



Addressing Riverbank Erosion in Fort Good Hope

A case study

Presented at the Riverbank Erosion Workshop

December 3, 2025

Presented by:

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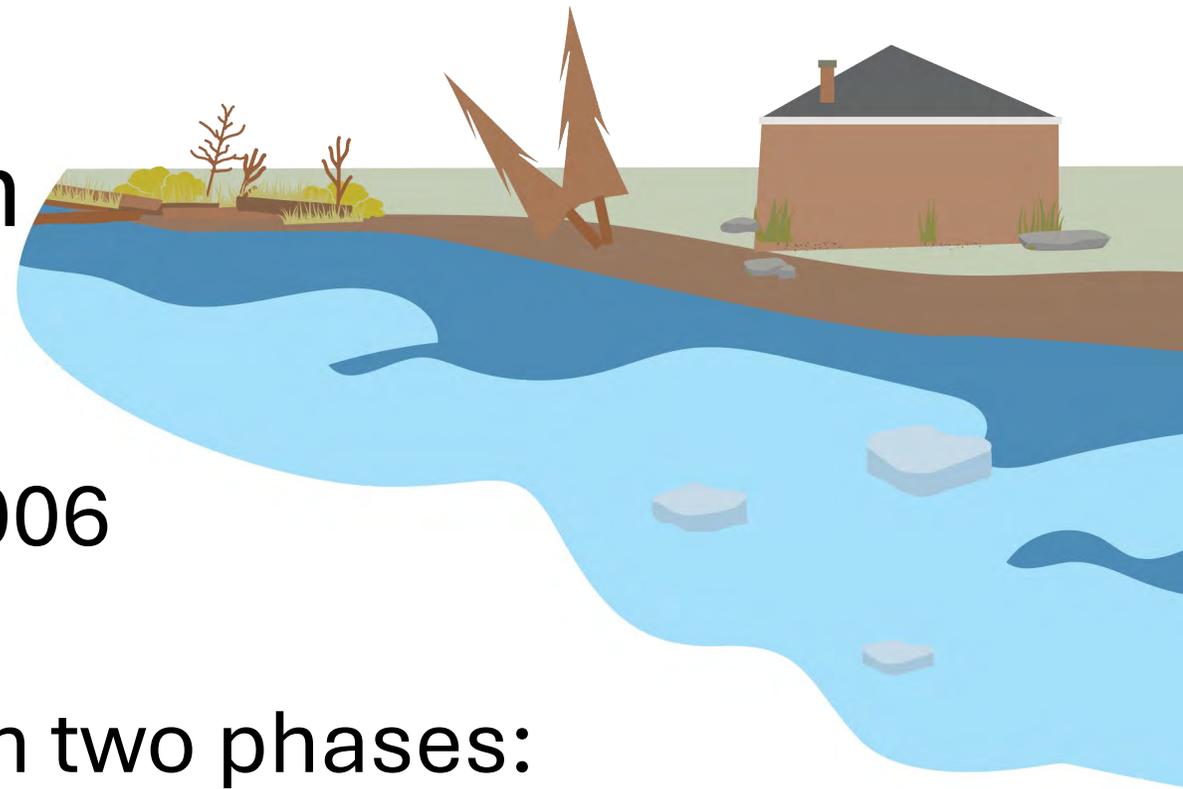


Addressing Riverbank Erosion in Fort Good Hope



1. Recognize the Problem

- Earlier assessments completed in 1991, 1997, 2006
- Recent projects have been in two phases:
 - Phase I 2021-2023 Field Assessment and initial communication (Tetra Tech)
 - Phase II 2024-2026 Planning and Communication





3. Gather and assess initial information (Tetrattech field work)



Photo: Tetrattech, 2023

Preliminary assessments (repeated)



Source: Tetrtech 2023

House Number	Risk Matrix (w/in next 1-10 years)		Risk of Slope Failure Affecting Structure	Priority for Relocation?
	Likelihood of Slope Failure Affecting Structure	Consequence of Slope Failure		
2N	Moderate	Moderate	Moderate	Moderate
1N	High	High	Very High	Immediate
1S	High	High	Very High	Immediate
2S	High	High	Very High	Very High
3S	High	High	Very High	Very High
4S	High	High	Very High	Very High
5S	High	High	Very High	Very High
7S	High	High	Very High	Very High
8S	High	High	Very High	Very High
9S	High	High	Very High	Very High
10S	High	High	Very High	Very High
11S	Low	Moderate	Low	Low
12S	Low	Moderate	Low	Low
13S	High	High	Very High	Immediate
14S	Low	Moderate	Low	Low
15S	Low	Moderate	Low	Low
16S	Low	Moderate	Low	Low
17S	High	High	Very High	Immediate
18S	Moderate to High	Moderate to High	High	Moderate
20S	Moderate to High	Moderate to High	High	High
21S	Moderate	Moderate	Moderate	Moderate
22S	Moderate	Moderate	Moderate	Moderate
23S	High	High	Very High	Very High
24S	High	High	Very High	Very High
27S	High	High	Very High	High - Very High
28S	High	High	Very High	Very High
29S	High	High	Very High	Very High
31S	High	High	Very High	Very High
32S	High	High	Very High	Very High
33S	High	High	Very High	Very High
34S	High	High	Very High	Very High
35S	High	High	Very High	Very High
36S	High	High	Very High	Very High

Table 1: Erosion Risk Matrix

Engineering team identified:

- 24 homes at very high priority for relocation
- - of those, 4 can be further prioritized
- An additional 5 homes at high priority for relocation

--- a total of 29 homes at high or very high priority for relocation

Source: Tetrattech, 2023

Additional recommendations

- **Avoid unstable terrain:** 30 year setback line in which there should be no new development
- **Improve Surface Water Drainage:** Develop a community drainage plan to enhance runoff and reduce landslides.
- **Protect At-Risk Elements:** Repair and strengthen the foundations of houses and buildings to resist land movement.
- **Annual monitoring:** Conduct yearly inspections of high-risk homes to ensure safety.
- **Monitor the Water Reservoir:** Ensure that the systems carrying water away from the reservoir do not exacerbate erosion.
- **Further Studies:** Perform more details studies, such as topographic / LiDAR surveys and site-specific geotechnical assessments, to better understand ground and permafrost conditions
- **Evacuation Plan:** Evacuate high risk homes if river conditions during spring break up exceed normal summer levels, particularly if water and ice reach slopes with angles above 10 degrees. (where vegetation starts).



2. Manage the threat right away

- Planning and fundraising take time!
- How can we keep people safe in the meantime?

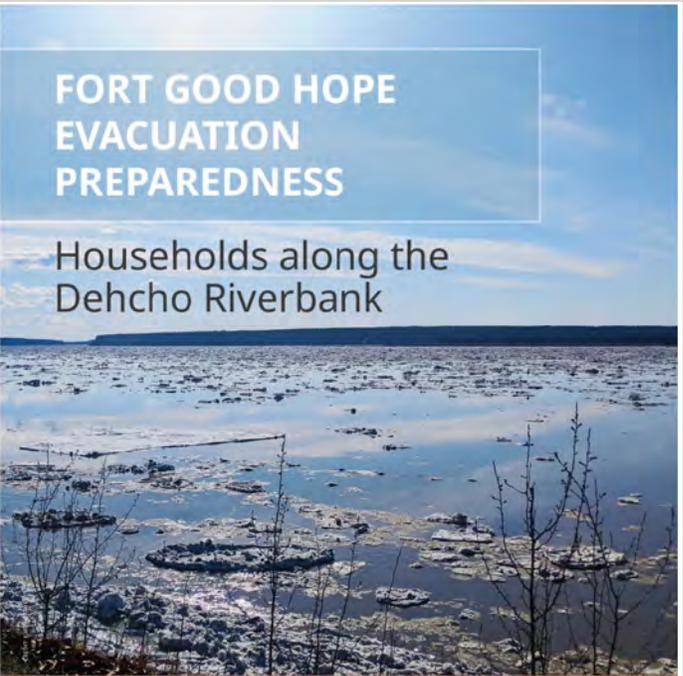




Manage the Threat Right Away

**FORT GOOD HOPE
EVACUATION
PREPAREDNESS**

Households along the
Dehcho Riverbank



MAY 2024



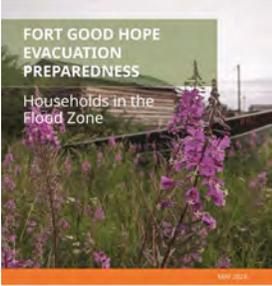
**FORT GOOD HOPE
EVACUATION
PREPAREDNESS**

Households in the
Flood Zone



MAY 2024





Households in Flood Zone



When will I know if I need to leave my house?
Please monitor the river. If the water starts to rise, leave your house to be safe. The water can rise quickly.

How long do I need to leave my house?
You should stay out of your house until the ice jam has broken, water levels have receded, and an inspection of the area is complete. It is hard to predict how long this could be, but we recommend being prepared for a week away.

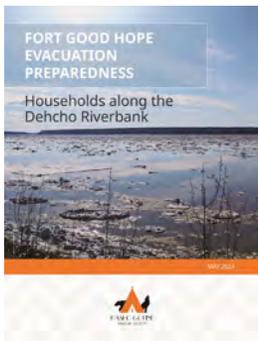
Where can I go if I need to leave my house?
There are **four options** that the community has identified:

1. Stay with family or friends in the community.
• We will provide the host with \$50 per person per night.

2. Go to the cultural camp.
• We will set up the cultural camp for you to stay. Plan to bring your own tent and bedding if you can as our supply is limited.
• Water and meals will be provided.

3. Stay in the hotel.
• We will try to find you a room in the Arctic Circle camp or another available space in the community if the first two options don't work for you. There are limited rooms available, but we will try to find space.

4. Make your own plan.
• Go on the land or to another community. If there is another option that works best for you, please let us know and we will try to support you as best we can.



Households along the Dehcho River



Why is it recommended that I leave my house?

When the river floods, the water and ice can undercut the riverbank or pull away soil, leading to sudden and potentially significant slope collapses. The engineers documented evidence of slope loss of up to 16m in one season in the past.

When do the engineers recommend that I leave my house?

During breakup, if an ice jam forms and the water levels on the river rise high enough to reach the vegetation on the riverbank, the engineers recommend homeowners leave their houses.

How long do I need to leave my house?

You should stay out of your house until the ice jam has broken, water levels have receded, and an inspection of the area is complete. It is hard to predict how long this could be, but we recommend being prepared for a week away.

When will I know if I need to leave my house?

Please monitor the river. Residents should evacuate their homes if the water rises to where there is vegetation along the river bank. If the water is rising to this point, leave your home.



4. Evaluation Options and Make a Plan

Fort Good Hope Draft Plan

- Communicate
- Plan (land use, drainage, emergency preparedness and response)
- Further assessments
- Continued monitoring
- Relocations



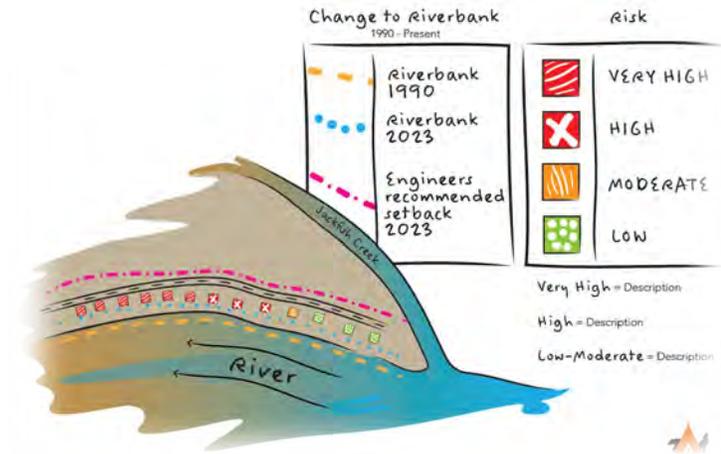
Communicate

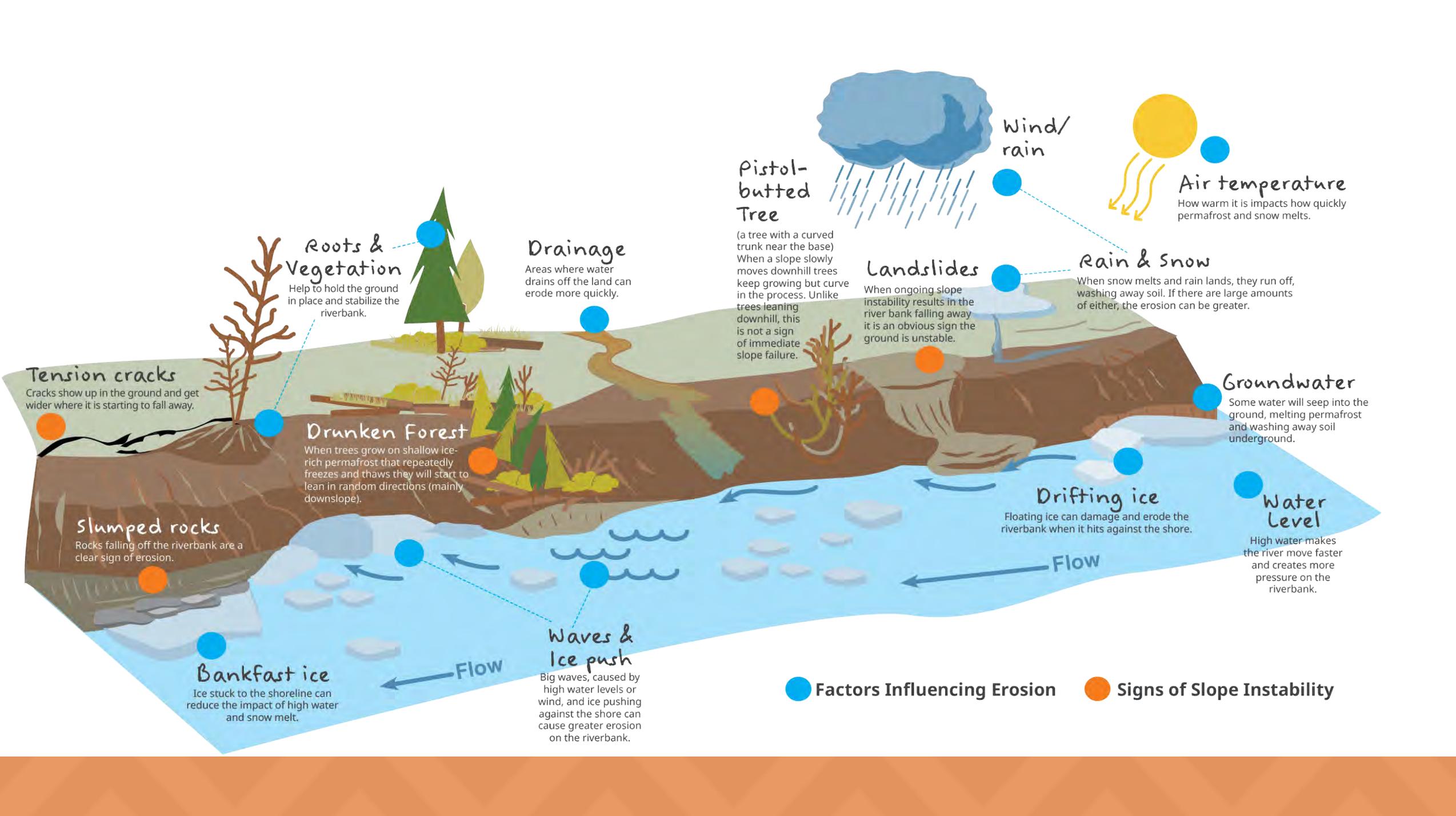
Completed or in process

- Homeowner packages
- Leadership deliberations
- Public meetings and discussion
- Partnership outreach and collaborations

Planning in progress / future actions

- Advocacy and fundraising
- Iterative engagement with affected residents
- Repeated communications with affected institutions
- On-going leadership meetings
- Periodic public updates





Tension cracks
Cracks show up in the ground and get wider where it is starting to fall away.

Roots & Vegetation
Help to hold the ground in place and stabilize the riverbank.

Drunk Forest
When trees grow on shallow ice-rich permafrost that repeatedly freezes and thaws they will start to lean in random directions (mainly downslope).

Slumped rocks
Rocks falling off the riverbank are a clear sign of erosion.

Bankfast ice
Ice stuck to the shoreline can reduce the impact of high water and snow melt.

Drainage
Areas where water drains off the land can erode more quickly.

Pistol-butted Tree
(a tree with a curved trunk near the base)
When a slope slowly moves downhill trees keep growing but curve in the process. Unlike trees leaning downhill, this is not a sign of immediate slope failure.

Landslides
When ongoing slope instability results in the river bank falling away it is an obvious sign the ground is unstable.

Wind/rain

Air temperature
How warm it is impacts how quickly permafrost and snow melts.

Rain & Snow
When snow melts and rain lands, they run off, washing away soil. If there are large amounts of either, the erosion can be greater.

Groundwater
Some water will seep into the ground, melting permafrost and washing away soil underground.

Drifting ice
Floating ice can damage and erode the riverbank when it hits against the shore.

Water Level
High water makes the river move faster and creates more pressure on the riverbank.

Waves & Ice push
Big waves, caused by high water levels or wind, and ice pushing against the shore can cause greater erosion on the riverbank.

● Factors Influencing Erosion ● Signs of Slope Instability

Plan

Completed or in process

- Incorporate in capital plans and operational budgets
- Land use planning (Community Plan, zoning bylaw, and Drainage Plan)
- Emergency Plan

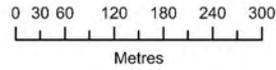
Planning in progress / future actions

- Consider human resource implications
- Implementing drainage and community plans, zoning bylaws
- Emergency preparedness and stronger tie-ins in emergency plan.

Environmental Hazards to Development

Community of Fort Good Hope

-  Recommended Setback for Permanent Structures
-  15 m Offset from Crest of Slope
-  Lots Losing Road Access
-  Reservoir Downslope Hazard Area
-  Floodway and Floodfringe
-  2021 Flood Extent
-  Wetland Areas
-  Drainage Mitigation Required
-  Ditches
-  Intermittent Streams



Scale 1: 6,250
Projection: NAD 1983 UTM Zone 9N
(Original Document Size: 11" x 17")
December 2025

Flood Risk, Ditches, and Intermittent Streams are derived from the Administration of the Territorial Lands Act System (ATLAS), Government of the Northwest Territories, June 2025.

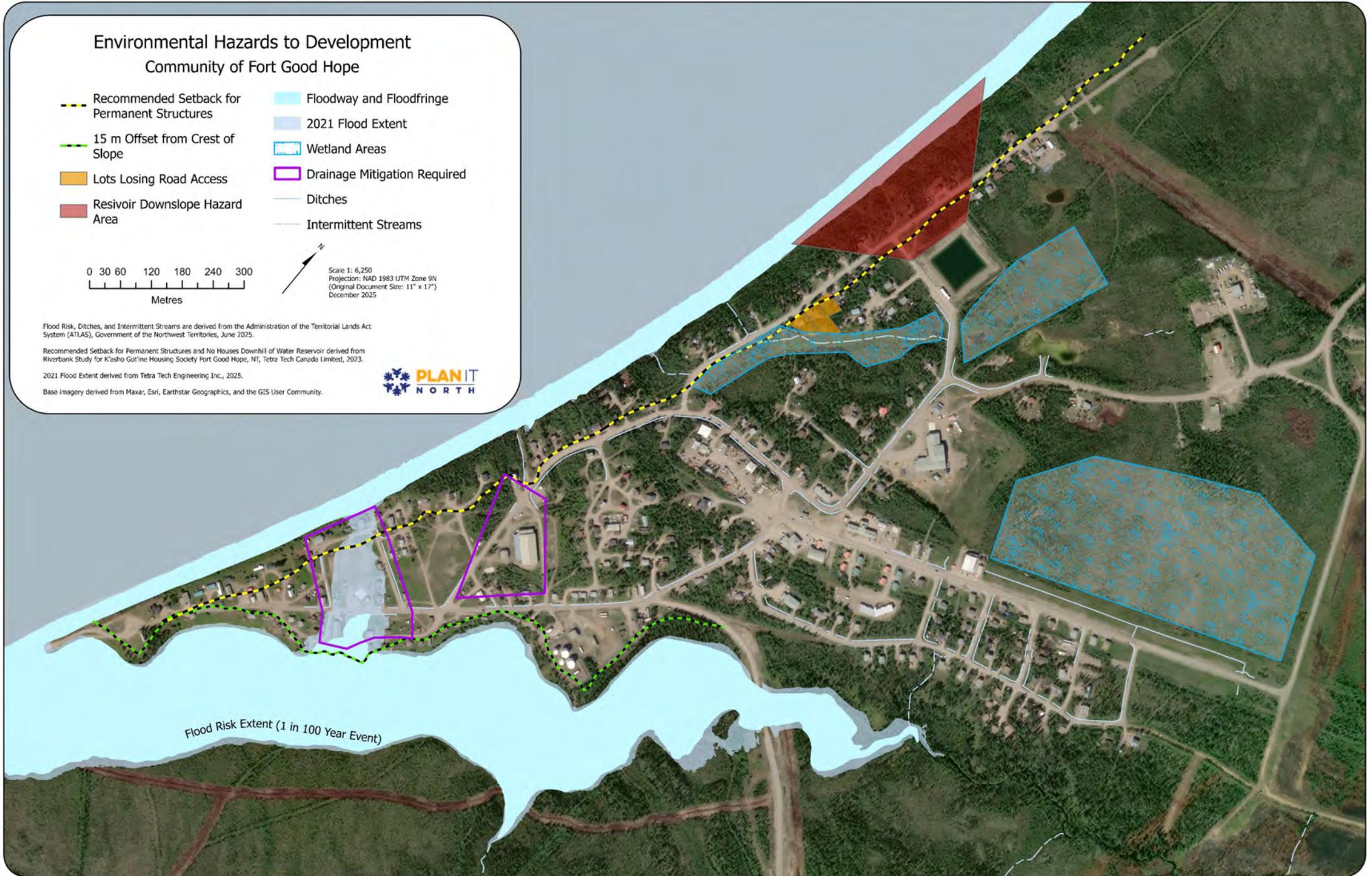
Recommended Setback for Permanent Structures and No Houses Downhill of Water Reservoir derived from Riverbank Study for K'asho Got'ine Housing Society Fort Good Hope, NT, Tetra Tech Canada Limited, 2023.

2021 Flood Extent derived from Tetra Tech Engineering Inc., 2025.

Base imagery derived from Maxar, Esri, Earthstar Geographics, and the GIS User Community.



Flood Risk Extent (1 in 100 Year Event)



Further assessments

Completed or in process

- Inundation maps and flood hazard maps (GNWT – ECC, NRCAN)
- University of Alberta and NTGS partnerships

Planning in progress / future actions

- Investigation of water reservoir
- Repeated assessment of Dehcho riverbanks, expansion of assessment to Jackfish Creek side
- Investigation of options for the cemeteries and church



Continued monitoring

Completed or in process

- Draft monitoring plan

Planning in progress / future actions

- Dialogue about roles, responsibilities
- Resourcing
- Further review with specialists to finalize monitoring plan, roles, and decision points

Relocations



Completed or in process

- Household communications
- Site option assessments
- Home condition assessments
- Prioritizing and sequencing

Planning in progress / future actions

- Continued household communications
- Site development
- Finalize home assessments
- Fundraise
- Pilot (focus on priorities)

Riverbank Instability: A Draft Guide for Communities



1 Recognize the Problem

- Identify what's at risk
- Observe changes
- Gather local knowledge
- Watch for warning signs
- Understand the causes



2 Manage the Threat Right Away

- Keep people and assets safe
- Communicate with the community
- Seek expert advice
- Monitor regularly
- Use short-term fixes
- Plan what you will do if things get worse quickly



3 Gather and Assess Initial Information

- Work with qualified experts
- Gather and review the right data
- Do field checks
- Get an assessment report
- Think about next steps



4 Evaluation Options and Make a Plan

- Compare solutions with technical specialists
- Talk with your community
- Understand what approvals you will need and what funding is available
- Make a decision and a plan



5 Take Action

- Put the plan into action
- Give the river space
- Take direction action on the riverbank
- Reinforce/protect structure
- Make the connection to community planning



Keep monitoring

- Track and document changes
- Identify and address new risks
- Measure how well your actions are working





Questions and discussion welcome!

Christine Wenman, RPP, MCIP,
PlanIt North

