about soil quality

Atmospheric

2024

Study Lead: Independent Environmental Consultants

This study collects and monitors atmospheric data, including:

- Air quality
- Noise
- Light

Tissue Chemistry

FUTURE PROGRAM

Study Lead: To be determined

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

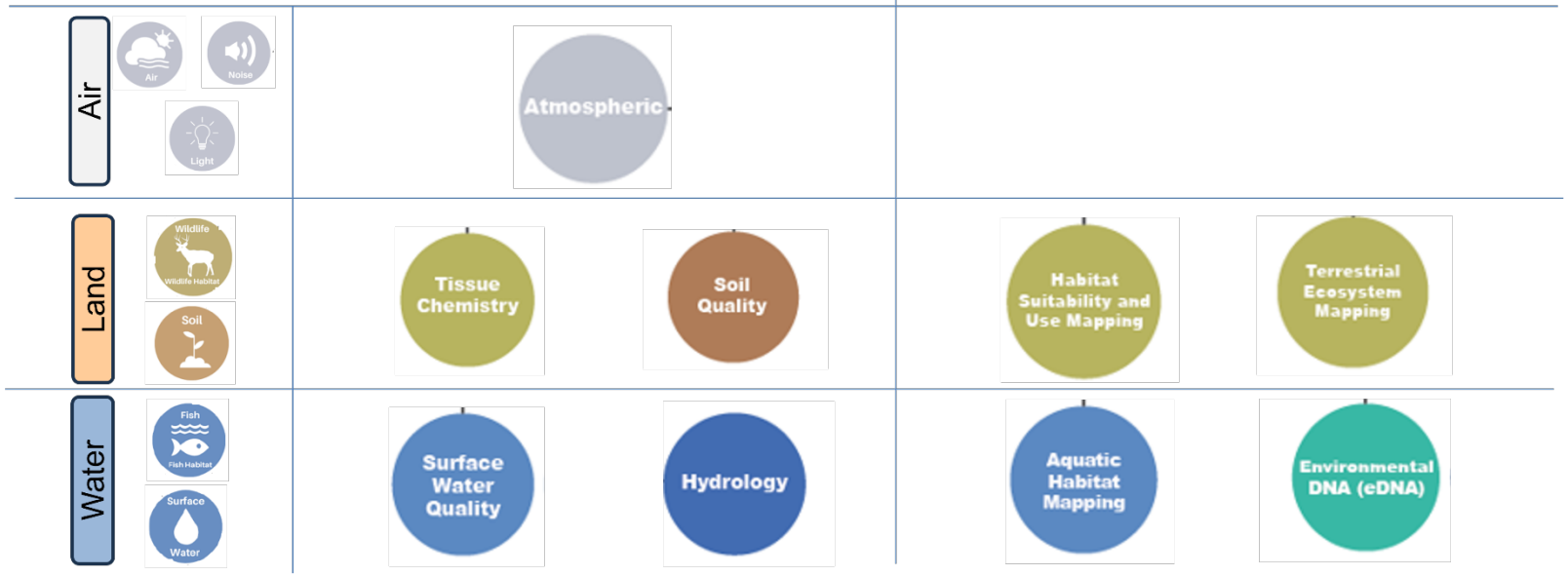
- Small and large mammals
- Vegetation (plants and berries)
- Birds and water fowl
- Fish
- Insects
- Frogs and tadpoles

Change Assessments

How are we considering potential impacts?

Change Assessments – what do they tell us?

Environmental Media Baseline Studies	Biodiversity Impact Studies - Baseline
Physical and chemical properties What's in the water, soil and air?	What species are found here? What are the habitats and ecosystems made up of?
Environmental Media Change Assessment	Biodiversity Change Assessment



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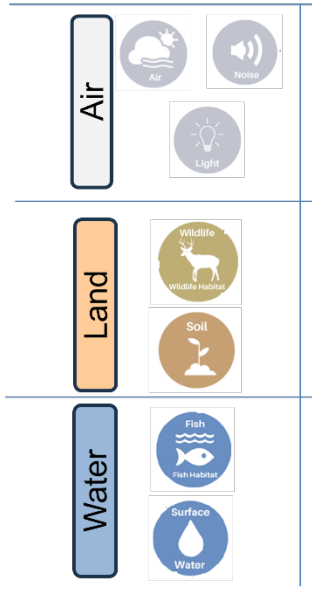
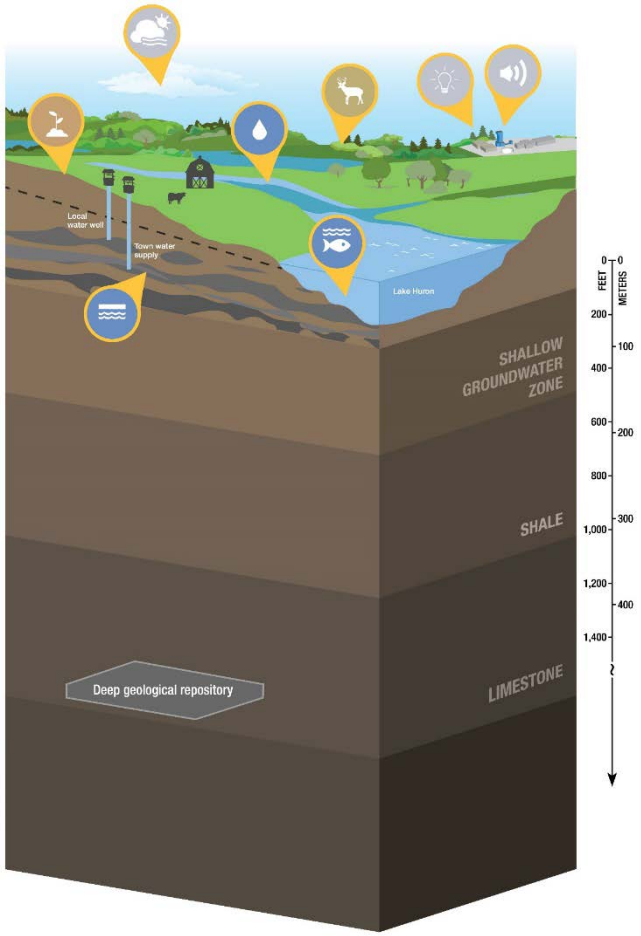


- How could the project interact with these environmental components?
- How could we mitigate this?
- What are industry best practices that could be followed?

Change Assessment Screening Process

Environmental Media

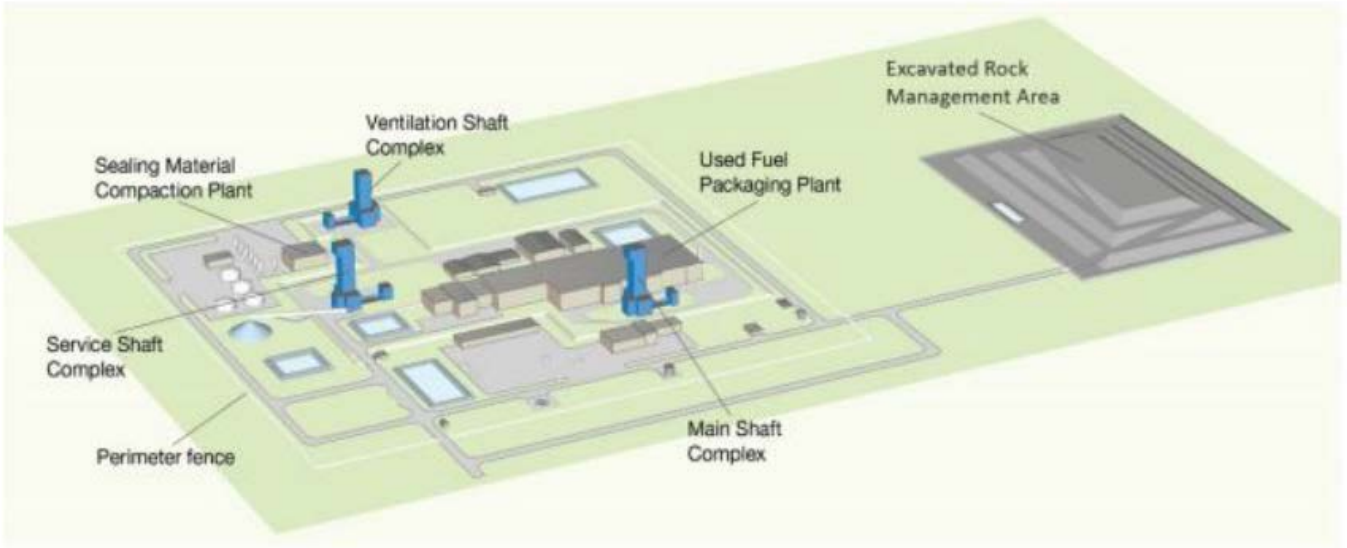
1. What are the environmental components that could be impacted?



Change Assessment Screening Process

Environmental Media

1. What are the environmental components that could be impacted?
2. What are the project activities that could interact with the environmental component?



Materials Handling

Dewatering Underground Development

Land Clearing and Grading

Altered Site Drainage

Surface Facilities

Vehicle Use/Traffic

Heating and Ventilation

Shaft Construction, Operation, and Closure

Treated Water Release

Water Supply Requirements

Excavation and Blasting

Excavated Rock Management Area

Groundwater Monitoring Wells

Change Assessment Screening Process

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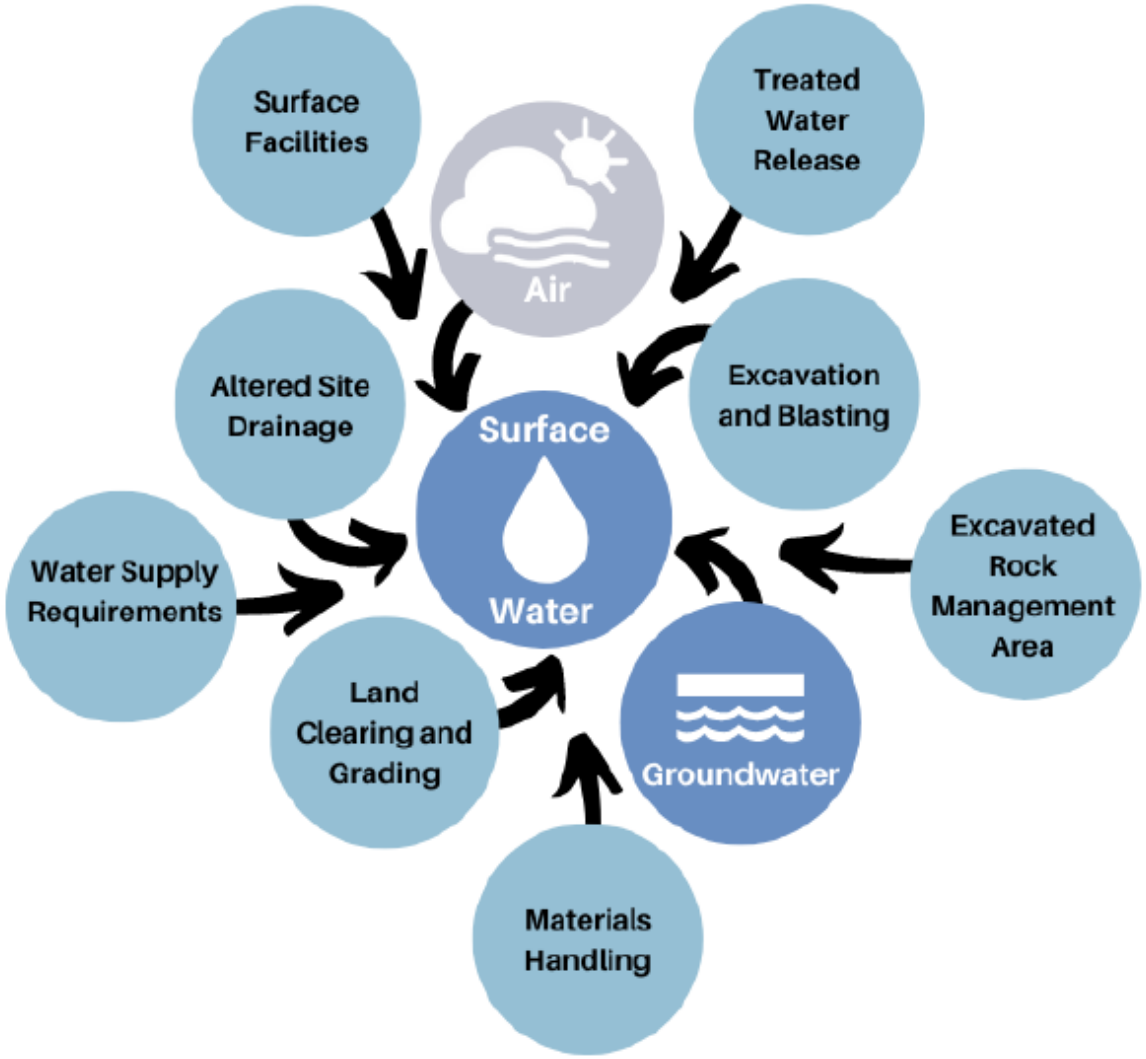
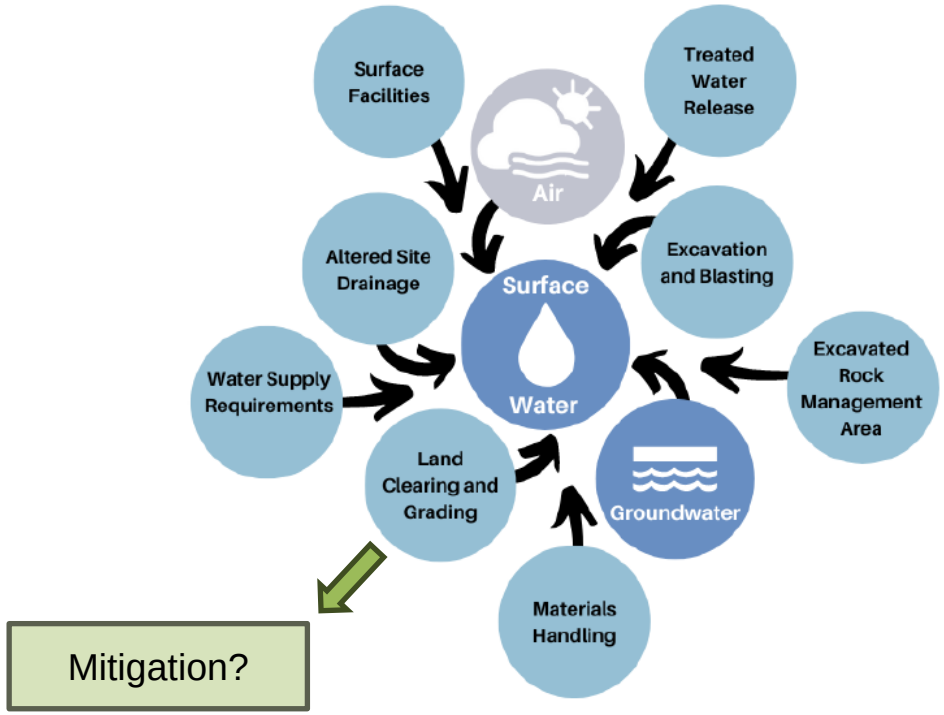


Change Assessment Screening Process

Environmental Media

1. What are the environmental components that could be impacted?
2. What are the project activities that could interact with the environmental component?
3. Are there mitigation measures that could mitigate the interactions?



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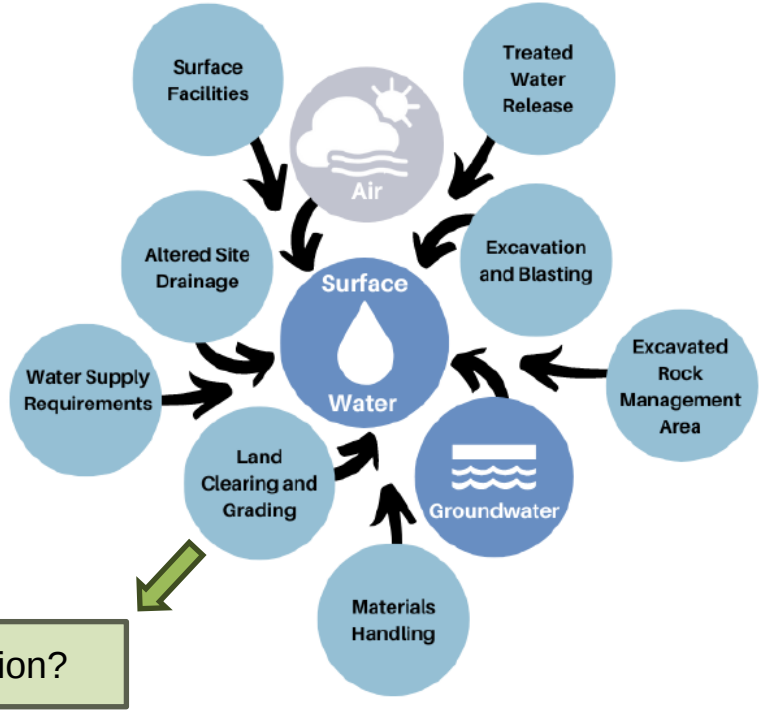


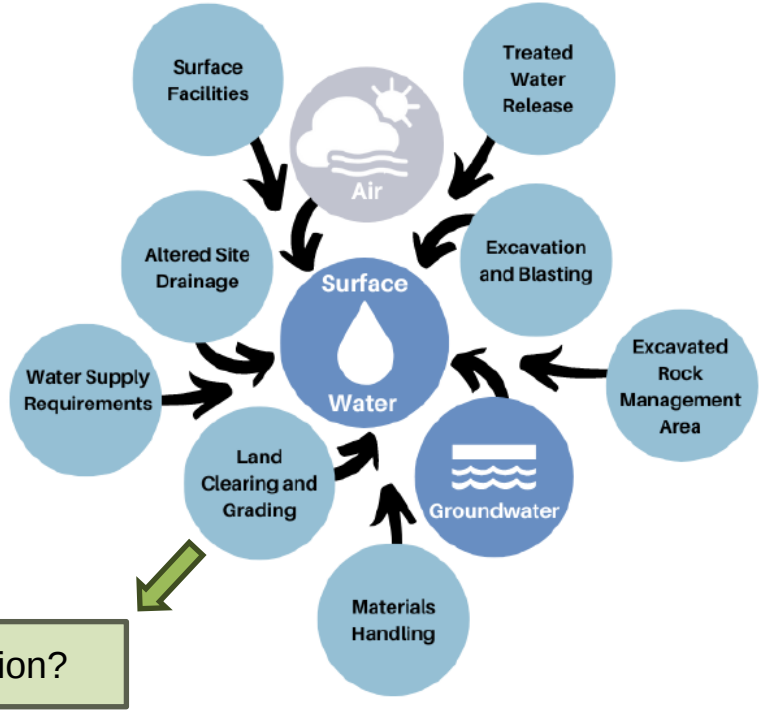
Mitigation?

- Minimize water crossing and avoid potentially sensitive habitats to the extent practical
- Install appropriate erosion and sediment control measures

Change Assessment Screening Process

Environmental Media

1. What are the environmental components that could be impacted?
2. What are the project activities that could interact with the environmental component?
3. Are there existing mitigation measures that could mitigate the interaction?
4. What are the best practices?



Mitigation?

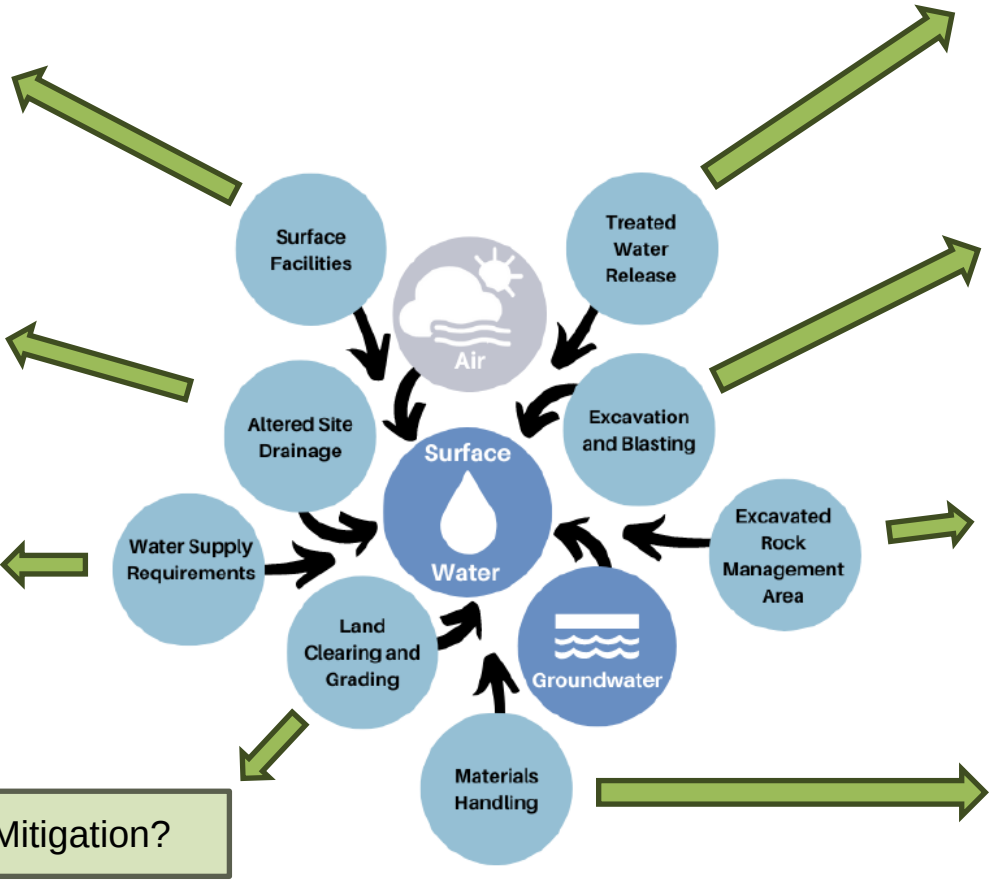
- Minimize water crossing and avoid potentially sensitive habitats to the extent practical
- Install appropriate erosion and sediment control measures.

→ Department of Fisheries and Ocean (DFO): *Measures to Protect Fish and Fish Habitat*

- Apply best management practices minimize water quality impacts to groundwater recharge areas such as reduce infiltration along access roads, storage areas and other well travelled areas where soil compaction may occur

- Design and install appropriate site drainage and water containment and conveyance structures to divert contact water for treatment

- Select water intake location to provide adequate separation from industrial activities, minimize susceptibility to flooding and erosion



- Install and operate appropriate effluent treatment system to reduce the release of contaminants
- Monitor treated effluent flow and quality and ensure water meets quality appropriate for release

- Collect, store, and divert contact water (surface and groundwater) to water treatment plant

- Locate area in an area to avoid stream and wetlands, to the extent possible
- Treat water conveyed to stormwater management pond according to applicable regulations prior to discharge

- Double containment of fuel storage tanks
- Regular equipment maintenance and checks for leaks

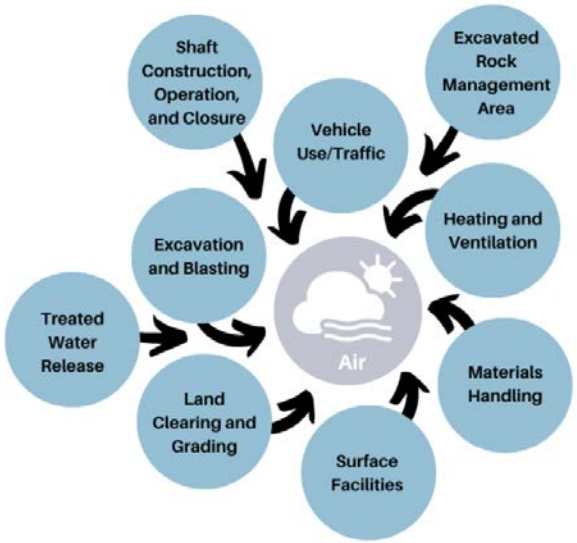
Mitigation?

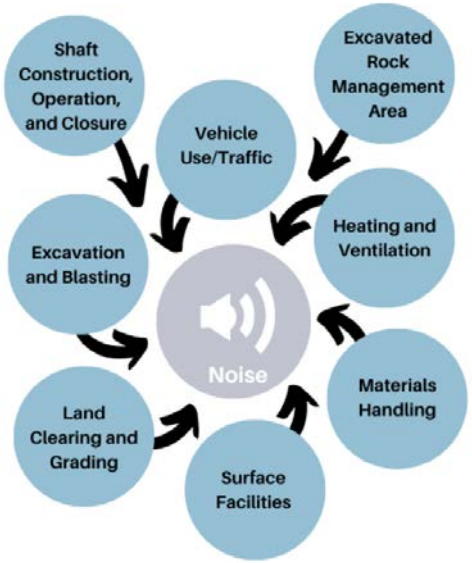
- Minimize water crossing and avoid potentially sensitive habitats to the extent practical
- Install appropriate erosion and sediment control measures.

Department of Fisheries and Ocean (DFO): *Measures to Protect Fish and Fish Habitat*

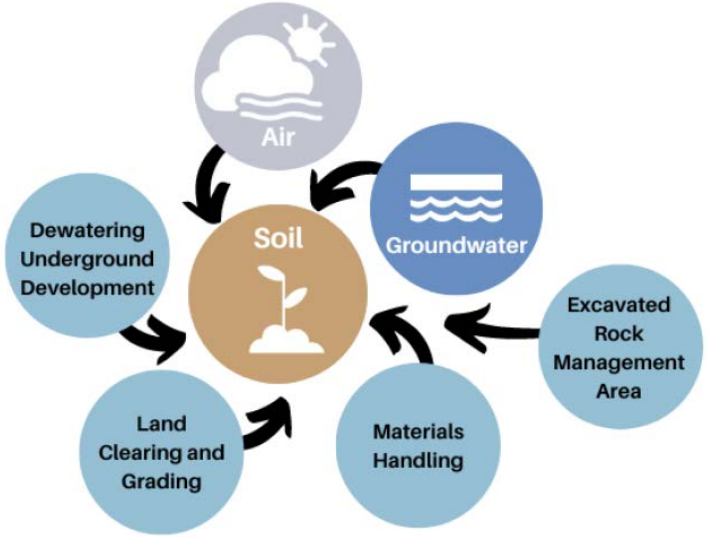
Environmental Media

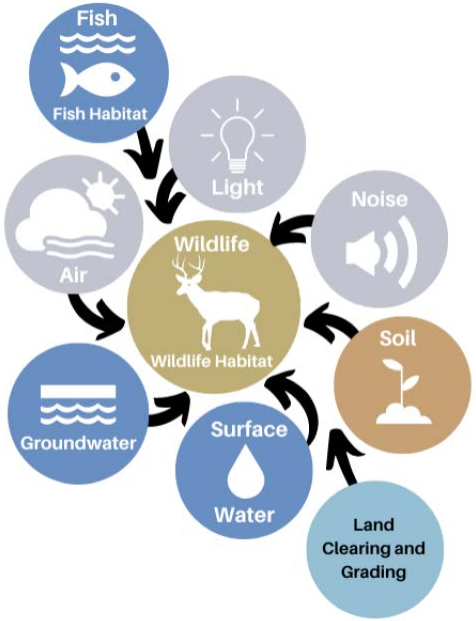
Air



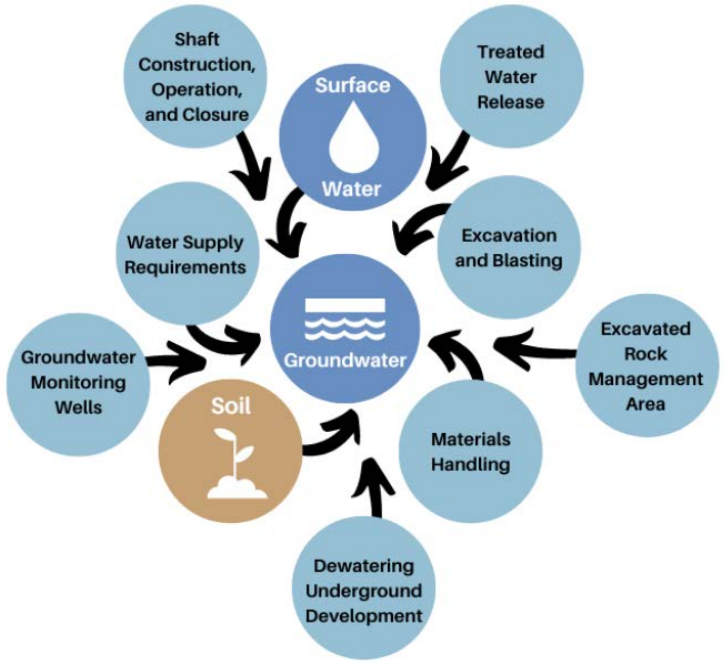


Land





Water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Surface Water
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Soil
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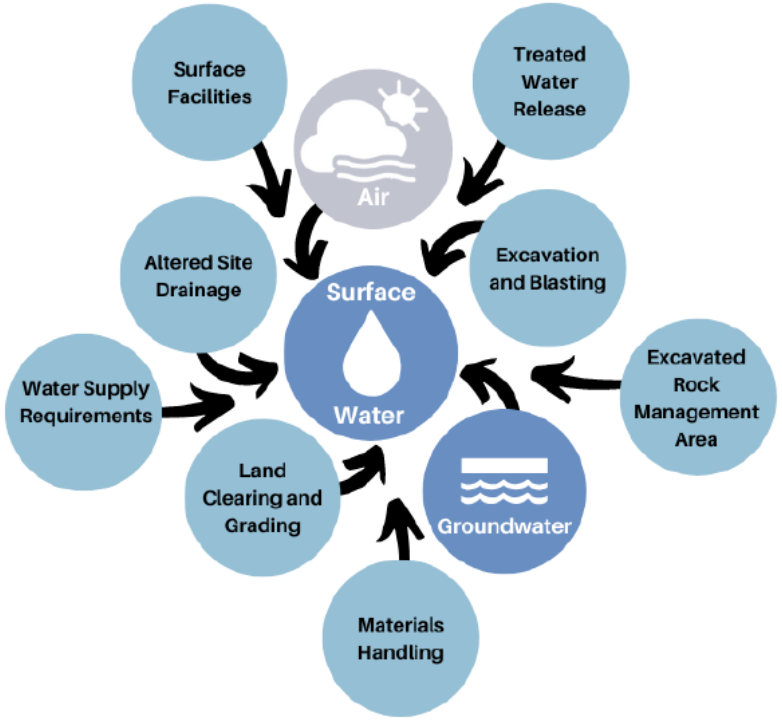
Surface Facilities
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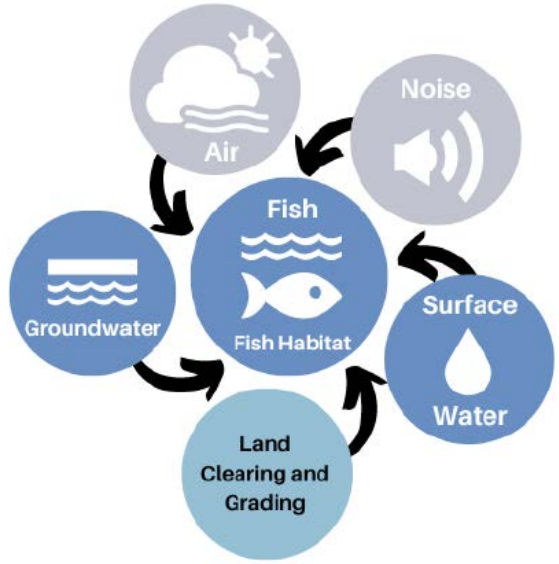
Air
Noise
Fish
Groundwater
Fish Habitat
Surface Water
Land Clearing and Grading

Environmental Media

Change Assessment – Conclusions and next steps

- We have identified possible mitigation measures for every potential impact identified
- Now we need to:
  1. Collect additional data
  2. Confirm whether an interaction will actually result from the project
  3. Characterize this interaction
  4. Select applicable mitigation measure(s)

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- **Questions and Feedback**

Biodiversity Impact Studies

Presented by:
Andrea Buckman, Ph.D., R.P.Bio
Senior Ecologist, BIS Project Manager,

Heather Bears, M.Sc., Ph.D., R.P.Bio
Director, Zoetica

October 2023

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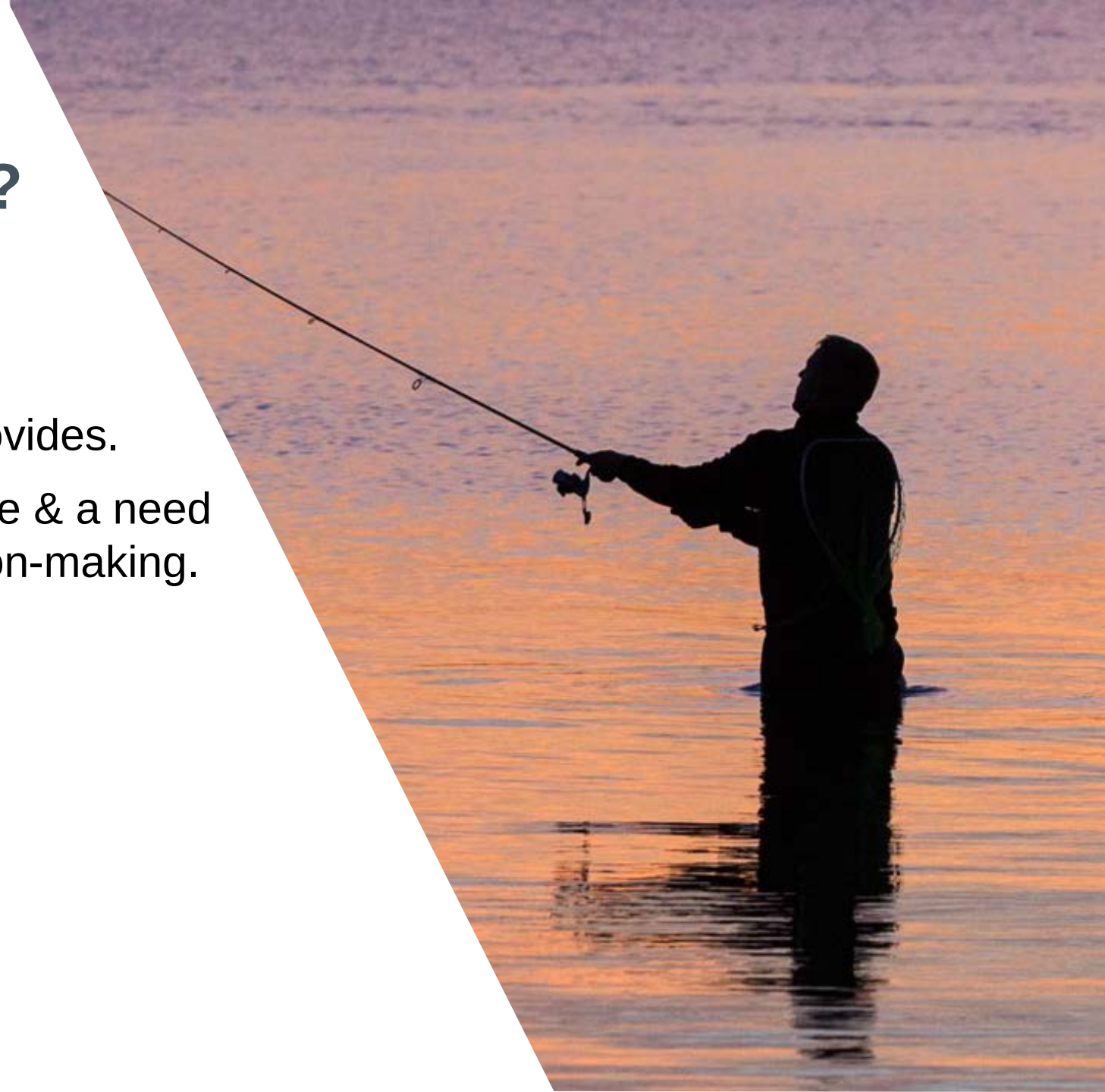
What is Biodiversity?

- Variability among life
- Forms basis of evolution
- Contribute to human well-being through:
  - Provisioning Services
  - Cultural Services
  - Regulating Services
  - Supporting Services
- Holistically considered in a biodiversity impact assessment study program

Why Study Biodiversity?

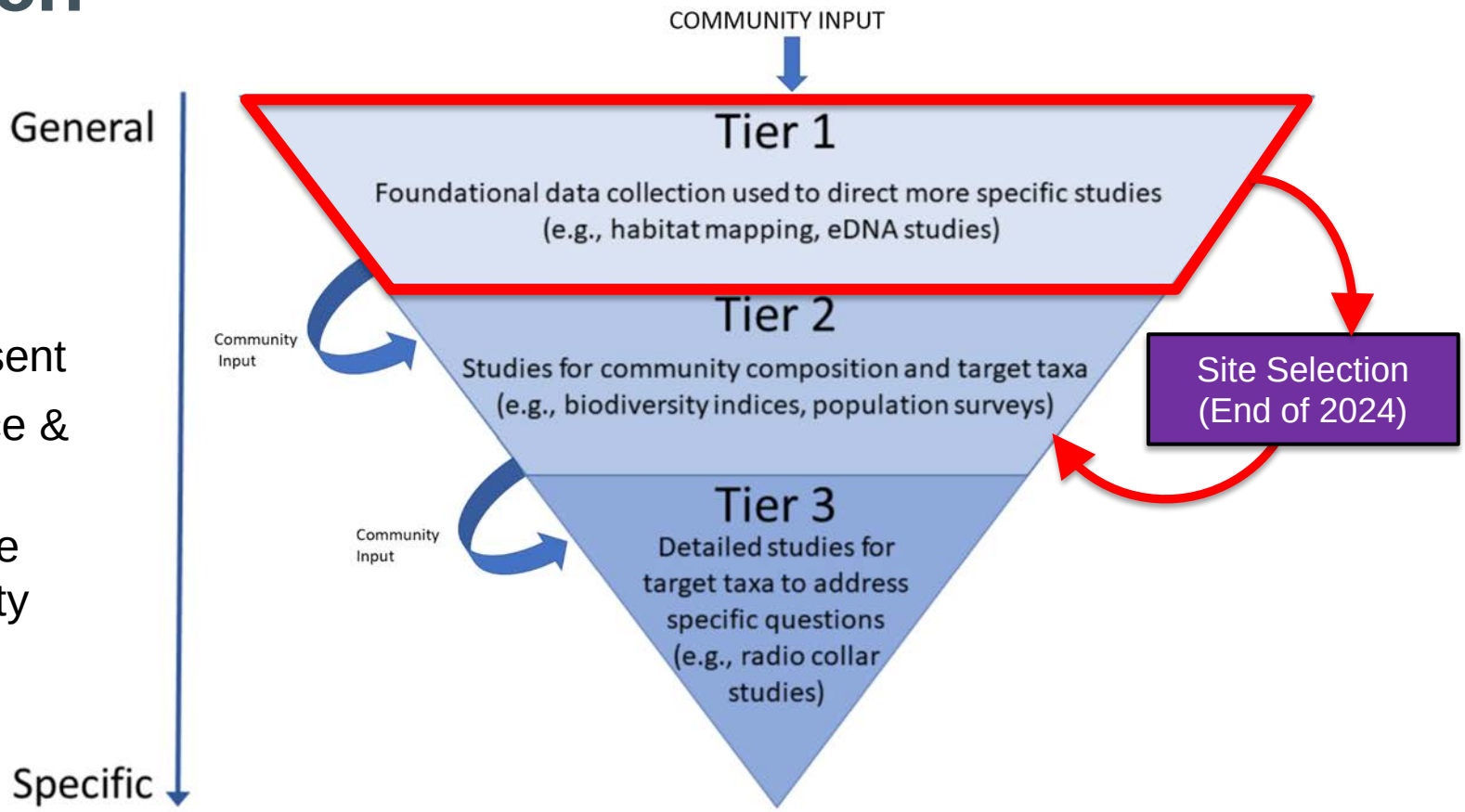
- It is the right thing to do.
- People rely on nature & services it provides.
- There are rights associated with nature & a need for government-to-government decision-making.
- It is the law.



Baseline Approach

Data are collected to:

- Understand biodiversity at present
- Enable site selection, avoidance & mitigation
- Make predictions about how the Project might impact biodiversity
- To track changes over time



Study Areas

Area of Interest

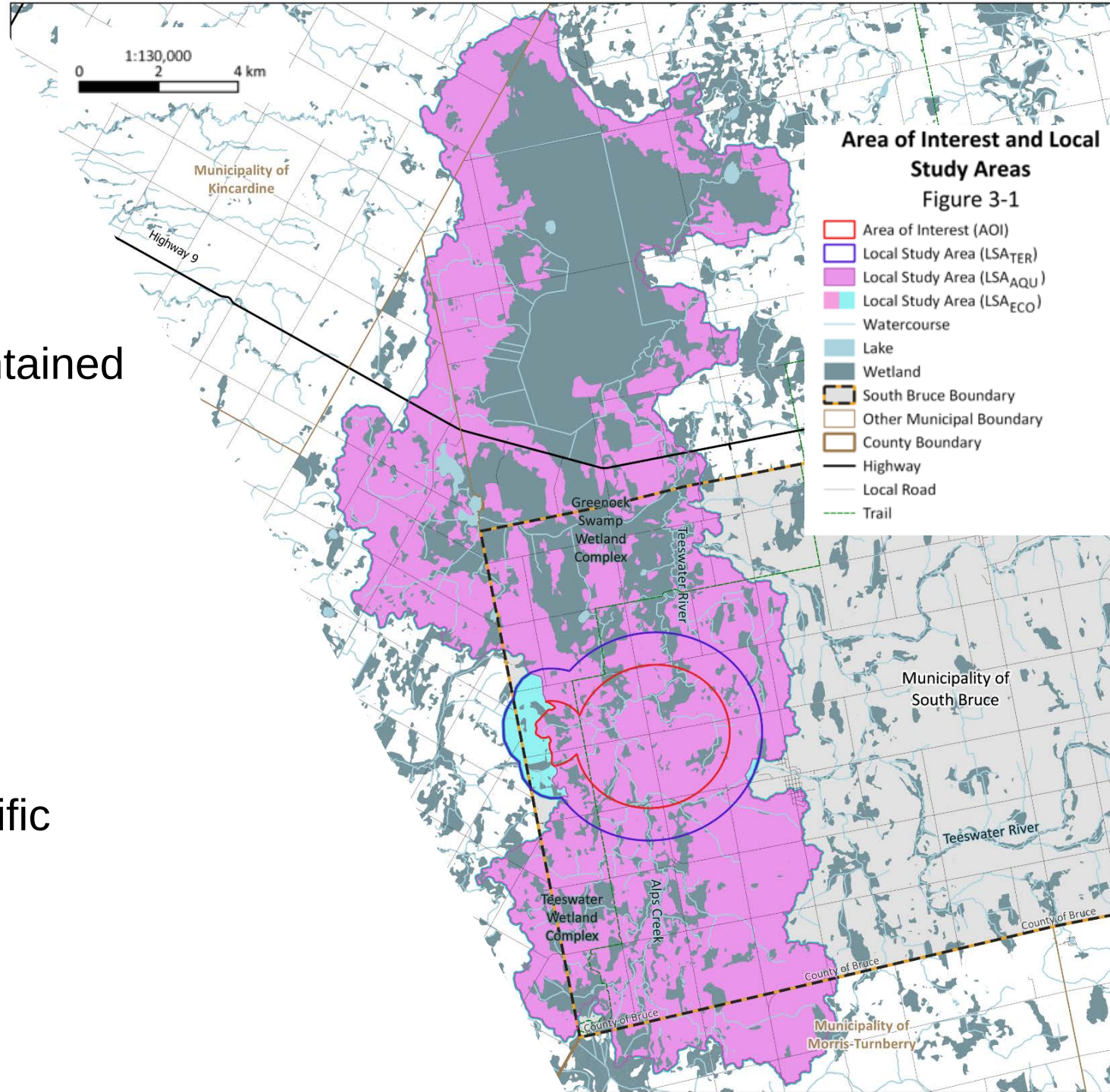
- Area within which infrastructure contained

Local Study Areas

- Terrestrial biodiversity
- Aquatic & semi-aquatic species
- Ecosystem function & services

Regional Study Areas

- Terrestrial – biodiversity value-specific
- Aquatic & semi-aquatic biodiversity
- Ecosystem function & services



Tier 1 Studies

- Examining Existing Data
- Terrestrial Ecosystem Mapping
- Significant Wildlife Habitat
- Aquatic Habitat Mapping
- Environmental DNA

Overarching Goals of Biodiversity Studies:

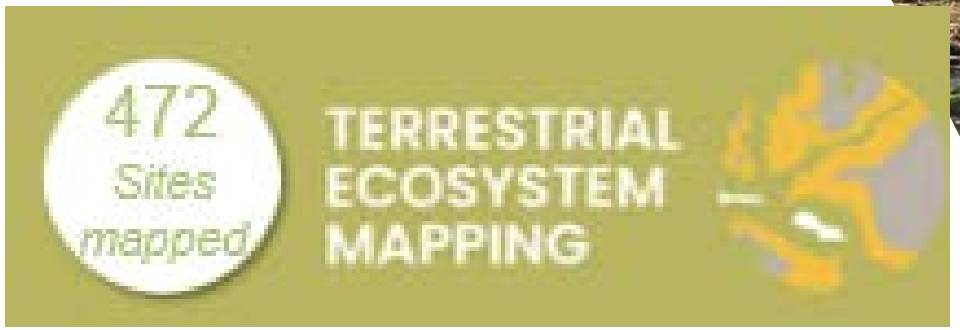
- Characterize the areas of importance for biodiversity to protect species and habitats from development.

Terrestrial Ecosystem Mapping

Purpose:

- Quantify & understand distribution of important habitats for avoidance and mitigation.

Results so far:



- identified important habitat in the AOI
  - rare habitat
  - wetland & riparian
  - wildlife habitat features
- Disturbance evident at most sites in the AOI

Significant Wildlife Habitat

Purpose:

- Identify candidate & confirmed Significant Wildlife Habitat (SWH) for avoidance & mitigation

Results so far:

- Searched desk-based data for confirmed SWH
- Identified candidate SWH that may become confirmed
    - mapped existing species observations & habitat data
    - Field identification of candidate SWH at all TEM plots

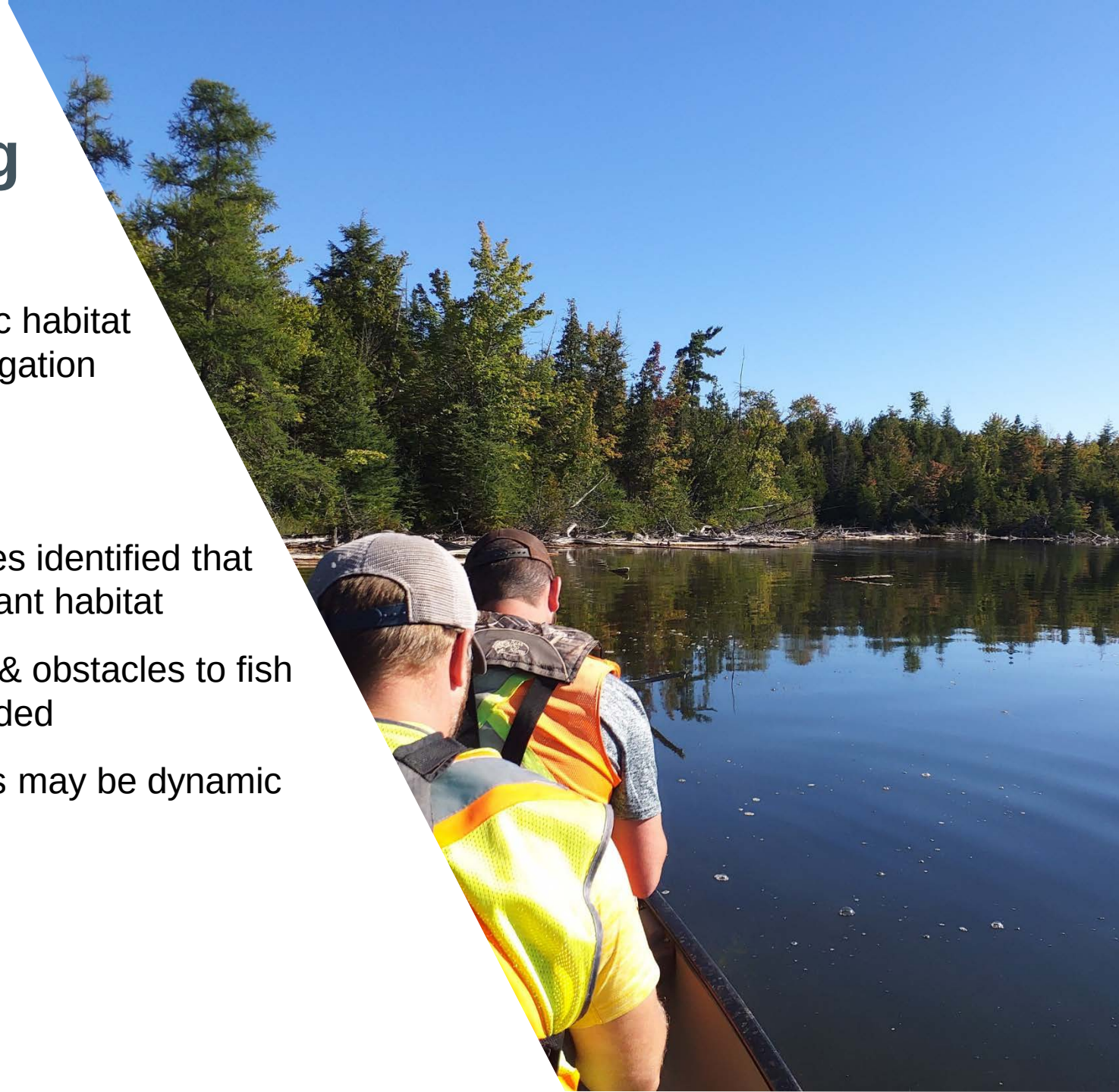
Aquatic Habitat Mapping

Purpose:

- Characterize presence & distribution of aquatic habitat & Identify important habitat for avoidance & mitigation

Results so far:

- Aquatic features identified that may be important habitat
- Many barriers & obstacles to fish passage recorded
- Many wetlands may be dynamic

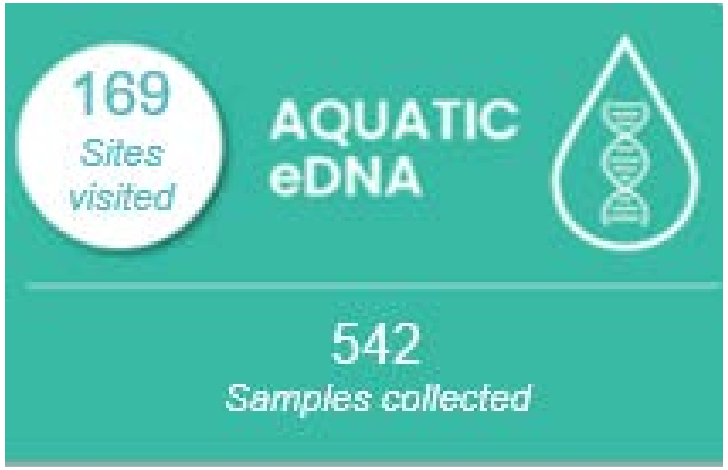


Environmental DNA

Purpose:

- First step in identifying species & biodiversity ‘hot spots’ that may require further study for avoidance & mitigation

- Results so far:



- 438 species detections (AOI)
- 3 species of conservation concern in AOI
- 4 invasive invertebrate species detected in AOI

Note: Additional seasonal sampling and confirmation of detections needed

Next Steps

1. Site selection (end of 2024)
2. Proceed with Tier 2 studies at selected site

TIER 2

3. Iterative Baseline Reports and Effects Assessment

BIS Change Assessment

Presented by:
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Andrea Buckman, Ph.D., R.P. Bio
Senior Ecologist, BIS Project Manager

October 2023

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NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

Change Assessment

Purpose of the Change Assessment

1. Potential Project x Biodiversity Interactions
    a. Species of Interest
    b. Important Habitat
    c. Wetland and Riparian Areas
    d. Ecosystem Services of Importance
2. Potential Mitigation via the Mitigation Hierarchy
3. Key Areas in AOI to avoid & areas that require mitigation

What do we know right now?

- Desk-based Data
- Field Data
- Project Information

How can we use the info. to ⬇ impacts early in the process?

- Mitigation Hierarchy
- Best Practices
- Further Study

CHANGE ASSESSMENT

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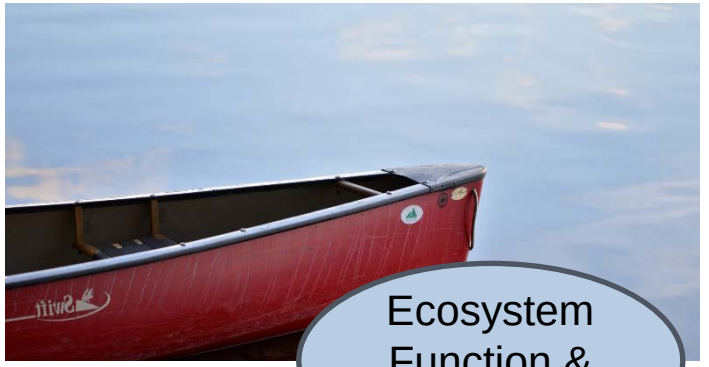
Change Assessment Screening Process

1. What are the environmental components that could be impacted?

Species of interest

Important habitat

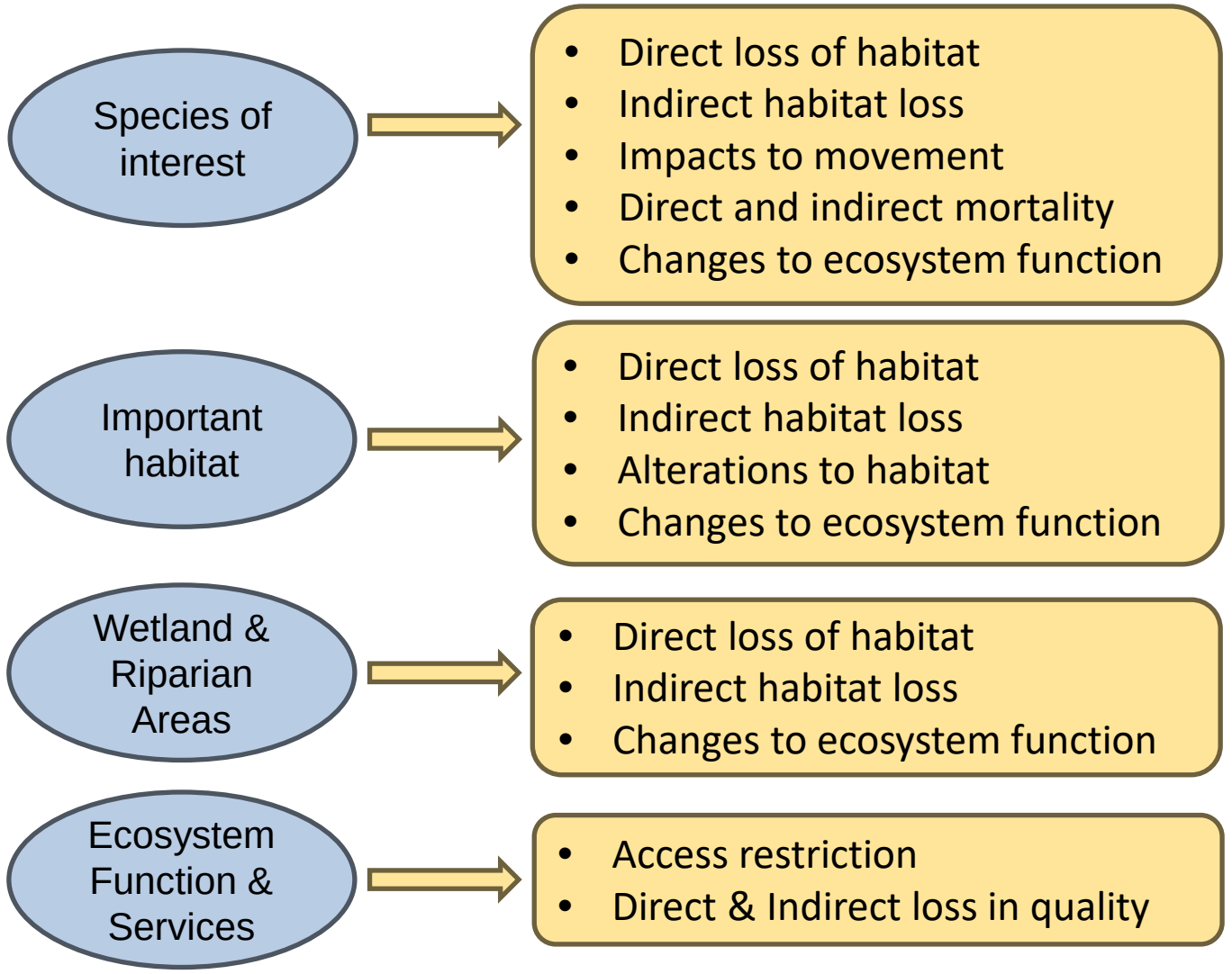
Wetland/ Riparian areas



Ecosystem Function & Services

Change Assessment Screening Process

1. What are the environmental components that could be impacted?
2. What are the project activities that could interact with the environmental component?



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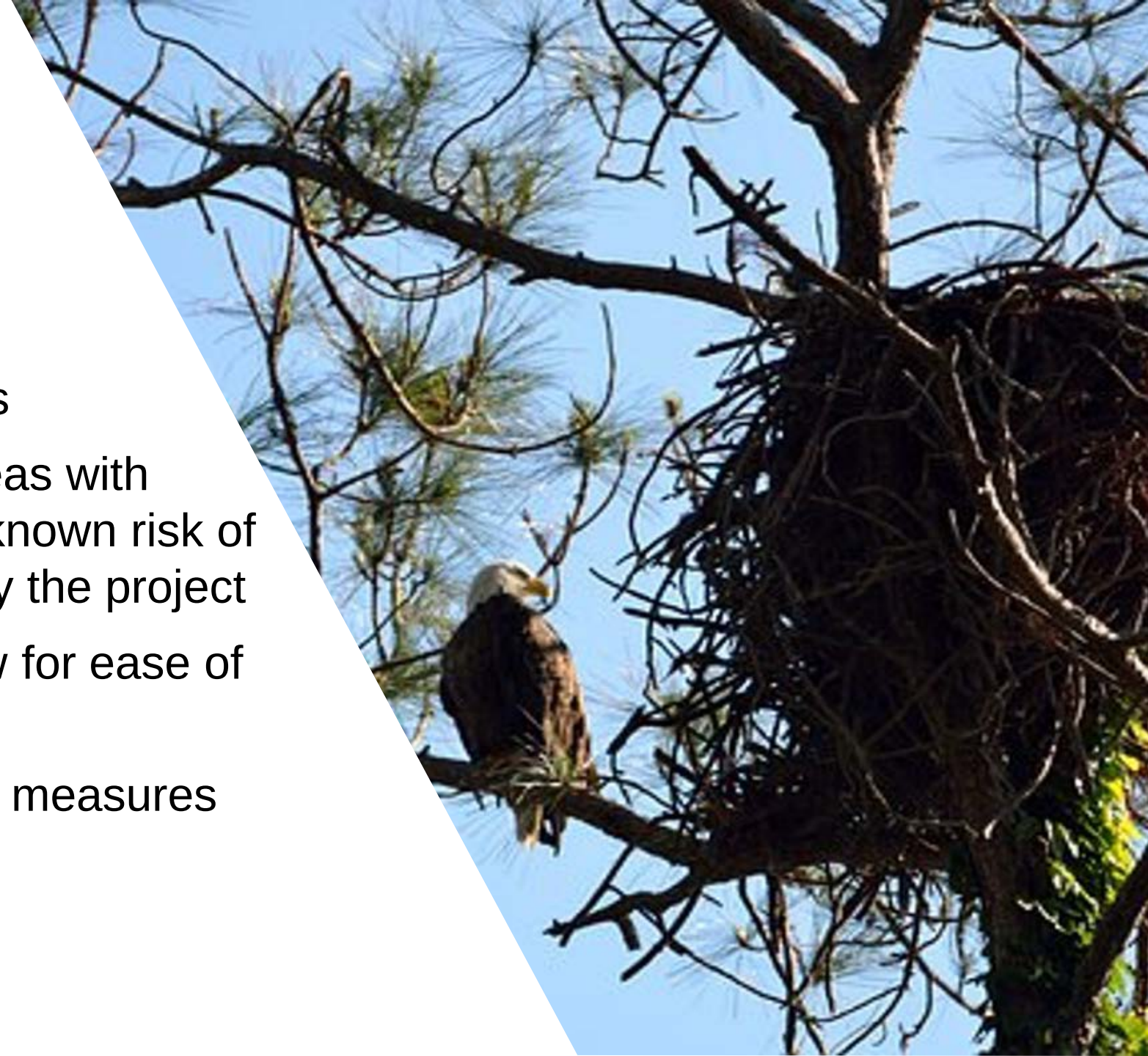
Methods

1. Compiled available data
2. Applied Best Practice buffers
3. Produced maps showing areas with greatest to lowest currently known risk of being negatively impacted by the project
4. Produced final maps to allow for ease of relaying information
5. Identified possible mitigation measures



Methods: Area Sensitivity Ranking

- Mapping of biodiversity sensitivities (colour scheme) follows the general approach below:

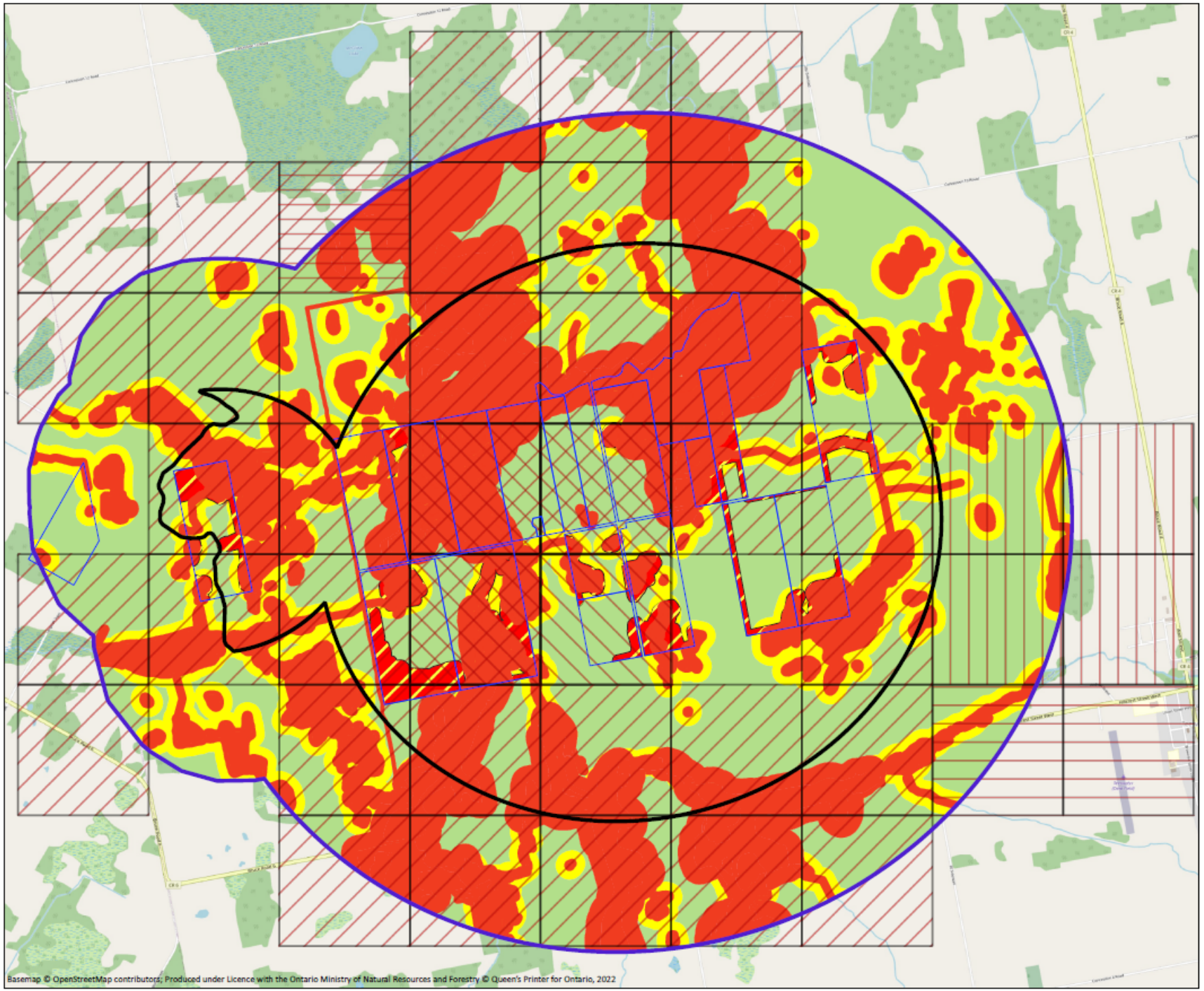
L • Least Mitigation Required

M • Low Mitigation Required

H • High Mitigation Required

Development in sensitive zones may still be possible but potential for increasing mitigation (following mitigation hierarchy) required moving from green to red zones.

Results



NWMO Biodiversity Impact Studies

Avoidance Zone Considerations Map

Figure 6-1a

- Area of Interest (AOI)
- Local Study Area (LSA_{TER})
- NWMO Purchased or Optioned Properties

Potential Development Constraints

- Red Zone: High Mitigation
  - ANSI Life Science (120 m buffer)
  - Deer Overwintering Area
  - Riparian (15 and 30 m buffer)
  - Provincially Significant Wetland (120 m buffer)
  - Rainbow Mussel Critical Habitat (15 m buffer)
  - Trail (15 m buffer)
- Potential Red Zone:
  - Bat Forage Habitat*
- Yellow Zone: Low Mitigation
  - Riparian (100 m buffer)
- Green Zone: Less Mitigation
  - No biodiversity x APM Project interactions identified to date.

Additional Potential Red Zone**

- Beaked Spikerush NHIC Occurrence
- Snapping Turtle NHIC Occurrence
- Great Blue Heron Nesting Colony (300 m buffer)
- Suspected Bat Roost (60 m buffer)

* Bat Forage Habitat layer is only potential critical habitat on NWMO owned or optioned lands. Recovery strategy around the habitat has not yet been finalized.

**Exact location of data cannot be shown on map due to data sensitivity, and therefore are masked with a 1 km grid.

1:28,000

0 0.5 1 km

ZOETICA

Inset Basemap © OpenStreetMap contributors

Data received from:
Ontario GeoHub -- Areas of Natural and Scientific Interest (NDMNRF); OHN Waterbody (NDMNRF); OHN Watercourse (NDMNRF); Wetlands (NDMNRF)
NWMO -- AOI; NHIC WCA Observations (NDMNRF); Non-Sensitive Wildlife Activity Area (NDMNRF); NHIC Species Occurences (NDMNRF); NWMO Purchased or Optioned Properties; Trail Segments (NDMNRF)
Critical Habitat for Rainbow data were created based on the federal recovery strategy

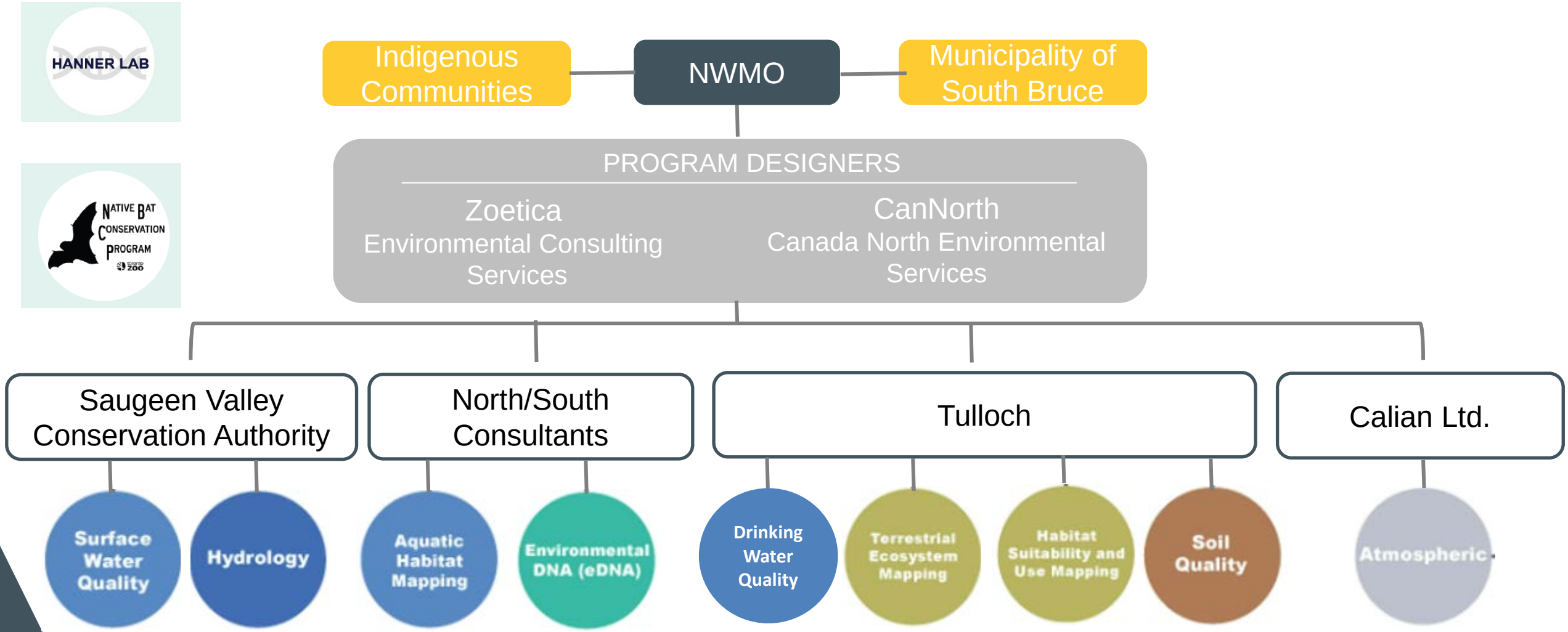
Project CRS: NAD83 / UTM zone 17N

Author: AH	Reviewed by: CC	Approved by: HB
November 15, 2022	Map ID: NWMO_BIS_A090a_SB	

Conclusions

- Change assessment useful tool for relaying information early
- Allowed for engaging in the first step of the mitigation hierarchy
- Allows for the identification of accepted mitigations
- More work needed & additional data may change conclusions
- Confirm Biodiversity & Project Interactions as part of Impact Assessment

Acknowledgments – the Baseline Monitoring Team:



Thank you.

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Technical Peer Review

- Peer review process has been continual and collaborative
- Peer review activities for EMBP and Biodiversity included:
  - Peer review of work plans for field activities
  - Field observations for the following field activities:
    - Aquatic habitat mapping and eDNA
    - Sediment and benthic sampling
    - Surface water sampling
    - Surficial soil and private well sampling
  - Peer review of the following reports:
    - Environmental Media Baseline Program Design
    - Biodiversity Impact Studies Best Practices and Preferred Approaches
    - Environmental Media Baseline Report – Year 1
    - Environmental Media Change Assessment Report
    - Biodiversity Baseline Report
    - Biodiversity Change Assessment Report
- GHD will be preparing a Peer Review Summary Report