Yukon University

# Climate risk mapping for Government of Yukon building assets

May 2023

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Photo Credit: Stephanie Saal / YukonU Research Centre

# Project Team

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# Context

Energy Management Unit (EMU) with the Government of Yukon (YG), Department of Highways and Public Works is interested in gathering information and tools to inform asset management planning within the context of a changing climate. As a result of this interest, the EMU has entered into an agreement with the YukonU Research Centre to gather existing spatial and asset data and produce maps of YG assets and their exposure to geohazards such as landslides, wildfire, floods, and permafrost thaw.

Work on this project uses YG buildings as a case study for developing and testing these hazard exposure maps. This report outlines the methods and information used to create the maps developed and presented to the EMU. The maps and data are provided in an accessible and adaptable format so that they may be updated and/or adapted in the future.

Contents

# List of Figures

# List of Tables

# 1 Key Contacts

## 1.1 Geological Hazards

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(on leave until September 2023)

Timeline for completion of anticipated hazard mapping projects:

Preliminary mapping for Haines Junction is likely to be completed around the end of 2023 and Whitehorse and Teslin around the end of the 23/24 fiscal year. Hazard mapping for Beaver Creek should have been completed at the end of March 2023. There may be a lag between completion and upload to GeoYukon, but the files will be available on the YGS website: https://data.geology.gov.yk.ca/

## 1.2 Wildfire Exposure for Whitehorse

**Jennifer Schmidt** *(she/her/hers)*
Associate Professor of Natural Resource Management and Policy
Institute of Social and Economic Research (ISER)
University of Alaska Anchorage
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https://respondtorisk.com/

For details on how the wildfire exposure data was collected and interpreted: https://sites.google.com/alaska.edu/jenschmidt/wildfire/aura/wildfire-exposure
For the Whitehorse wildfire exposure 2014 online map: https://uaa-geomatics.maps.arcgis.com/apps/instant/interactivelegend/index.html?appid=bc26872b4e3b42979a2215ad0a928eac.

For updated fire smarting data:

**Leigh Relkoff** *(She/Her)*
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## 1.3 Flood Hazard Mapping

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The status and anticipated timing of flood hazard maps:

- Southern Lakes (including Carcross, Tagish, Marsh Lake, and Lake Laberge), Carmacks and Teslin
  - Status: On-going
  - Anticipated completion: spring 2024 (draft maps in 2023)
- Old Crow and Ross River
  - Status: In planning
  - Anticipated completion: Spring 2025
- Dawson City, Klondike Valley, Mayo, Upper Liard, Pelly Crossing, Whitehorse
  - Status: Not started
  - Anticipated completion: to be determined

Flood mapping is prioritized based on:

1. Available data
2. Existing work
3. Development pressures
4. Community interest and input
5. Flood risk (likelihood and potential impact) based on recorded flood history
6. Complexity of flood mechanisms
7. Available funding
8. Input from federal prioritization process

# 2 Mapping methodology

## 2.1 Geological Hazards

The community hazard data were generated from 2011-2016 and are accompanied by detailed reports on data collection methods, modelling, and hazard classification methods. The reports and methods differ by community, and there are slightly different hazard rating descriptions and categories within each report. These reports are available from https://www.yukonu.ca/research/projects/hazard-mapping-yukon-communities. Efforts were made to confirm if there are more recent data available. The Yukon Geological Survey does have recent data for a few communities, with more data pending, however none of the YG buildings overlapped with areas associated with geological hazards within the updated data currently available. More information on knowledge gaps is discussed in section 7, and more details on timelines for release of more up-to-date geological hazards can be found in section 3.

Community geological hazards data and Yukon community boundaries were acquired from GeoYukon. YG building data were separated by community and reduced to Yukon community areas where geological hazard data was available. Geological hazard classifications were assigned to YG buildings. The geological hazards data associated with the YG buildings can be found in the accompanying tables and maps in section 3.

## 2.2 Wildfire Exposure

Wildfire exposure data for Whitehorse and surrounding areas was accessed from the ongoing Arctic Urban Risks and Adaptations (AURA) project led by Dr. Jennifer Schmidt, University of Alaska Anchorage, Institute of Social and Economic Research. The AURA project includes work on unstable permafrost, wildfire and rain-in-winter events. The wildfire exposure for our area was mapped in 2014 and provides exposure information related to vegetation existing at the time of mapping. The original wildfire exposure data was not available for download; however, an image layer file was located. The attribute table associated with the buildings was updated manually based on location of the building points in relation to the image file hazard rating categories. Maps were designed for several smaller communities within the Whitehorse area.

## 2.3 Flood Risk

The preliminary flood vulnerability maps for Dawson City (including the Tr'ondëk, C-4 subdivision) and Old Crow within and accompanying this report were developed by Benoit Turcotte, Ph.D., P.Eng, and Stephanie Saal, M.Sc., of the YukonU Research Centre with the support of research funds. Government-led flood hazard mapping for Yukon communities is ongoing and more information on timelines and key contacts can be found in section 3. The above-mentioned flood vulnerability maps included an elevation survey of first (ground) floors for essential community buildings. Vulnerability ratings are based on water levels in relation to first floor elevations. Hence, flood vulnerability could only be extracted for YG buildings that were included in the survey. Flood information was assigned to YG buildings for different flood scenarios.

The reports that accompany the flood vulnerability maps for Dawson City and Old Crow complement this report and contain more detailed information on the methodology for determining flood vulnerability based on several scenarios.

# 3 Government of Yukon building hazards results

## 3.1 Notes on limitations

### 3.1.1 Geological hazards

The landscape hazard maps used to classify Government of Yukon building hazard risk were originally intended to be used only as an adaptation planning tool, not as a basis for decision-making or development site selection. Any planned infrastructure development or upgrades should only use this map as a tool for identifying areas that will require additional engineering or technical studies.

### 3.1.2 Wildfire exposure

The wildfire exposure ratings reflect wildfire potential based on vegetation types identified using satellite imagery. The exposure scores are not an indicator of likelihood of wildfire but of what is possible based on existing vegetation at the time of mapping. They are meant as a tool for planning fuel treatments or taking other actions to reduce wildfire hazards.

### 3.1.3 Flood vulnerability

The flood vulnerability information on select YG buildings in Dawson City and Old Crow are based on models that differ from those used for Government-approved flood hazard maps. Although the data collection and modelling were done more recently than the other hazard categories, there remains uncertainty in predicting how often flood events may happen and what their severity might be given the expected frequency of extreme weather events in the region, and a relatively short record of annual maximum water levels.

## 3.2 Burwash Landing

The report that accompanies the hazards classification map for Burwash Landing and Destruction Bay (Northern Climate ExChange 2013) classifies geological hazards as:

> Green: no risk of permafrost degradation, no risk of geologic hazards.
>
> Yellow: moderate risk of permafrost degradation (i.e., moderate thaw settlement) or moderate risk of geologic hazards.
>
> Orange: moderate to high risk of permafrost degradation (i.e., moderate thaw settlement on flat terrain, poor drainage, and slow mass movement on slopes due to high pore water pressure) and moderate risk of geologic hazards.
>
> Red: moderate to high risk of permafrost degradation (i.e., high thaw settlement, water ponding, and slow to rapid mass movement on slopes due to excess pore water pressure) and/or high risk of geologic hazards.

Following is the map and table with information on geologic hazards related to YG buildings.

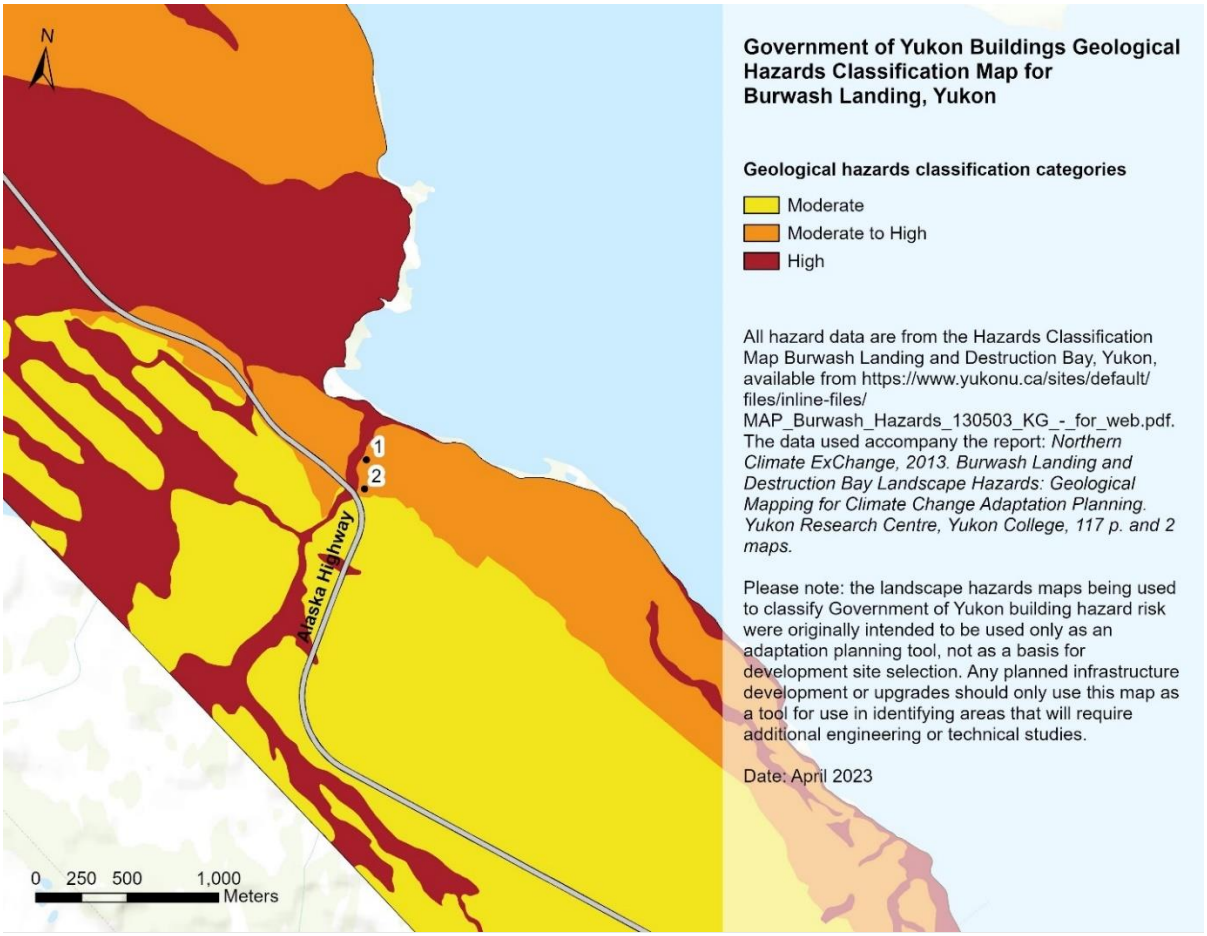


**Figure 3.2.1** Government of Yukon Buildings Geological Hazards Classification Map for Burwash Landing.

**Table 3.2.1 Government of Yukon Buildings Geological Hazards Classifications for Burwash Landing.**

| Building ID | Building name | Geological Hazard rating | Geological Hazard type |
|---|---|---|---|
| 1 | Firehall - Burwash Landing | Moderate to High | permafrost |
| 2 | Kluane Natural History Museum | Moderate to High | permafrost |

## 3.3 Dawson City

The report that accompanies the hazards classification map for Dawson City (Benkert, Kennedy, et al. 2015) classifies the geological hazards as:

> Green: Low risk. Characterized by flat to gently sloped terrain with south and west-facing slopes. Low-risk terrain is found above modern floodplains and is often comprised of well-drained gravel or weathered bedrock surface materials. Low-risk terrain may contain permafrost, but it is less likely to be ice rich compared with more hazardous terrain.
>
> Yellow: Moderate risk. Characterized by gentle to moderate slopes and occurs more commonly on west and south-facing slopes. Moderate-risk terrain is found on the steep edges and cold aspects of low-risk landforms (i.e., fluvial terraces and north-facing, high-elevation slopes). Moderate-risk terrain also occurs in coarse-grained (gravel) surficial materials that may be affected by ice-rich permafrost (e.g., downtown Dawson).
>
> Orange: Moderately high risk. Characterized by moderate to steep slopes and east to north-facing slopes. Moderately high-risk terrain is found on all aspects in the study area and is common in narrow, steep-sided valleys and on more gentle slopes where permafrost is more likely to be present. The difference between moderate and moderately high-risk terrain in the study area is often based on changes in slope angle and slope aspect.
>
> Red: High risk. Characterized by moderate to steep slopes and coldest east and north-facing slopes. Much of the high-risk terrain in the study area is

defined by geological boundaries containing high-hazard processes such as landslides, thermokarst, and active floodplains that may be subject to flooding. High-risk terrain in the study area occurs in valley bottoms (flood risk and high permafrost probabilities), on steep north-facing valley slopes and at the base of these slopes, and where landslide processes have affected large areas of the landscape (i.e., bedrock slide on the north side of the Klondike Valley)

Following are the maps and the table with information on geologic hazards related to YG buildings.

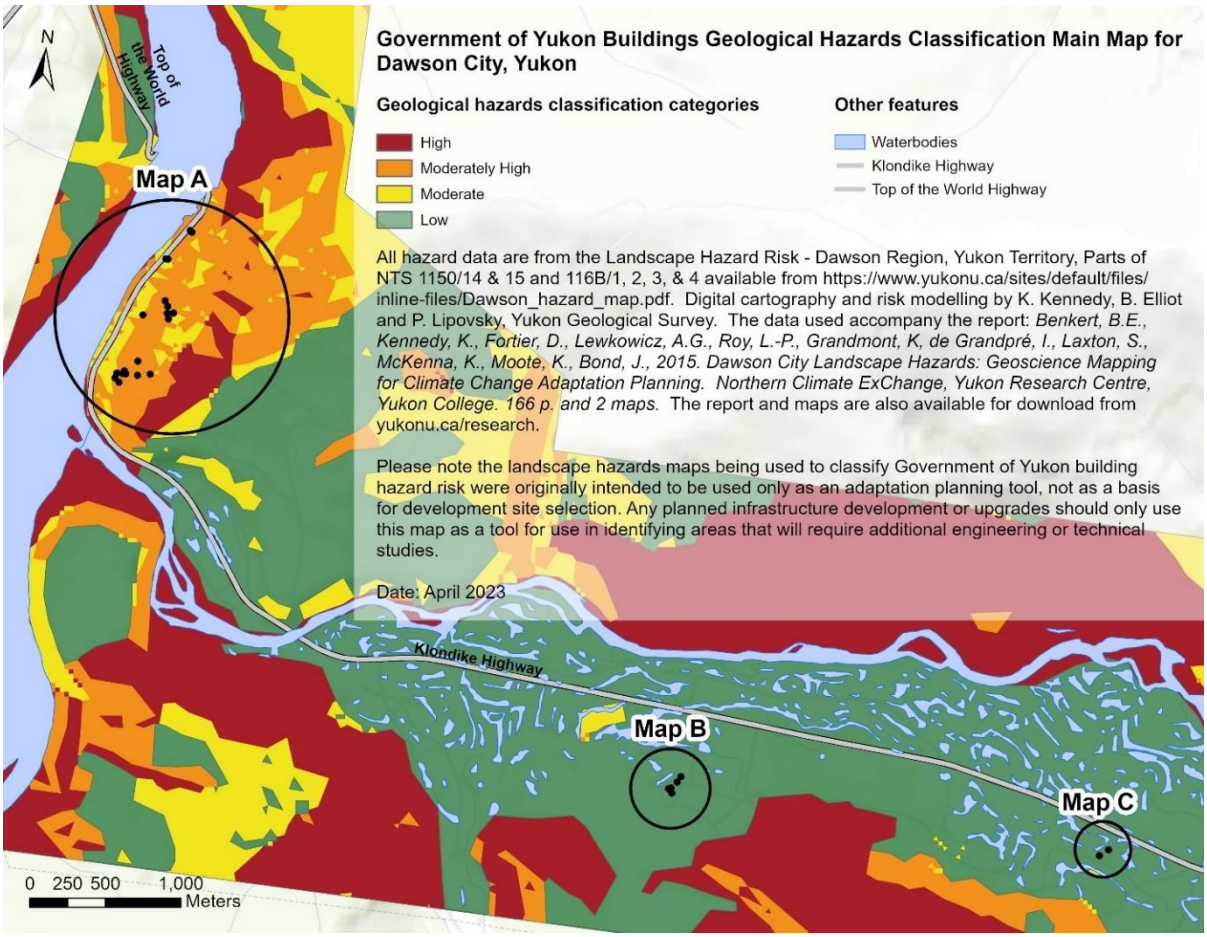


**Figure 3.3.1** Government of Yukon Buildings Geological Hazards Classification Main Map for Dawson City.

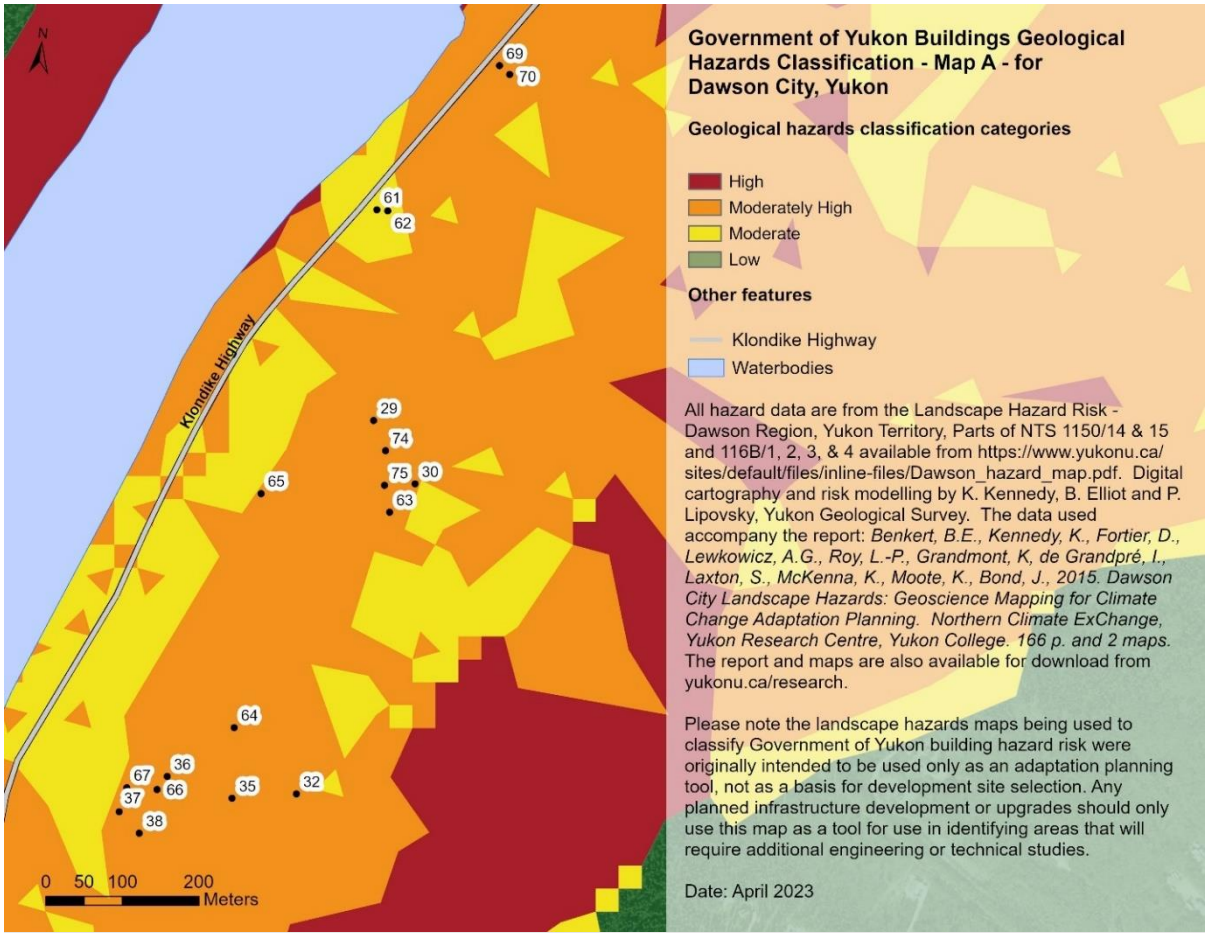


**Figure 3.3.2** Government of Yukon Buildings Geological Hazards Classification – Map A - for Dawson City.

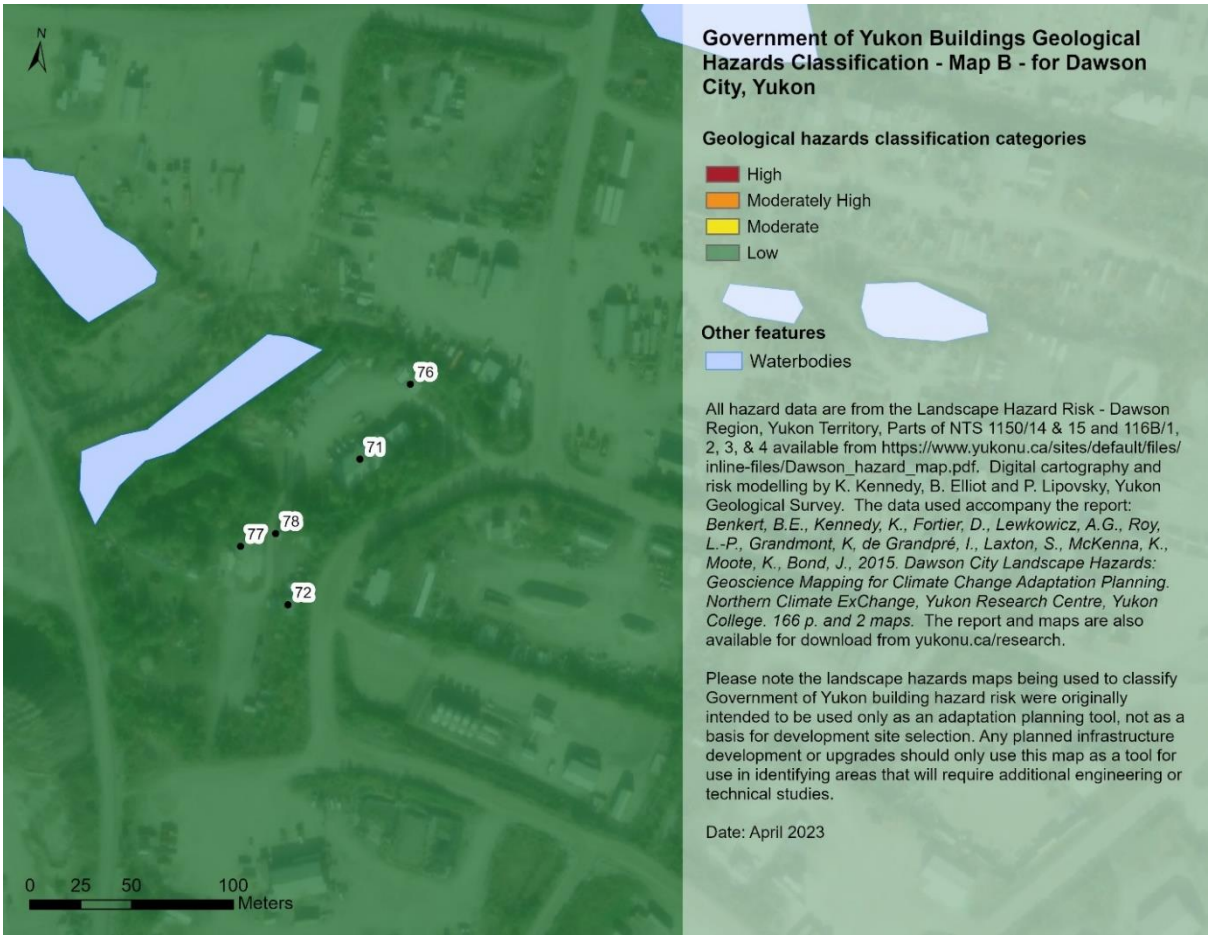


**Figure 3.3.3** Government of Yukon Buildings Geological Hazards Classification – Map B - for Dawson City.

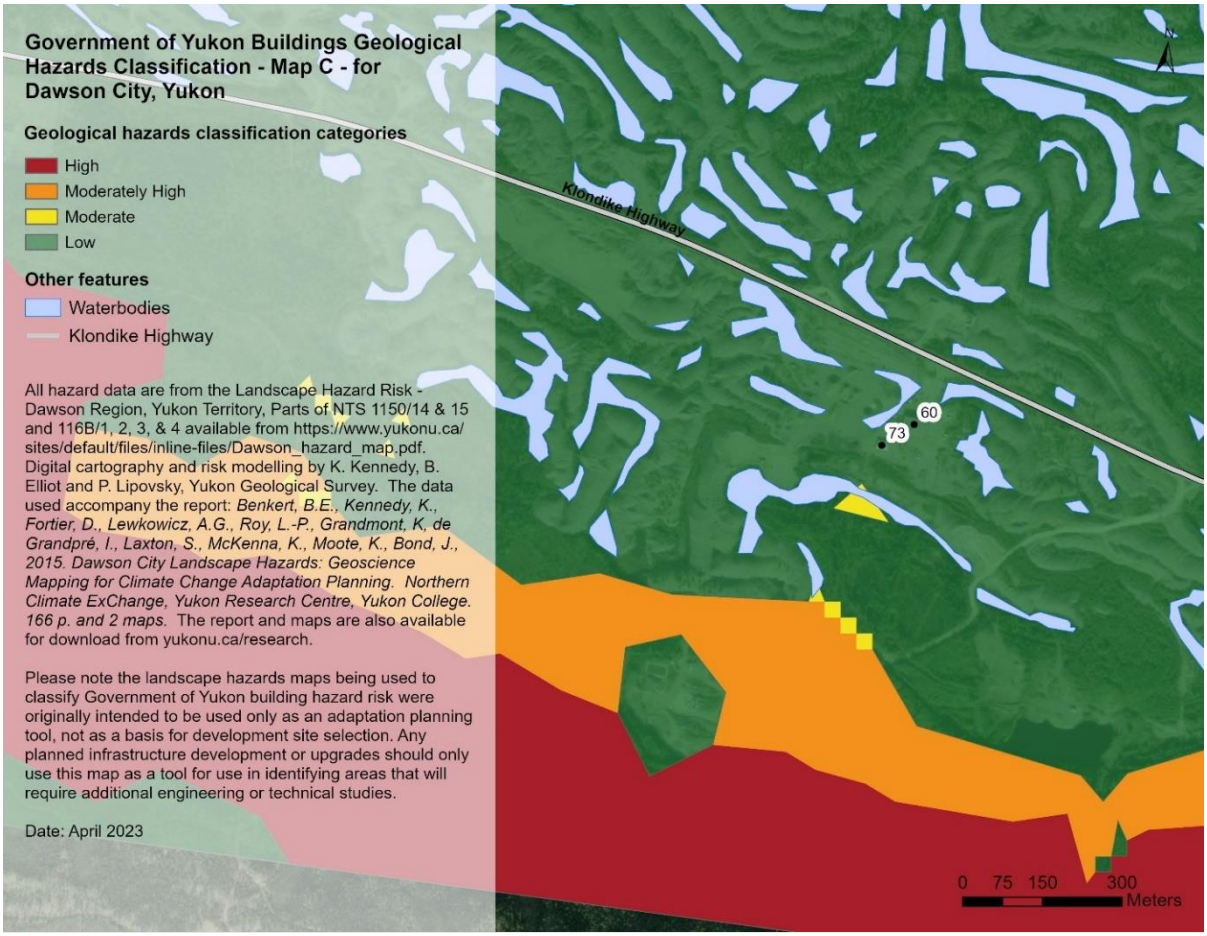


**Figure 3.3.4** Government of Yukon Buildings Geological Hazards Classification – Map C - for Dawson City.

**Table 3.3.1 Government of Yukon Buildings Geological Hazards Classification for Dawson City.**

| Building ID | Building name | Geological hazard rating |
|---|---|---|
| 29 | School of Visual Arts (SOVA) / Yukon College | Moderately High |
| 30 | Robert Service School | Moderately High |
| 32 | Alexander McDonald Lodge - Dawson City | Moderately High |
| 35 | Administration Building - Dawson City | Moderately High |
| 36 | FMRS Office - Northern Region | Moderately High |
| 37 | Biomass District Heating Building | Moderately High |
| 38 | Waste Water Treatment Plant - Dawson City | Moderately High |
| 60 | Grader Station - Dawson City | Low |
| 61 | Visitor Information Centre - Dawson City | Moderate |
| 62 | Storage Shed - Visitor Information Centre - Dawson City | Moderate |
| 63 | Robert Service School - Portable Classroom | Moderately High |
| 64 | Emergency Medical Services - Dawson City | Moderately High |
| 65 | Liquor Store - Red Feather Saloon - Dawson City | Moderately High |
| 66 | POL Shed - Dawson City | Moderately High |
| 67 | Storage Cold - FMRS - Dawson City | Moderately High |
| 68 | FMRS Maintenance Shop - Dawson City | Moderately High |
| 69 | Ladue Sawmill - Dawson City | Moderately High |
| 70 | Warehouse George Black Ferry Storage - Dawson City | Moderately High |
| 71 | Wildlife Office/Workshop - Dawson City | Low |
| 72 | Shed Cold Storage/Propane - Dawson City | Low |
| 73 | Garage Grader Station - Dawson City | Low |
| 74 | Shed 16x16 - Robert Service Dawson City | Moderately High |
| 75 | Shed 10x12 - Robert Service Dawson City | Moderately High |

| | | |
|---|---|---|
| 76 | Storage Shed Environment - Dawson City | Low |
| 77 | Storage Shed - EMR Dawson City | Low |
| 78 | POL Storage - Dawson City | Low |

The report that accompanies the flood vulnerability maps for Dawson (Turcotte and Saal 2022) presents four flooding scenarios based on a frequency analysis of high-water levels, with consideration for the dike storm drain valves being open or closed. The flood scenarios based on the frequency analysis are scenarios that have a likelihood of occurring either every two years, every 20 years, or every 200 years.

The flood vulnerability mapping done for Dawson included a detailed survey of assets within the community and a related assessment of flood risk for those assets for each scenario. When comparing the YG building data with the surveyed assets, it was noted that only some of the YG buildings in Dawson have associated flood vulnerability information.

Below are the flood maps and table of surveyed assets with their associated flood risk. The YG buildings are highlighted in purple. Any YG buildings not listed within the table had no flood information associated with the maps below.

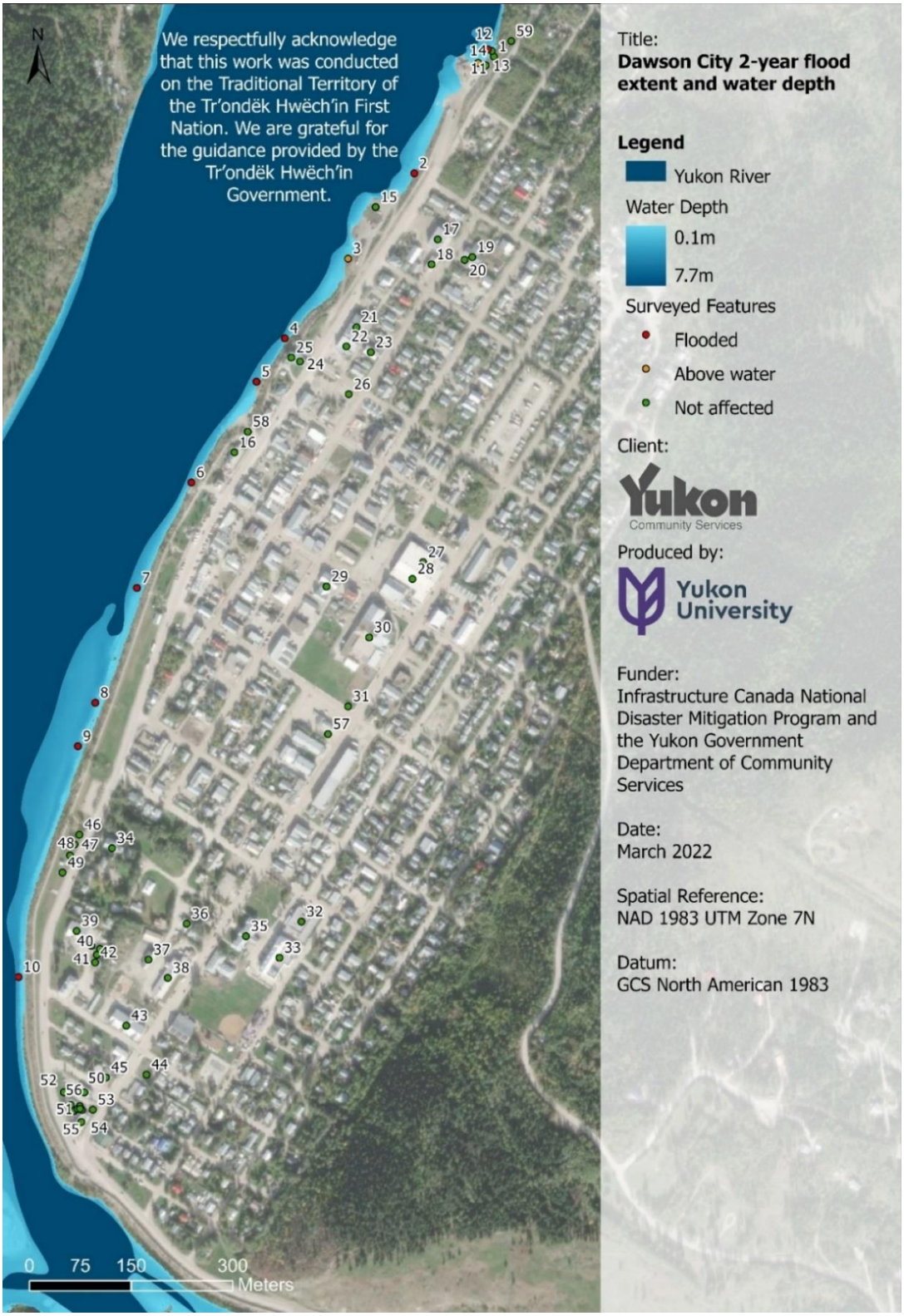


**Figure 3.3.5** Dawson City 2-year flood extend and water depth.

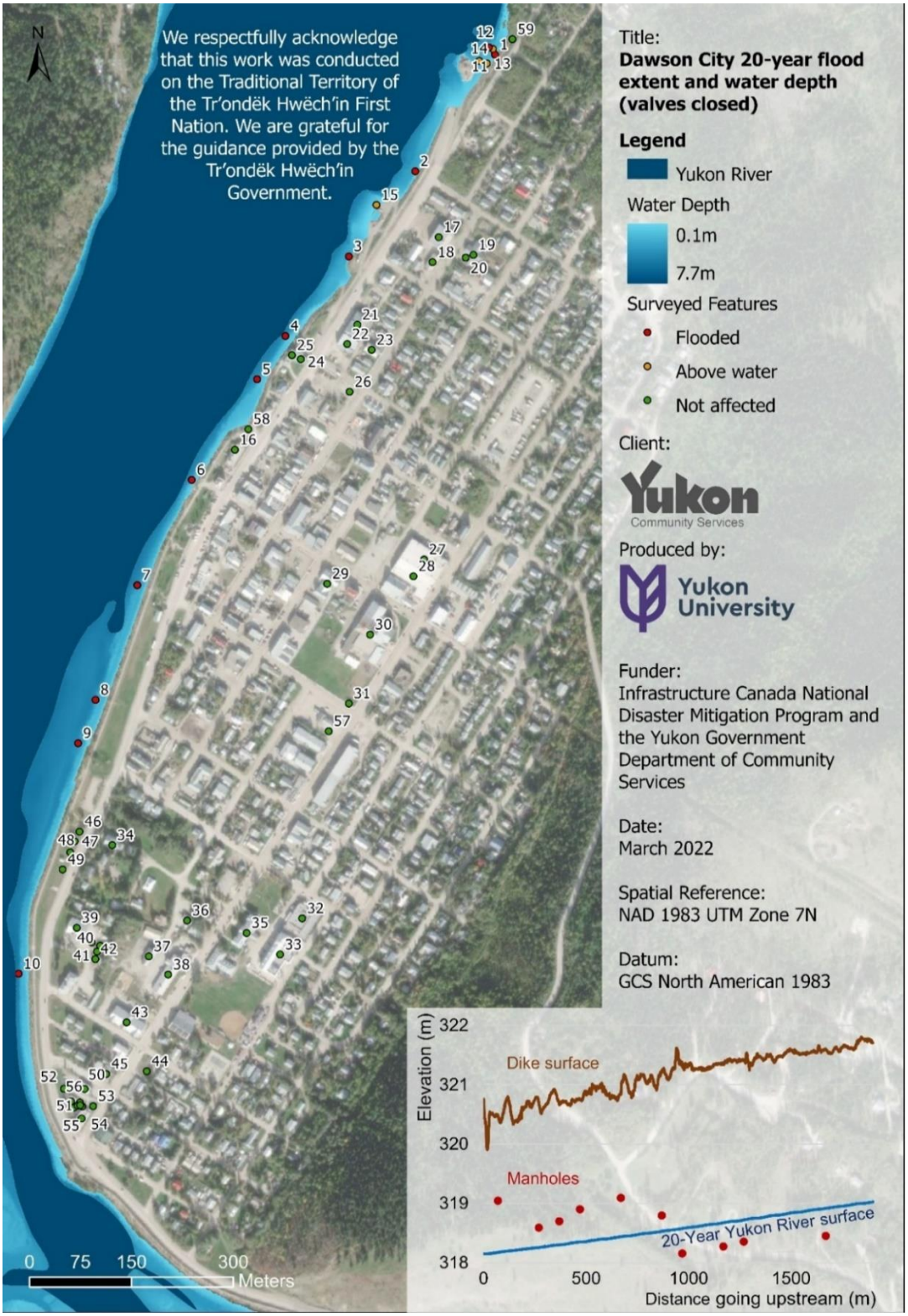


**Figure 3.3.6** Dawson City 20-year flood extent and water depth (valves closed).

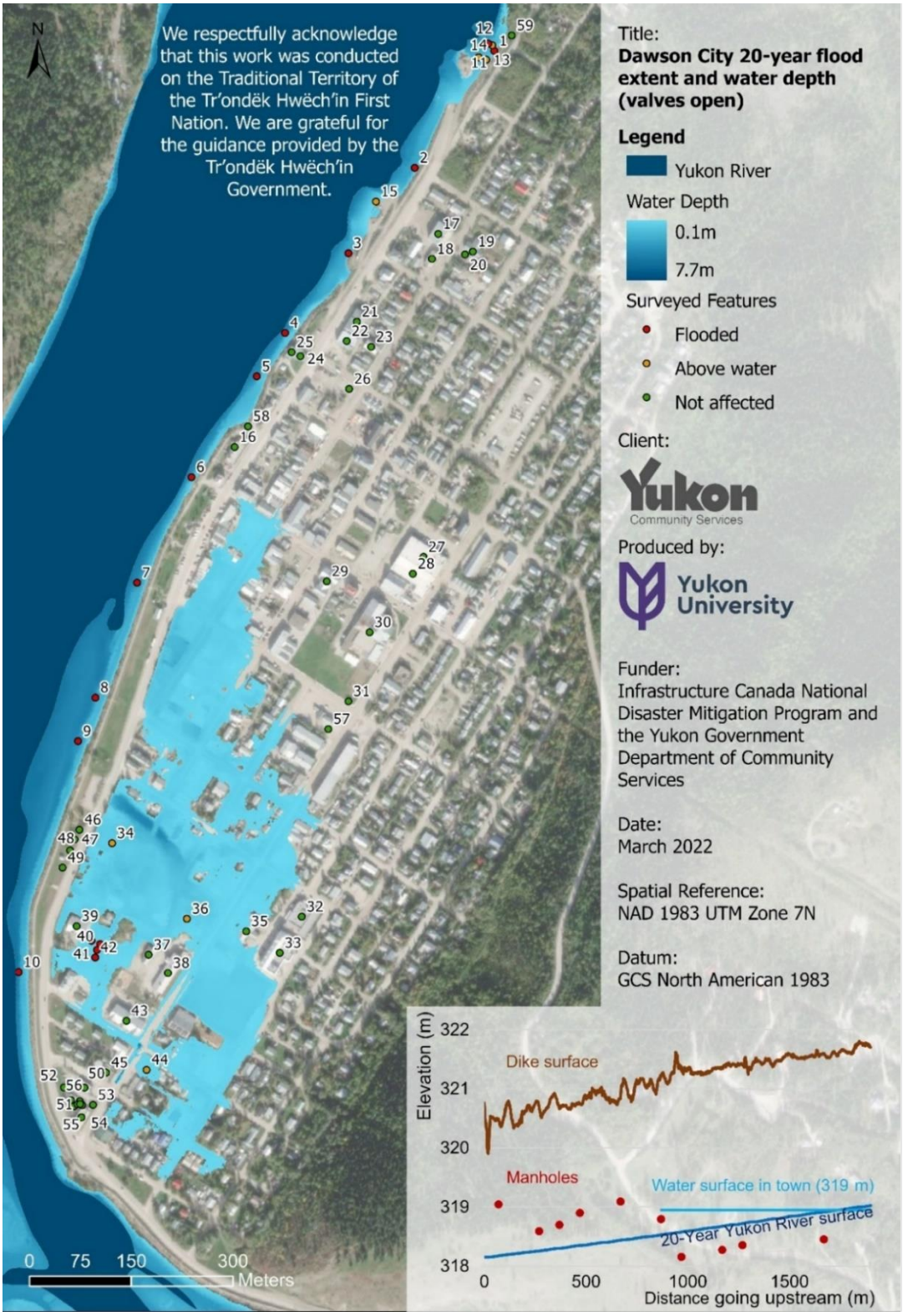


**Figure 3.3.7** Dawson City 20-year flood extent and water depth (valves open).


**Figure 3.3.8** Dawson City 200-year flood extent and water depth.

**Table 3.3.2 Dawson City flood risk for surveyed buildings.**

| Building ID | Building name | 2-year flood | 20-year flood | 1991 flood | 200-year flood |
|---|---|---|---|---|---|
| 1 | Storm Drain | Not affected | Flooded | Flooded | Flooded |
| 2 | Storm Drain | Flooded | Flooded | Flooded | Flooded |
| 3 | Storm Drain | Above water | Flooded | Flooded | Flooded |
| 4 | Storm Drain | Flooded | Flooded | Flooded | Flooded |
| 5 | Storm Drain | Flooded | Flooded | Flooded | Flooded |
| 6 | Storm Drain | Flooded | Flooded | Flooded | Flooded |
| 7 | Storm Drain | Flooded | Flooded | Flooded | Flooded |
| 8 | Storm Drain | Flooded | Flooded | Flooded | Flooded |
| 9 | Storm Drain | Flooded | Flooded | Flooded | Flooded |
| 10 | Storm Drain | Flooded | Flooded | Flooded | Flooded |
| 11 | Boat | Not affected | Above water | Above water | Flooded |
| 12 | Boat | Flooded | Flooded | Flooded | Flooded |
| 13 | Boat | Not affected | Above water | Above water | Flooded |
| 14 | Boat | Above water | Above water | Above water | Flooded |
| 15 | Boat | Not affected | Above water | Above water | Flooded |
| 16 | Boat | Not affected | Not affected | Not affected | Flooded |
| 17 | Building | Not affected | Not affected | Not affected | Flooded |
| 18 | Building | Not affected | Not affected | Not affected | Flooded |
| 19 | Building | Not affected | Not affected | Not affected | Above water |
| 20 | Building | Not affected | Not affected | Not affected | Flooded |
| 21 | Building | Not affected | Not affected | Not affected | Flooded |

| | | | | | |
|---|---|---|---|---|---|
| 22 | Building | Not affected | Not affected | Not affected | Above water |
| 23 | Building | Not affected | Not affected | Not affected | Above water |
| 24 | Building | Not affected | Not affected | Not affected | Flooded |
| 25 | Building | Not affected | Not affected | Not affected | Not affected |
| 26 | Building | Not affected | Not affected | Not affected | Flooded |
| 27 | Building | Not affected | Not affected | Not affected | Flooded |
| 28 | Building | Not affected | Not affected | Not affected | Flooded |
| 29 | School of Visual Arts (SOVA) / Yukon College | Not affected | Not affected | Not affected | Above water |
| 30 | Robert Service School | Not affected | Not affected | Not affected | Above water |
| 31 | Building | Not affected | Not affected | Not affected | Flooded |
| 32 | Alexander McDonald Lodge - Dawson City | Not affected | Not affected | Not affected | Flooded |
| 33 | Building | Not affected | Not affected | Not affected | Flooded |
| 34 | Building | Not affected | Not affected | Above water | Flooded |
| 35 | Administration Building - Dawson City | Not affected | Not affected | Not affected | Flooded |
| 36 | FMRS Office - Northern Region | Not affected | Not affected | Above water | Flooded |
| 37 | Biomass District Heating Building | Not affected | Not affected | Not affected | Flooded |

| | | | | | |
|---|---|---|---|---|---|
| 38 | Waste Water Treatment Plant - Dawson City | Not affected | Not affected | Not affected | Flooded |
| 39 | Building | Not affected | Not affected | Not affected | Flooded |
| 40 | Building | Not affected | Not affected | Flooded | Flooded |
| 41 | Building | Not affected | Not affected | Flooded | Flooded |
| 42 | Building | Not affected | Not affected | Flooded | Flooded |
| 43 | Building | Not affected | Not affected | Not affected | Flooded |
| 44 | Building | Not affected | Not affected | Above water | Flooded |
| 45 | Building | Not affected | Not affected | Not affected | Flooded |
| 46 | | Not affected | Not affected | Not affected | Flooded |
| 47 | | Not affected | Not affected | Not affected | Flooded |
| 48 | | Not affected | Not affected | Not affected | Flooded |
| 49 | | Not affected | Not affected | Not affected | Flooded |
| 50 | Building | Not affected | Not affected | Not affected | Flooded |
| 51 | Building | Not affected | Not affected | Not affected | Flooded |
| 52 | Other | Not affected | Not affected | Not affected | Above water |
| 53 | Other | Not affected | Not affected | Not affected | Flooded |
| 54 | Other | Not affected | Not affected | Not affected | Above water |
| 54 | Other | Not affected | Not affected | Not affected | Above water |
| 54 | Other | Not affected | Not affected | Not affected | Above water |
| 55 | Other | Not affected | Not affected | Not affected | Flooded |
| 56 | Other | Not affected | Not affected | Not affected | Flooded |
| 57 | Other | Not affected | Not affected | Not affected | Flooded |
| 58 | Other | Not affected | Not affected | Not affected | Flooded |
| 59 | Depression | Not affected | Not affected | Not affected | Flooded |

## 3.4 Destruction Bay

The report that accompanies the hazards classification map for Burwash Landing and Destruction Bay (Northern Climate ExChange 2013) classifies the geological hazards as:

> Green: no risk of permafrost degradation, no risk of geologic hazards.
>
> Yellow: moderate risk of permafrost degradation (i.e., moderate thaw settlement) or moderate risk of geologic hazards.
>
> Orange: moderate to high risk of permafrost degradation (i.e., moderate thaw settlement on flat terrain, poor drainage, and slow mass movement on slopes due to high pore water pressure) and moderate risk of geologic hazards.
>
> Red: moderate to high risk of permafrost degradation (i.e., high thaw settlement, water ponding, and slow to rapid mass movement on slopes due to excess pore water pressure) and/or high risk of geologic hazards.

Following is the map and table with information on geologic hazards related to YG buildings.

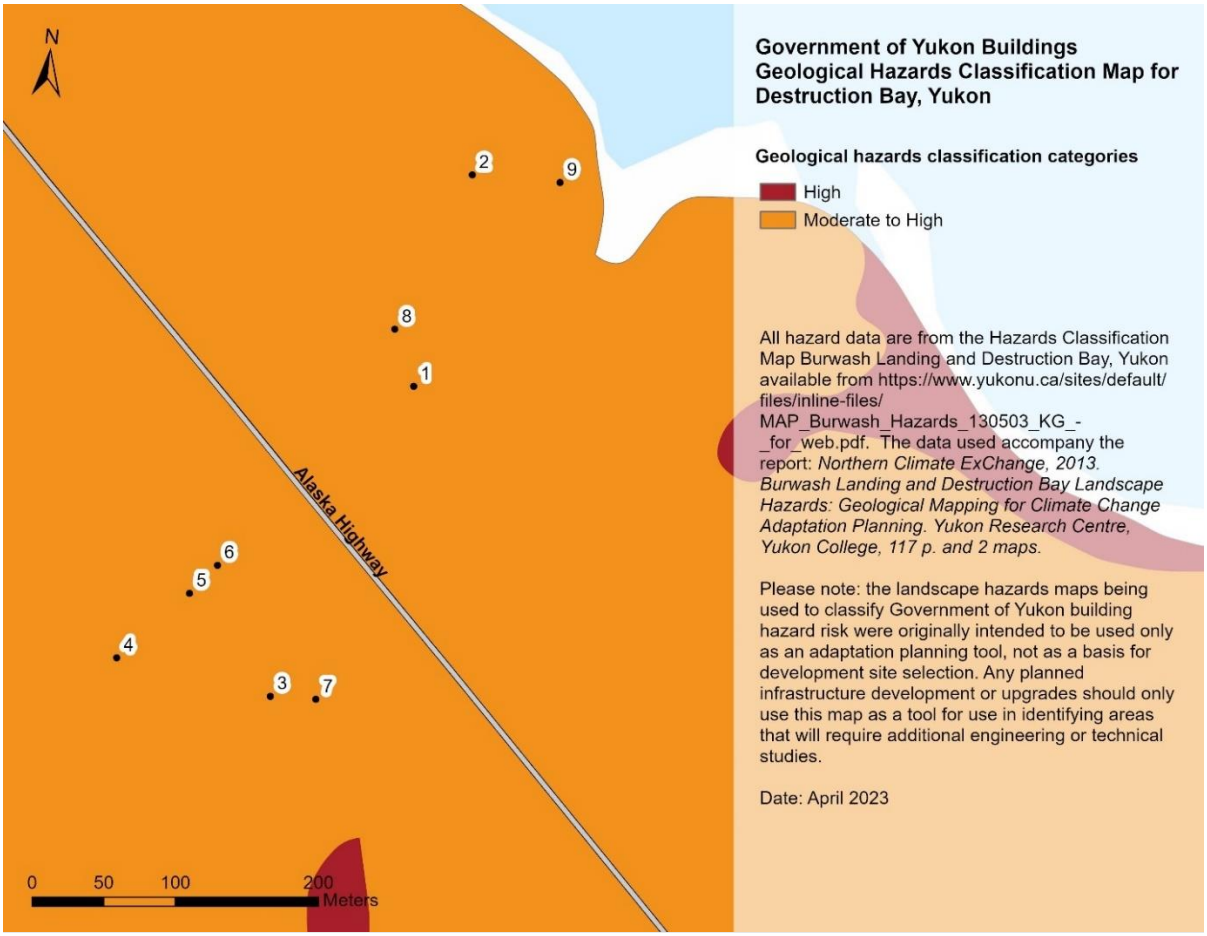


**Figure 3.4.1** Government of Yukon Buildings Geological Hazards Classification Map for Destruction Bay.

**Table 3.4.1 Government of Yukon Buildings Geological Hazards Classification for Destruction Bay.**

| Building ID | Building name | Geological hazard rating | Geological hazard type |
|---|---|---|---|
| 1 | Kluane Lake School | Moderate to High | permafrost |
| 2 | Health Centre - Destruction Bay | Moderate to High | permafrost |
| 3 | Grader Station - Destruction Bay | Moderate to High | permafrost |
| 4 | Crew Residence Foremans Trailer - Destruction Bay | Moderate to High | permafrost |
| 5 | Warehouse - Destruction Bay Grader Station | Moderate to High | permafrost |
| 6 | Storage Shed - Destruction Bay Grader Station | Moderate to High | permafrost |
| 7 | POL Storage - Destruction Bay Grader Station | Moderate to High | permafrost |
| 8 | Firehall - Destruction Bay | Moderate to High | permafrost |
| 9 | Health Centre Garage - Destruction Bay | Moderate to High | permafrost |

## 3.5 Faro

The report that accompanies the hazards classification map for Faro (Benkert, Fortier, Lipovsky, Lewkowicz, Roy, et al. 2015) classifies the geological hazards as:

> Green: low risk of hazards following permafrost degradation, low risk of geomorphic hazards.
>
> Yellow: moderate risk of hazards following permafrost degradation (e.g., moderate thaw settlement) or moderate risk of geomorphic hazards.

Red: high risk of hazards following permafrost degradation (e.g., high thaw settlement, water ponding, and slow to rapid mass movement on slopes) and/or high risk of geomorphic hazards (e.g., gullying, flooding, steep slopes).

Following are maps and the table with information on geologic hazards related to YG buildings.

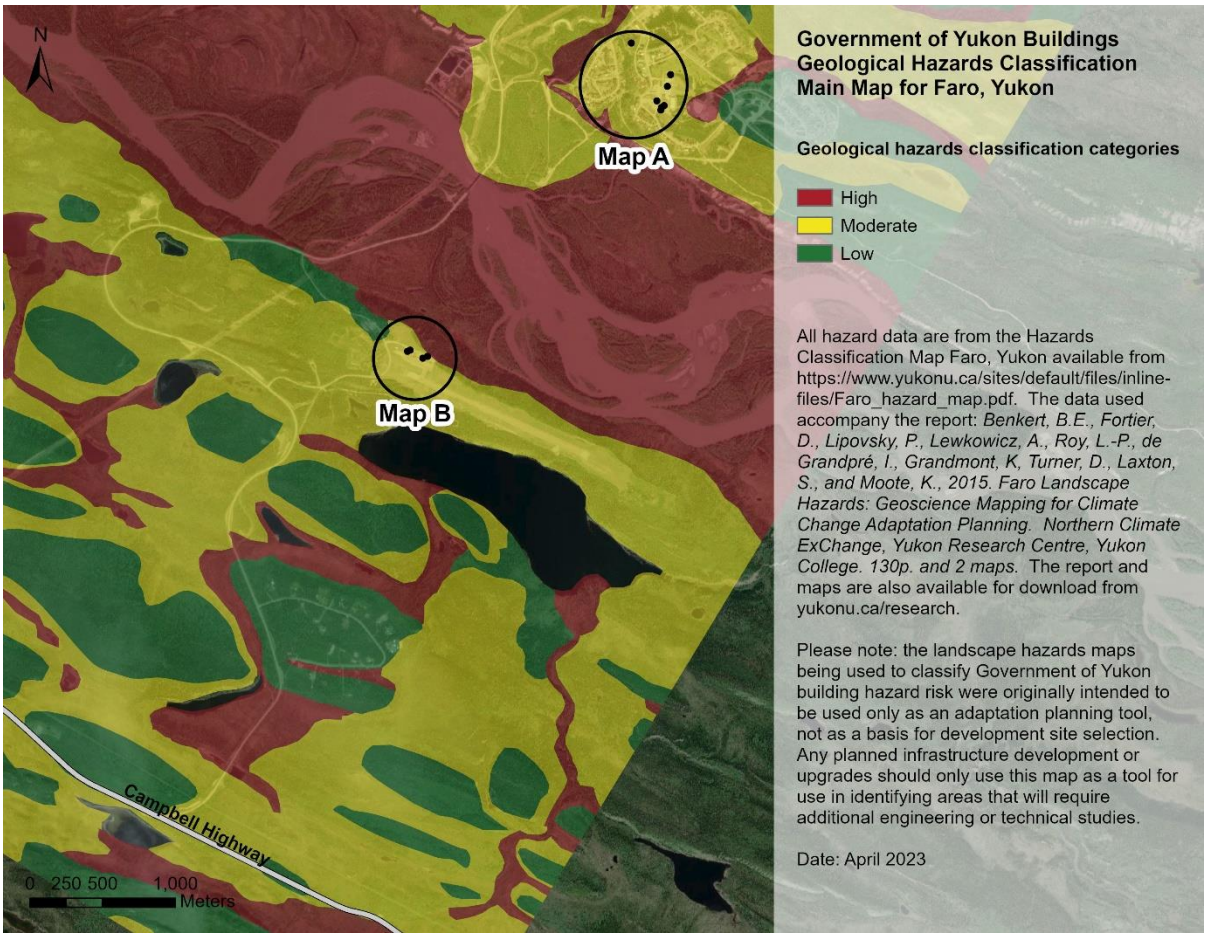


**Figure 3.5.1** Government of Yukon Buildings Geological Hazards Classification Main Map for Faro.

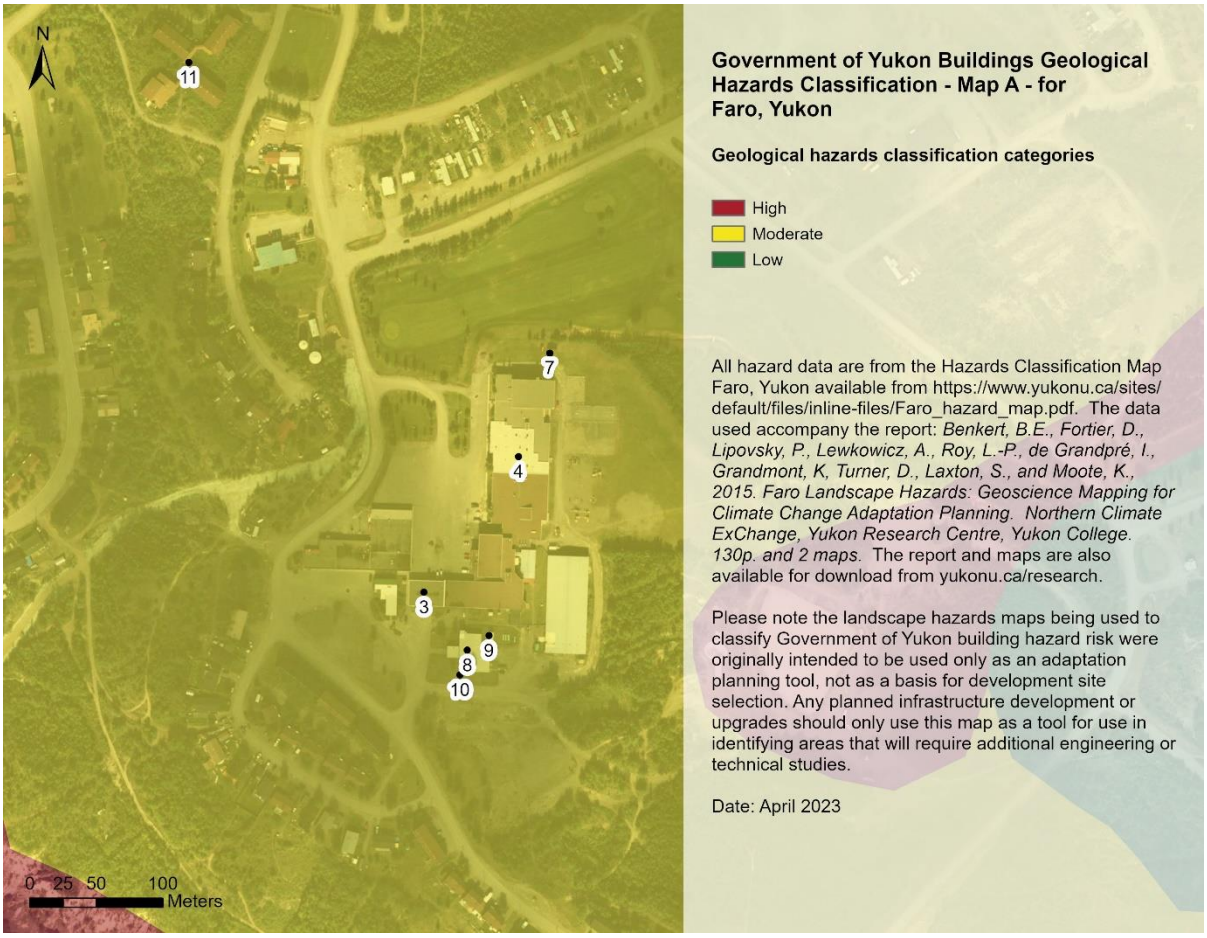


**Figure 3.5.2** Government of Yukon Buildings Geological Hazards Classification – Map A - for Faro.

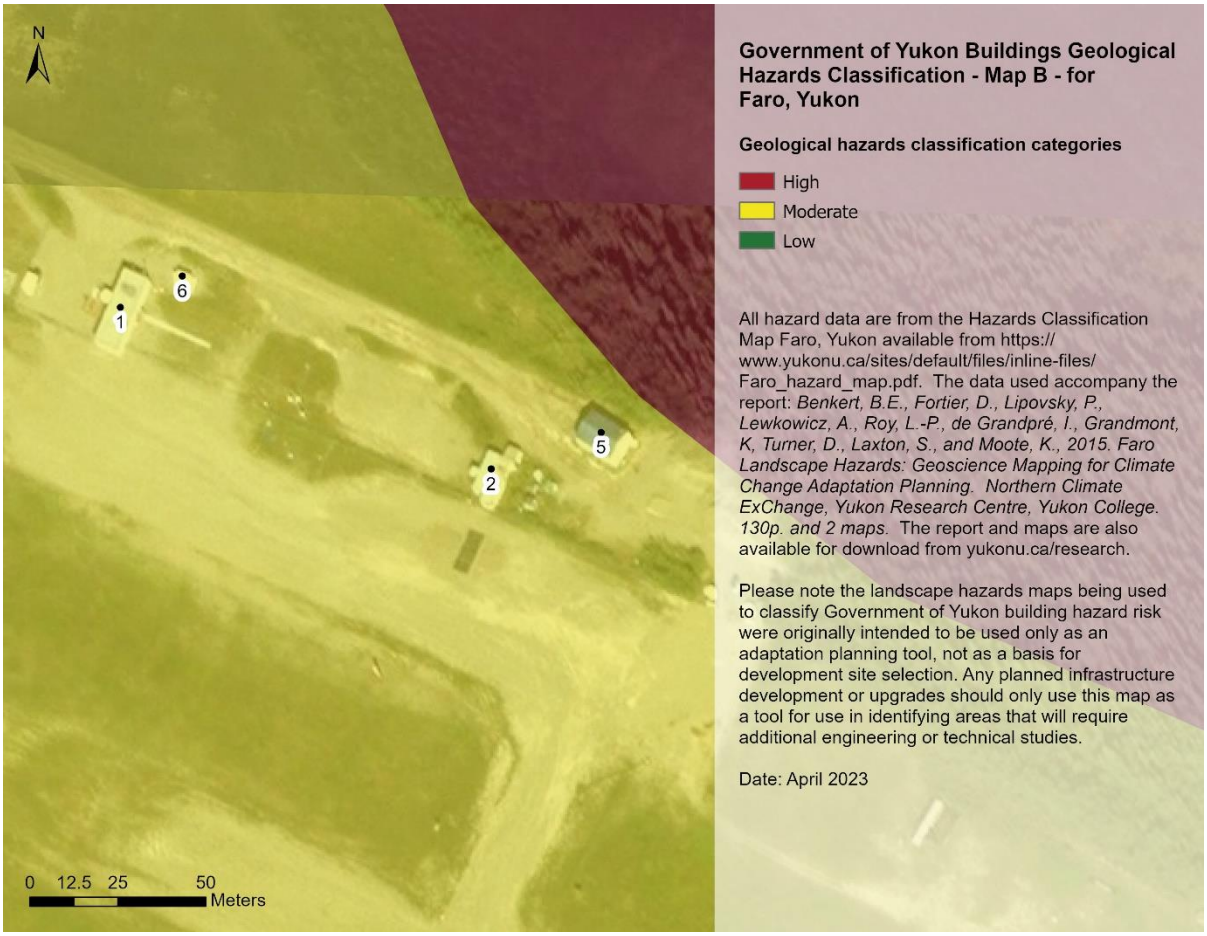


**Figure 3.5.3** Government of Yukon Buildings Geological Hazards Classification – Map B - for Faro.

**Table 3.5.1 Government of Yukon Buildings Geological Hazards Classification for Faro.**

| Building ID | Building name | Geological hazard rating | Geological hazard type |
|---|---|---|---|
| 1 | Airport Terminal - Faro | Moderate | drumlin sideslope and/or unmapped drumlins |
| 2 | NBD Facility (Old Terminal) - Faro | Moderate | drumlin sideslope and/or unmapped drumlins |
| 3 | Liquor Store - Faro | Moderate | potential permafrost at depth |
| 4 | Del Van Gorder School | Moderate | potential permafrost at depth |
| 5 | Shed Snowblower Aviation - Faro | Moderate | drumlin sideslope and/or unmapped drumlins |
| 6 | Emergency Power Unit - Faro | Moderate | drumlin sideslope and/or unmapped drumlins |
| 7 | Storage Shed - Del Van Gorder School - Faro | Moderate | potential permafrost at depth |
| 8 | Health Centre - Faro | Moderate | potential permafrost at depth |
| 9 | Generator Shed - Health Center - Faro | Moderate | potential permafrost at depth |
| 10 | Health Centre Garage - Faro | Moderate | potential permafrost at depth |
| 11 | Chateau Jomini Complex - Faro | Moderate | potential permafrost at depth |

## 3.6 Mayo

The report that accompanies the hazards classification map for Mayo (Northern Climate ExChange 2011a) classifies the geological hazards as:

> Green: Low - Stable landform. Unlikely to be affected by mass movement, thermokarst, subsidence, bank erosion, flooding or instability. These landforms typically consist of gravel or sand, are well drained and have shallow to moderate slopes. Low hazard landforms may contain little to no permafrost and are above the floodplain of the Stewart or Mayo rivers.
>
> Yellow: Medium - Unlikely to be affected by mass movement, thermokarst, subsidence, bank erosion, flooding or instability. These landforms typically consist of gravel, sand, glacial diamict or colluvial materials. They are well to moderately drained and have shallow to steep slopes. Medium hazard landforms may have moderate amounts of permafrost and may occur within an area of shallow groundwater.
>
> Red: High - Unstable landform. Likely to be affected by mass movement, thermokarst, subsidence, bank erosion, flooding or instability. These landforms typically consist of glacial diamicts, colluvial materials, glaciolacustrine, lacustrine and fluvial deposits. They are generally moderately to poorly drained and have shallow to steep slopes. High hazard landforms may have a significant thickness of permafrost containing high ice contents, be prone to gravity-induced erosion, and occur within the floodplain of the Stewart or Mayo rivers.

Following is the map and table with information on geologic hazards related to YG buildings.

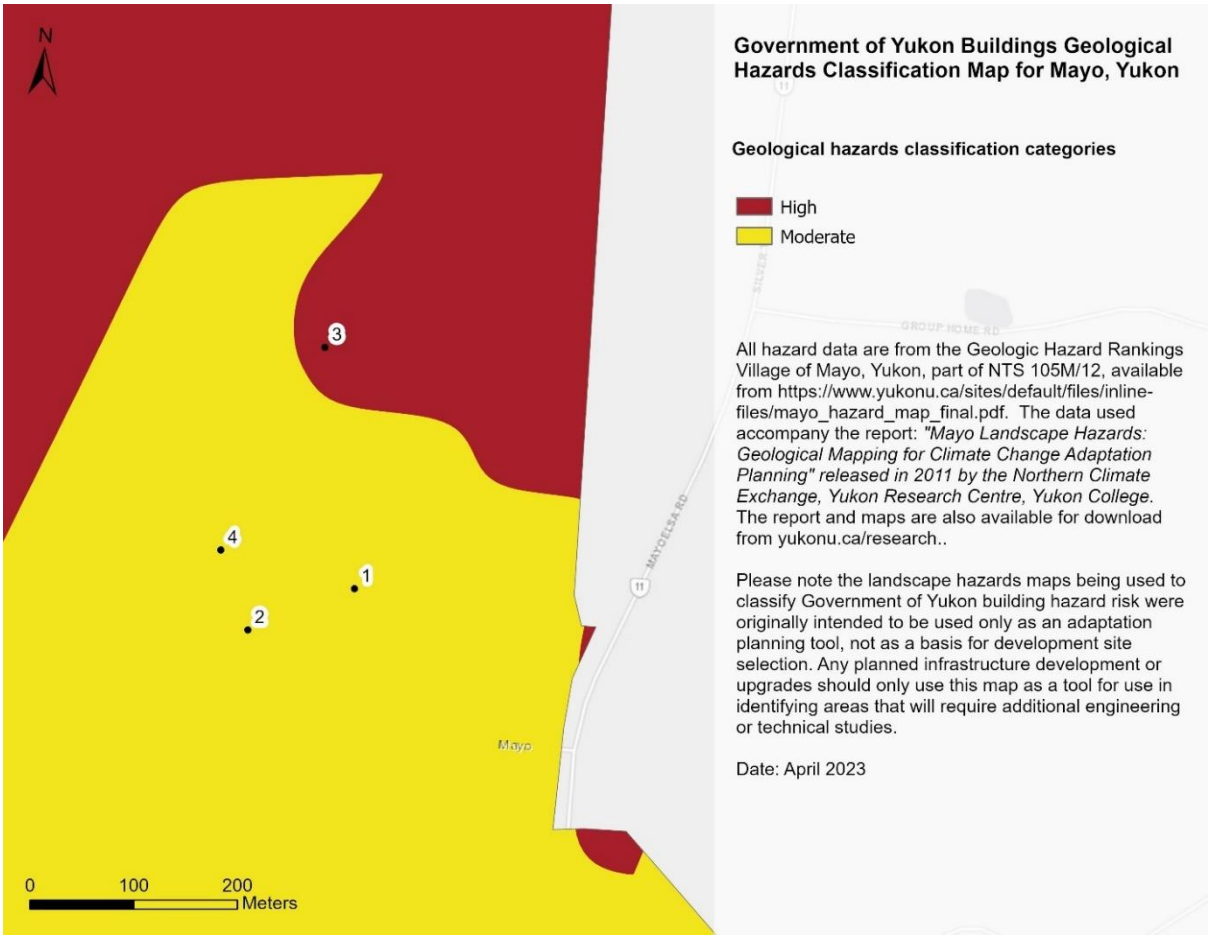


**Figure 3.6.1** Government of Yukon Buildings Geological Hazards Classification Map for Mayo.

**Table 3.6.1 Government of Yukon Buildings Geological Hazards Classification for Mayo.**

| Building ID | Building name | Geological hazard rating | Geological hazard type |
|---|---|---|---|
| 1 | Health Centre - Mayo | Moderate | permafrost, shallow groundwater table |
| 2 | Administration Building - Mayo | Moderate | permafrost, shallow groundwater table |
| 3 | J.V. Clark School | High | permafrost, shallow groundwater, flooding |
| 4 | Mining Recorder's Office - Mayo | Moderate | permafrost, shallow groundwater table |

## 3.7 Old Crow

The report that accompanies the hazards classification map for Old Crow (Benkert et al. 2016) classifies geological hazards as:

> Green: Low-Risk terrain in the Old Crow area is characterized by flat to gently sloped terrain comprised of well-drained gravel or weathered bedrock surface materials. Low-risk terrain contains permafrost that may be ice rich, but it is less likely to be affected by flooding and mass movement than more hazardous terrain in the map area.
>
> Yellow: Moderate-Risk terrain in the Old Crow area is characterized by gentle to moderate slopes with moderate to poor drainage. Moderate-risk terrain is found on the pediment slopes of Berry Hill, as well as on poorly drained parts of the fluvial terrace near the North Road and school subdivisions. Moderate-risk terrain contains finer grained material compared with material found in low-risk terrain and is almost always affected by permafrost with high potential for thaw settlement.

Orange: Moderately High-Risk terrain in the Old Crow area is characterized by moderate to steep slopes with all slope aspects. Moderately high-risk terrain is found on the steep escarpment above town, and in areas subject to regular flooding. Moderately high-risk terrain contains permafrost and is subject to landslides related to poor slope drainage and permafrost thaw. The difference between moderate and moderately high-risk terrain in the study area is largely related to landslide susceptibility.

Red: High-Risk terrain in the Old Crow area is characterized by steep slopes and warm aspects (i.e., west and south facing). It is characterized by an increased risk of landslides. High risk terrain in the study area occurs in areas with documented landslide debris, paths, or features of slow mass movement such as tension cracks. High-risk terrain contains both permafrost and fine-grained surficial materials on steep to very steep slopes that can easily generate landslides with significant run-out distances.

Following are the maps and the table with information on geologic hazards related to YG buildings.

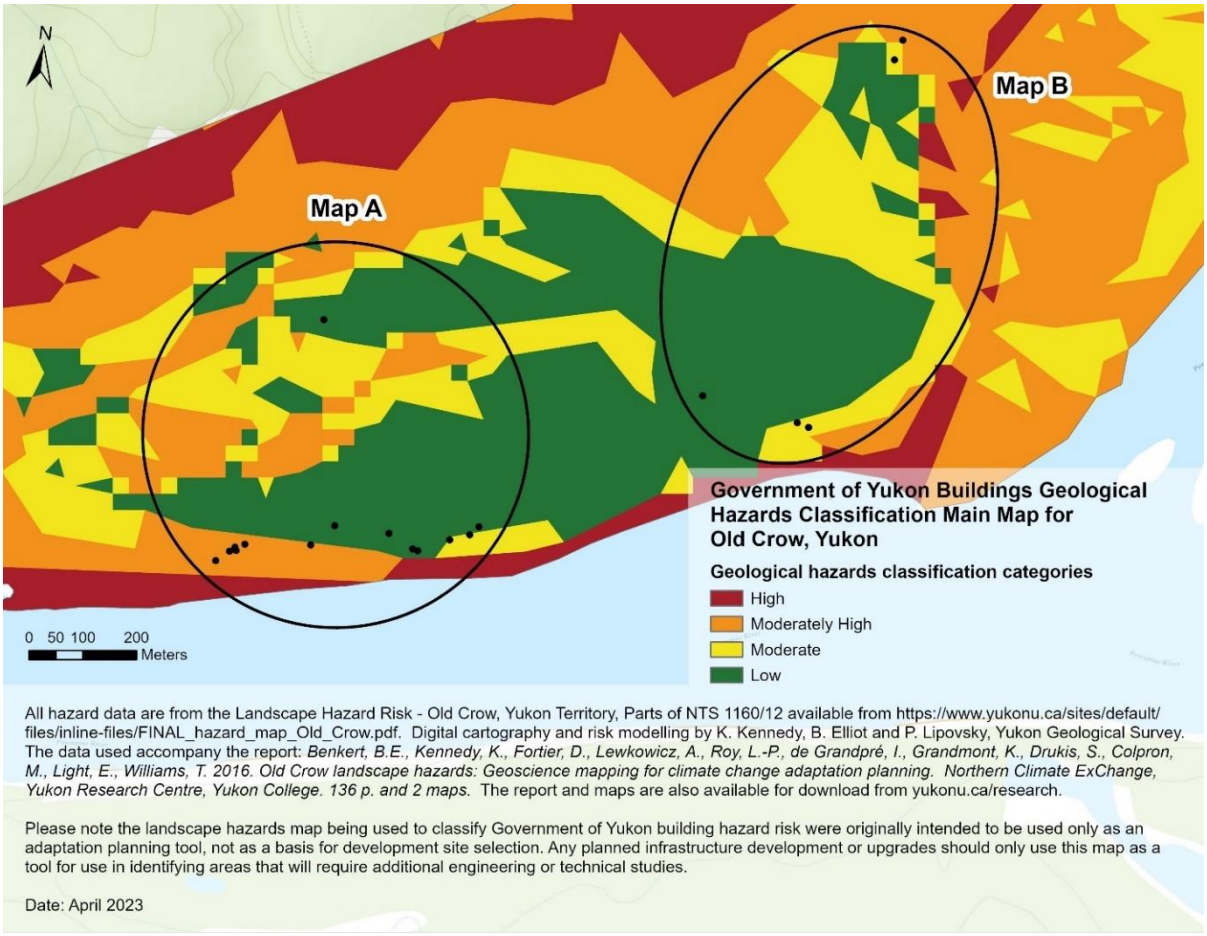


**Figure 3.7.1** Government of Yukon Buildings Geological Hazards Classification Main Map for Old Crow.


**Figure 3.7.2** Government of Yukon Buildings Geological Hazards Classification – Map A - for Old Crow.


**Figure 3.7.3** Government of Yukon Buildings Geological Hazards Classification – Map B - for Old Crow.

**Table 3.7.1 Government of Yukon Buildings Geological Hazards Classification for Old Crow.**

| Building ID | Building name | Geological hazard rating |
|---|---|---|
| 1 | Old Crow School | Moderate |
| 9 | Yukon College Community Campus - Old Crow | Low |
| 23 | Health Centre/Residence - Old Crow | Moderate |
| 24 | Water Treatment Plant - Old Crow | Moderate |
| 27 | Firehall/3-Bay Garage - Old Crow | Low |
| 44 | Workshop - Old Crow | Moderately High |
| 45 | Garage - Old Crow | Moderately High |
| 55 | Storage and Ice House - Old Crow | Low |
| 56 | Storage Shed 16' x 19' - Old Crow | Moderately High |
| 57 | Storage Shed - Old Crow | Low |
| 58 | Grader Station - Old Crow | Moderately High |
| 59 | Generator Shed - Old Crow | Low |
| 60 | Shed Fuel Storage Airport - Old Crow | Moderately High |
| 61 | Shed Fuel Storage Grader Station - Old Crow | Moderately High |
| 62 | Communications Equipment Storage - Old Crow | Low |
| 63 | District Office Forestry - Old Crow | Moderate |
| 64 | Warehouse Forestry - Old Crow | Moderate |
| 65 | Shed Chief Zzeh Gittlit School - Old Crow | Moderately High |

The report that accompanies the flood vulnerability maps for Old Crow (Turcotte and Saal 2022) presents 3 flooding scenarios based on a frequency analysis of high-water levels, as well as one flooding scenario based on records from a flood event in 1991. The flood scenarios based on the frequency analysis are scenarios that have a likelihood of occurring either every two years, every 20 years or every 200 years.

The flood vulnerability mapping done for Old Crow included a detailed survey of assets within the community and a related assessment of flood vulnerability for those assets for the four scenarios. When comparing the YG building data with the surveyed assets, it was noted that only some of the YG buildings in Old Crow have associated flood vulnerability information.

Below are the flood vulnerability maps and table of surveyed assets with their associated flood vulnerability. The YG buildings are highlighted in purple. Any YG buildings not listed within the table had no flood information associated with the maps below.

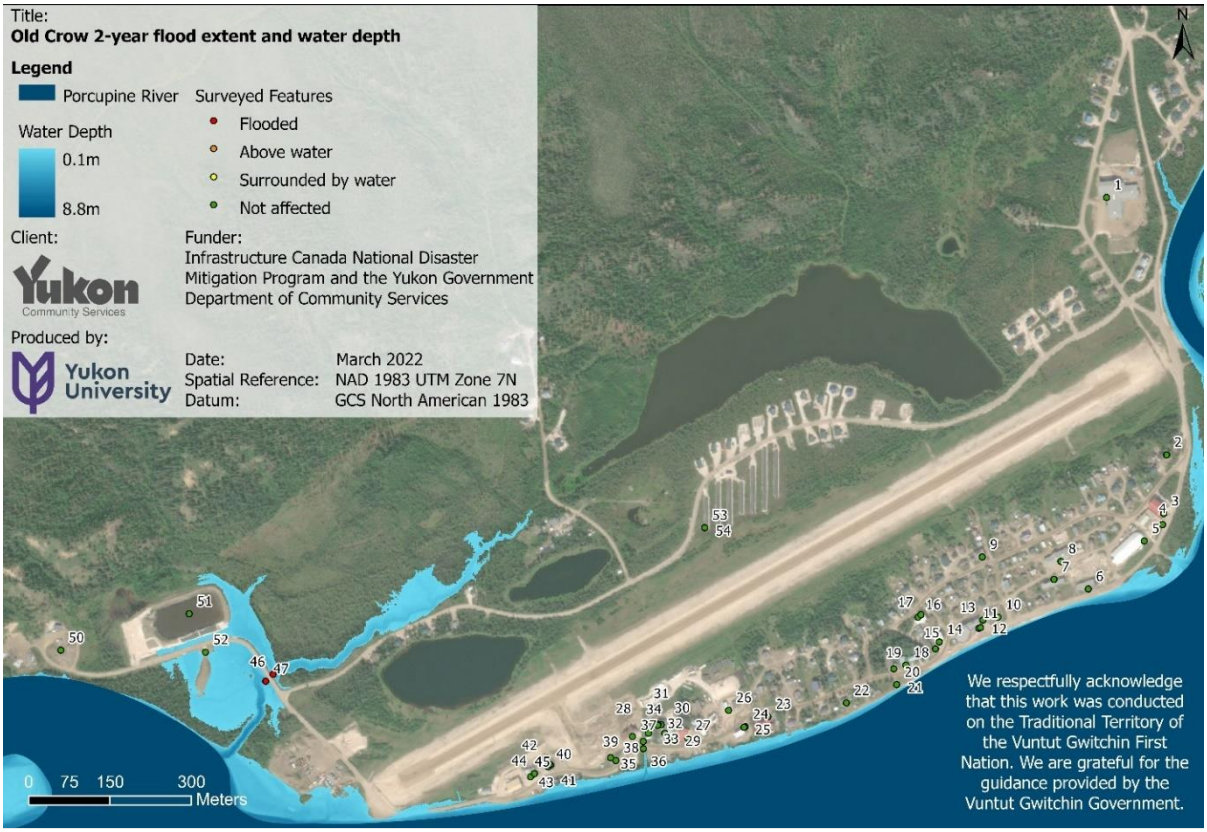


**Figure 3.7.4** Old Crow 2-year flood extent and water depth.

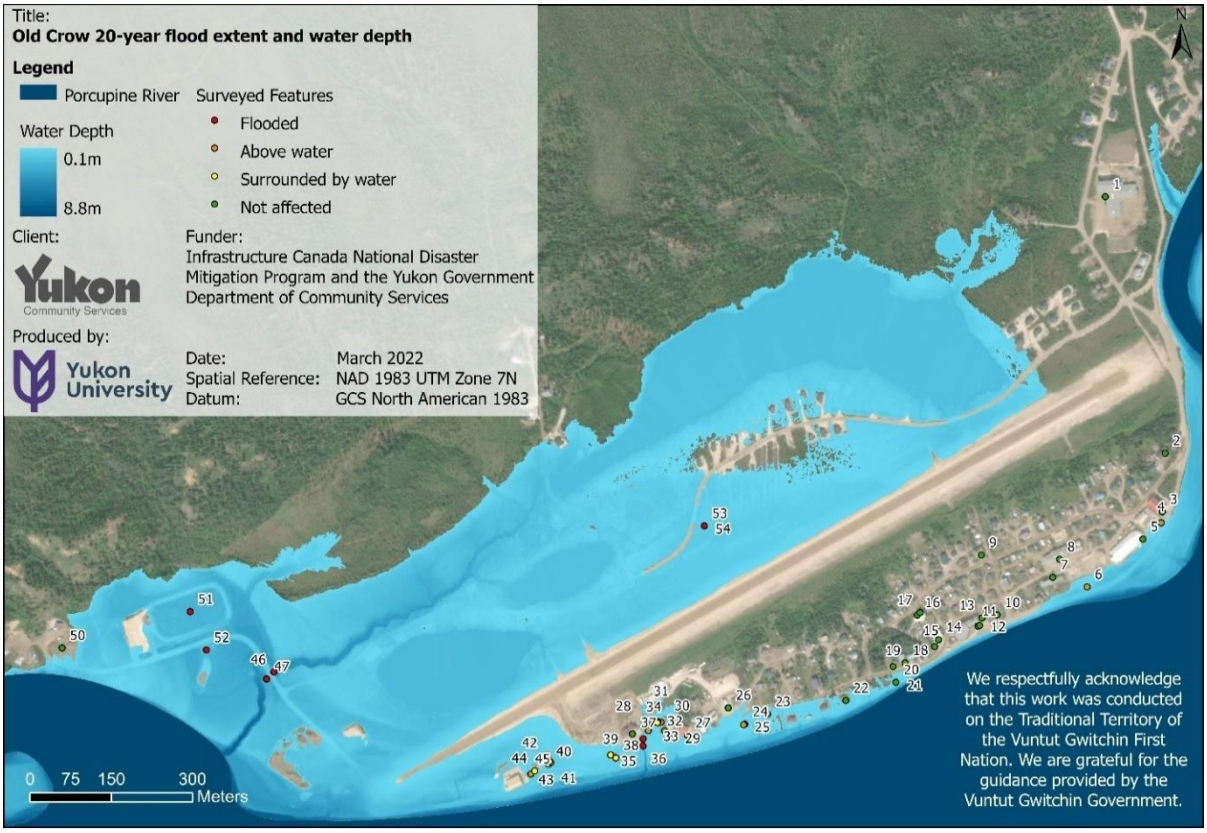


**Figure 3.7.5** Old Crow 20-year flood extent and water depth.

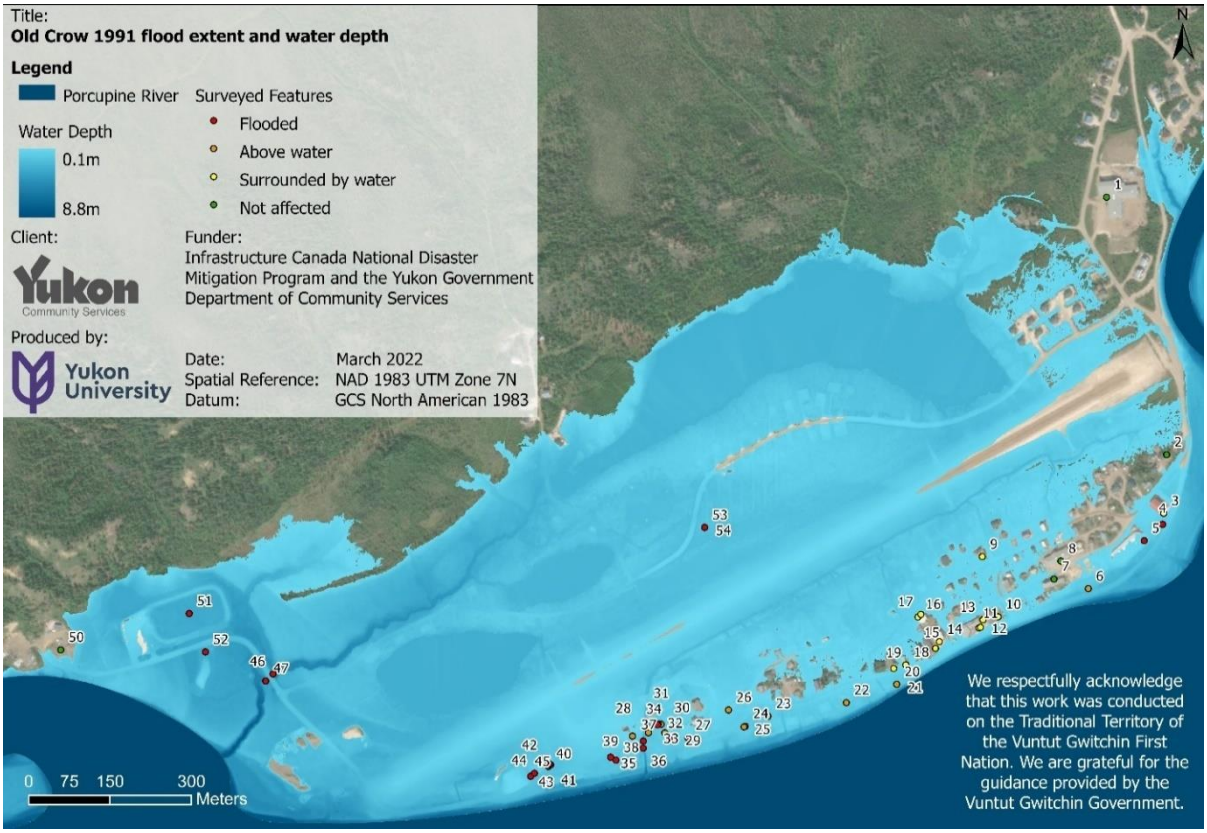


**Figure 3.7.6** Old Crow 1991 flood extent and water depth.

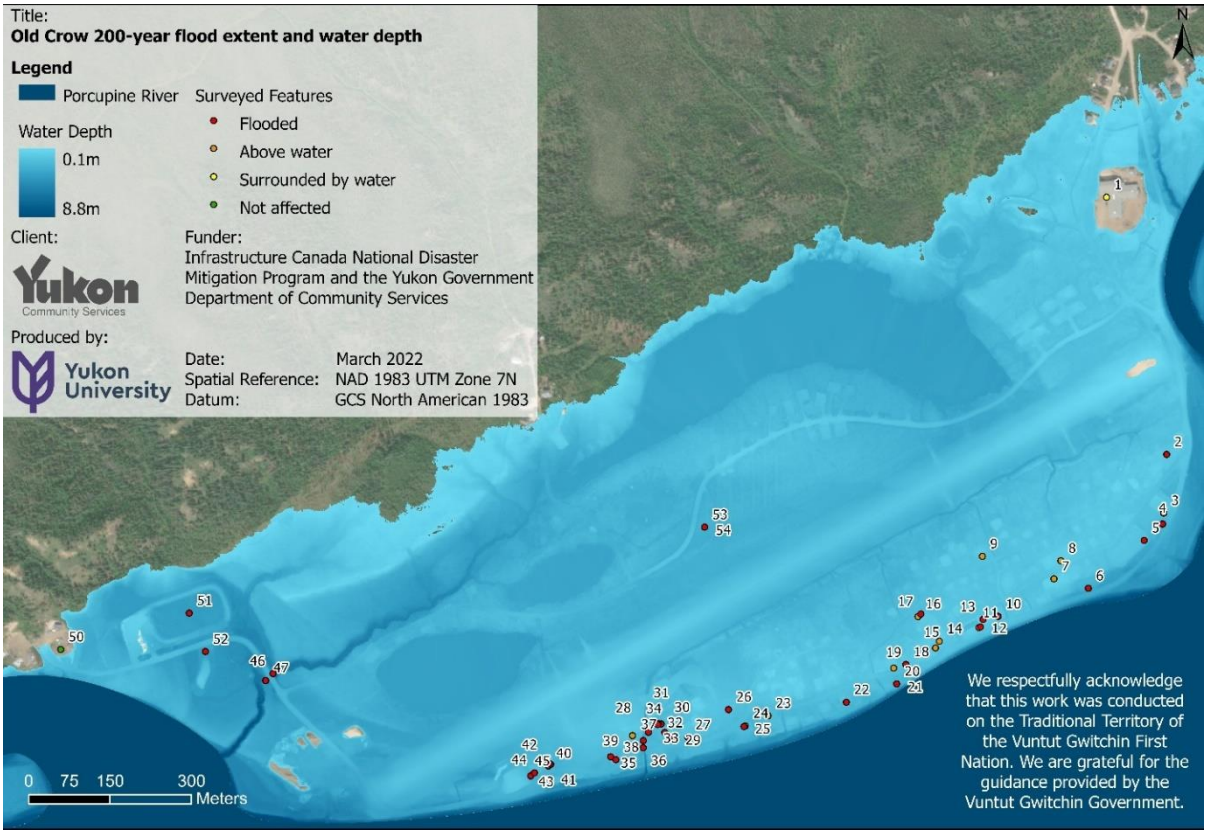


**Figure 3.7.7** Old Crow 200-year flood extent and water depth.

**Table 3.7.2 Old Crow flood risk for surveyed buildings.**

| Building ID | Building name | 2 year flood | 20 year flood | 1991 flood | 200 year flood |
|---|---|---|---|---|---|
| 1 | Old Crow School | Not affected | Not affected | Not affected | Surrounded by water |
| 2 | Trinin Tsul Zheh, Family Dayhome | Not affected | Not affected | Not affected | Flooded |
| 3 | Coop | Not affected | Not affected | Surrounded by water | Above water |
| 4 | Wood and other storage yard | Not affected | Above water | Flooded | Flooded |
| 5 | Arena | Not affected | Not affected | Flooded | Flooded |
| 6 | Old Crow Arctic Research Facility | Not affected | Above water | Above water | Flooded |
| 7 | John Tizya Centre | Not affected | Not affected | Not affected | Above water |
| 8 | Sarah Abel Chitze Building | Not affected | Not affected | Not affected | Above water |
| 9 | Yukon College Community Campus | Not affected | Not affected | Surrounded by water | Above water |
| 10 | Old Crow Community Centre | Not affected | Not affected | Surrounded by water | Flooded |
| 11 | New Community Centre | Not affected | Not affected | Surrounded by water | Above water |
| 12 | Boardwalk around New Community Centre | Not affected | Not affected | Surrounded by water | Flooded |
| 13 | Fuel tank for new community centre | Not affected | Not affected | Surrounded by water | Flooded |
| 14 | RCMP main building | Not affected | Not affected | Surrounded by water | Above water |

| | | | | | |
|---|---|---|---|---|---|
| 15 | RCMP Temporary quarters | Not affected | Not affected | Surrounded by water | Above water |
| 16 | RCMP building | Not affected | Not affected | Surrounded by water | Above water |
| 17 | RCMP building | Not affected | Not affected | Surrounded by water | Flooded |
| 18 | Old church | Not affected | Not affected | Surrounded by water | Flooded |
| 19 | New church | Not affected | Not affected | Surrounded by water | Above water |
| 20 | Water survey station | Not affected | Surrounded by water | Flooded | Flooded |
| 21 | Water survey station | Not affected | Not affected | Above water | Flooded |
| 22 | Old Crow B&B | Not affected | Not affected | Above water | Flooded |
| 23 | Health Centre/Residence - Old Crow | Not affected | Above water | Above water | Above water |
| 24 | Water Treatment Plant - Old Crow | Not affected | Above water | Above water | Above water |
| 25 | Water treatment facility | Not affected | Above water | Above water | Flooded |
| 26 | Porcupine enterprises | Not affected | Not affected | Above water | Flooded |
| 27 | Firehall/3-Bay Garage - Old Crow | Not affected | Not affected | Flooded | Flooded |
| 28 | Northwestel building | Not affected | Above water | Above water | Flooded |
| 29 | ATCO old diesel generator | Not affected | Not affected | Flooded | Flooded |

| | | | | | |
|---|---|---|---|---|---|
| 30 | ATCO diesel tanks 1 & 2 | Not affected | Not affected | Above water | Flooded |
| 31 | ATCO new generator, blue roof | Not affected | Above water | Above water | Flooded |
| 32 | ATCO white batery | Not affected | Above water | Above water | Above water |
| 33 | ATCO transformer (green) | Not affected | Surrounded by water | Flooded | Flooded |
| 34 | Metal track with electric cables | Not affected | Surrounded by water | Flooded | Flooded |
| 35 | South airport culvert drainage | Not affected | Flooded | Flooded | Flooded |
| 36 | South airport culvert drainage | Not affected | Flooded | Flooded | Flooded |
| 37 | Airport Terminal-Old Crow | Not affected | Not affected | Above water | Above water |
| 38 | Two grey fuel tanks, west of airport terminal | Not affected | Surrounded by water | Flooded | Flooded |
| 39 | Dike around fuel tanks | Not affected | Surrounded by water | Flooded | Flooded |
| 40 | large fuel tanks and smaller white ones | Not affected | Surrounded by water | Flooded | Flooded |
| 41 | Smaller white tank | Not affected | Surrounded by water | Flooded | Flooded |
| 42 | Tank at the back | Not affected | Surrounded by water | Flooded | Flooded |
| 43 | Dike around fuel tanks | Not affected | Surrounded by water | Flooded | Flooded |
| 44 | Workshop - Old Crow | Not affected | Surrounded by water | Flooded | Flooded |

| | | | | | |
|---|---|---|---|---|---|
| 45 | Garage - Old Crow | Not affected | Above water | Flooded | Flooded |
| 46 | Large culvert draining north of airstrip, upstream | Not affected | Flooded | Flooded | Flooded |
| 47 | Large culvert draining north of airstrip, downstream | Flooded | Flooded | Flooded | Flooded |
| 50 | Household waste dump | Not affected | Not affected | Not affected | Not affected |
| 51 | Sewage lagoon | Not affected | Flooded | Flooded | Flooded |
| 52 | Community metal dump | Not affected | Flooded | Flooded | Flooded |
| 53 | Solar farm | Not affected | Above water | Flooded | Flooded |
| 54 | Solar farm | Not affected | Flooded | Flooded | Flooded |

## 3.8 Pelly Crossing

The report that accompanies the hazards classification map for Pelly Crossing (Northern Climate ExChange 2011b) classifies hazards as:

> Green: Low - Stable landform. Unlikely to be affected by mass movement, thermokarst, subsidence, bank erosion, flooding or instability. These landforms typically consist of gravel or sand, are well drained, and have shallow to moderate slopes. Low hazard landforms may contain little to no permafrost and are above the floodplain of the Pelly River. Low hazard landforms are unlikely to become unstable under predicted changes in climate.

Yellow: Medium - Unlikely to be affected by mass movement, thermokarst, subsidence, bank erosion, flooding or instability. These landforms typically consist of gravel, sand, glacial diamict or colluvial materials. They are well to moderately drained and have shallow to steep slopes. Medium hazard landforms may have moderate amounts of permafrost and may occur within an area of shallow groundwater. Medium hazard landforms are likely to become either more or less stable under predicted changes in climate.

Red: High - Unstable landform. Likely to be affected by mass movement, thermokarst, subsidence, bank erosion, flooding or instability. These landforms typically consist of glacial diamicts, colluvial materials, glaciolacustrine, lacustrine and fluvial deposits. They are generally moderately to poorly drained and have shallow to steep slopes. High hazard landforms may have a significant thickness of permafrost containing high ice contents, be prone to gravity-induced erosion, and occur within the floodplain of the Pelly River. High hazard landforms are likely to become either more or less stable under predicted changes in climate

Following is the map and table with information on geologic hazards related to YG buildings.

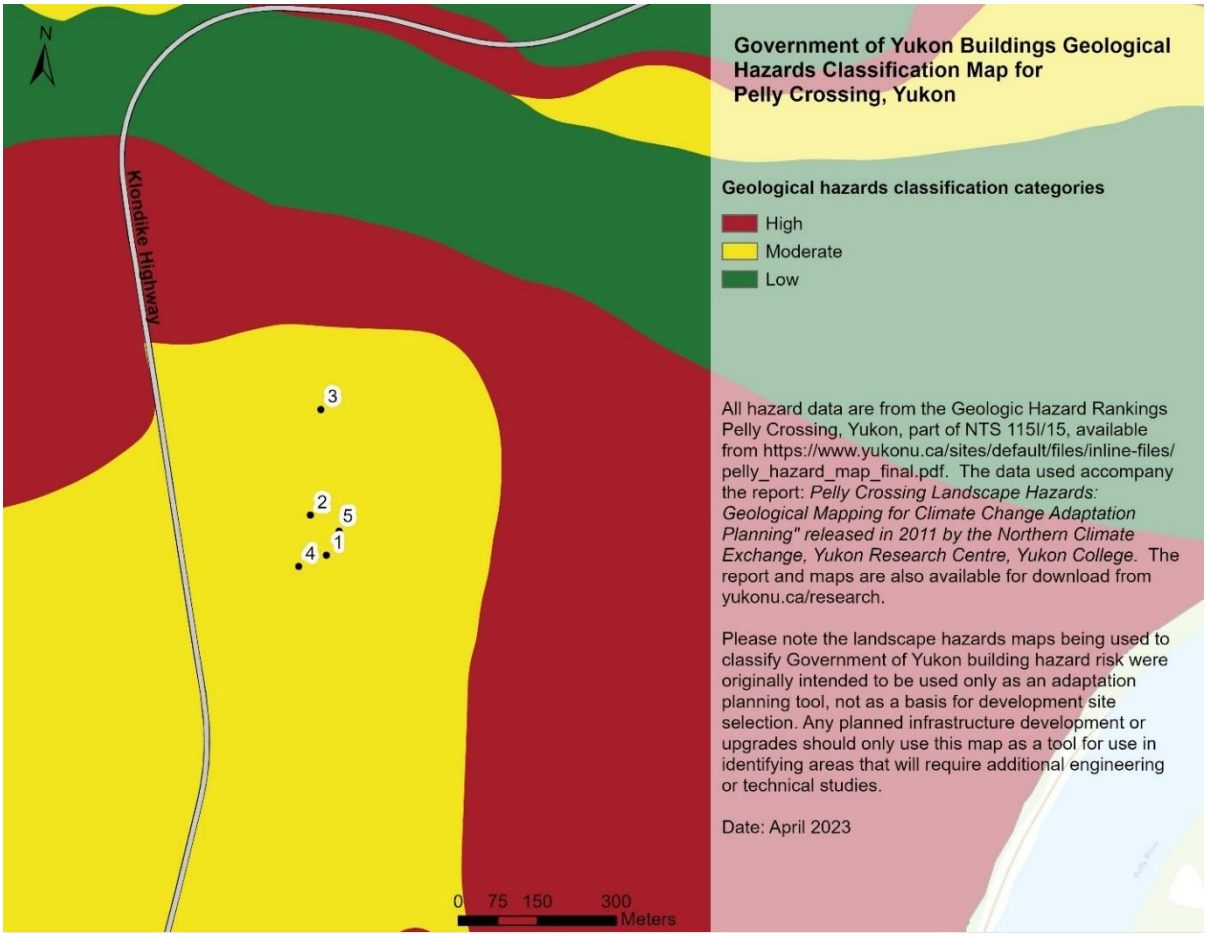


**Figure 3.8.1** Government of Yukon Buildings Geological Hazards Classification Map for Pelly Crossing.

**Table 3.8.1 Government of Yukon Buildings Geological Hazards Classification for Pelly Crossing.**

| Building ID | Building name | Geological hazard rating | Geological hazard type |
|---|---|---|---|
| 1 | Eliza Van Bibber School | Moderate | Flooding risk, riverbank erosion |
| 2 | Health Centre | Moderate | Flooding risk, riverbank erosion |
| 3 | Swimming Pool | Moderate | Flooding risk, riverbank erosion |
| 4 | Garage Eliza Van Bibber School | Moderate | Flooding risk, riverbank erosion |
| 5 | Yukon College Campus Pelly Crossing | Moderate | Flooding risk, riverbank erosion |

## 3.9 Ross River

The report that accompanies the hazards classification map for Ross River (Benkert, Fortier, Lipovsky, Lewkowicz, de Grandpré, et al. 2015) classifies hazards as:

> Green: low risk of hazards following permafrost degradation or low risk of geomorphic hazards.
>
> Yellow: moderate risk of hazards following permafrost degradation (e.g., moderate thaw settlement) or moderate risk of geomorphic hazards.
>
> Red: high risk of hazards following permafrost degradation (e.g., high thaw settlement, water ponding, and slow to rapid mass movement on slopes) and/or high risk of geomorphic hazards (e.g., gullying, flooding, steep slopes).

Following are the maps and the table with information on geologic hazards related to YG buildings.

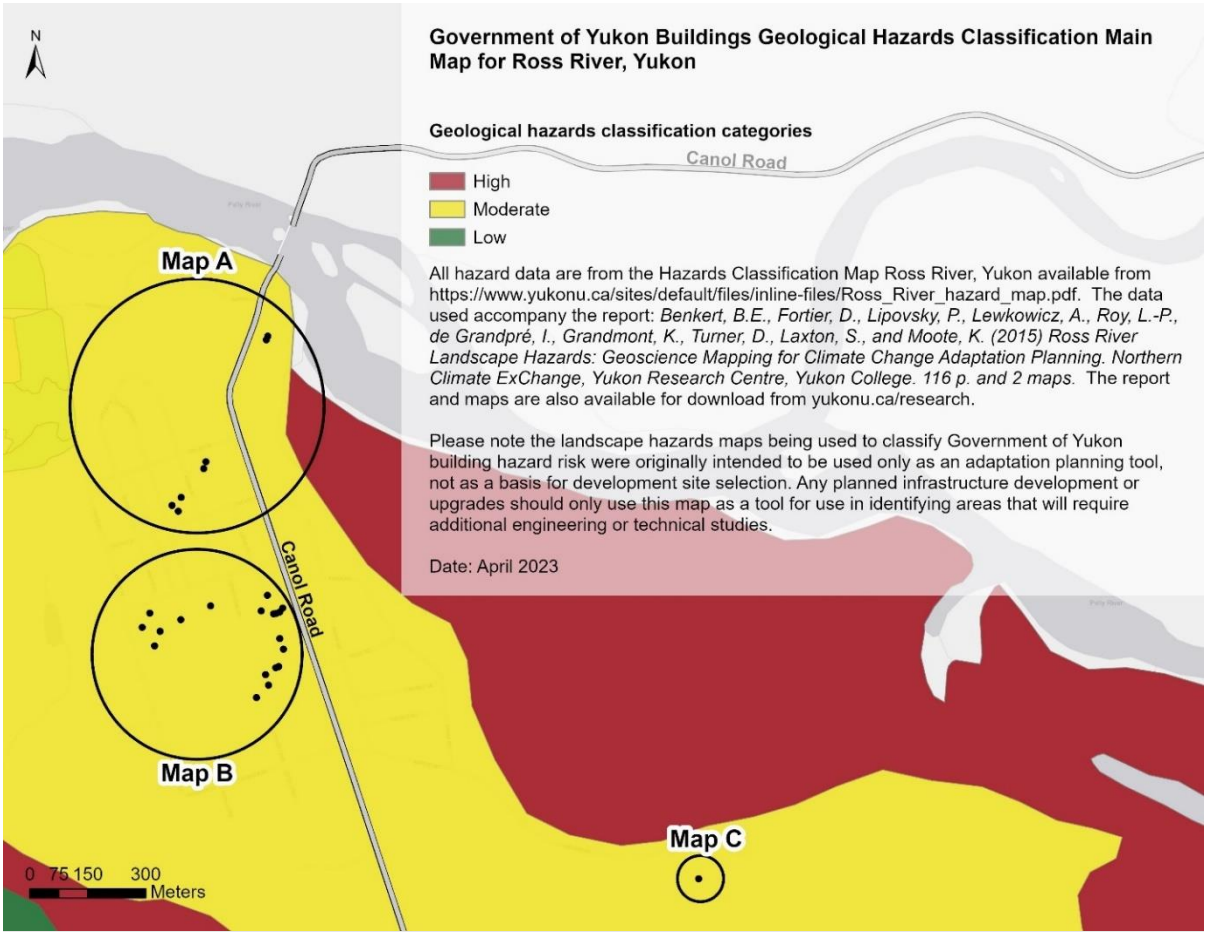


**Figure 3.9.1** Government of Yukon Buildings Geological Hazards Classification Main Map for Ross River.

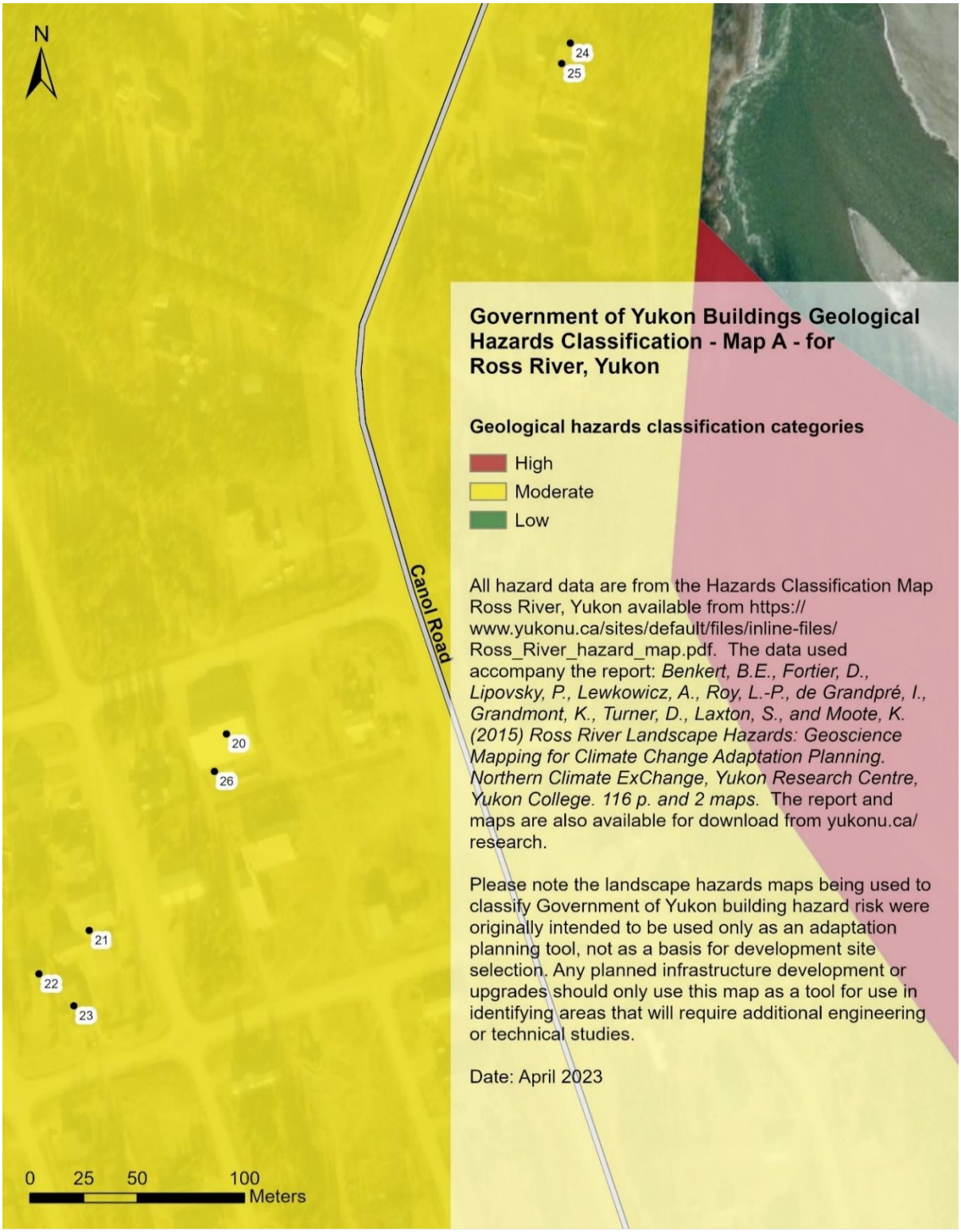


**Figure 3.9.2** Government of Yukon Buildings Geological Hazards Classification – Map A - for Ross River.

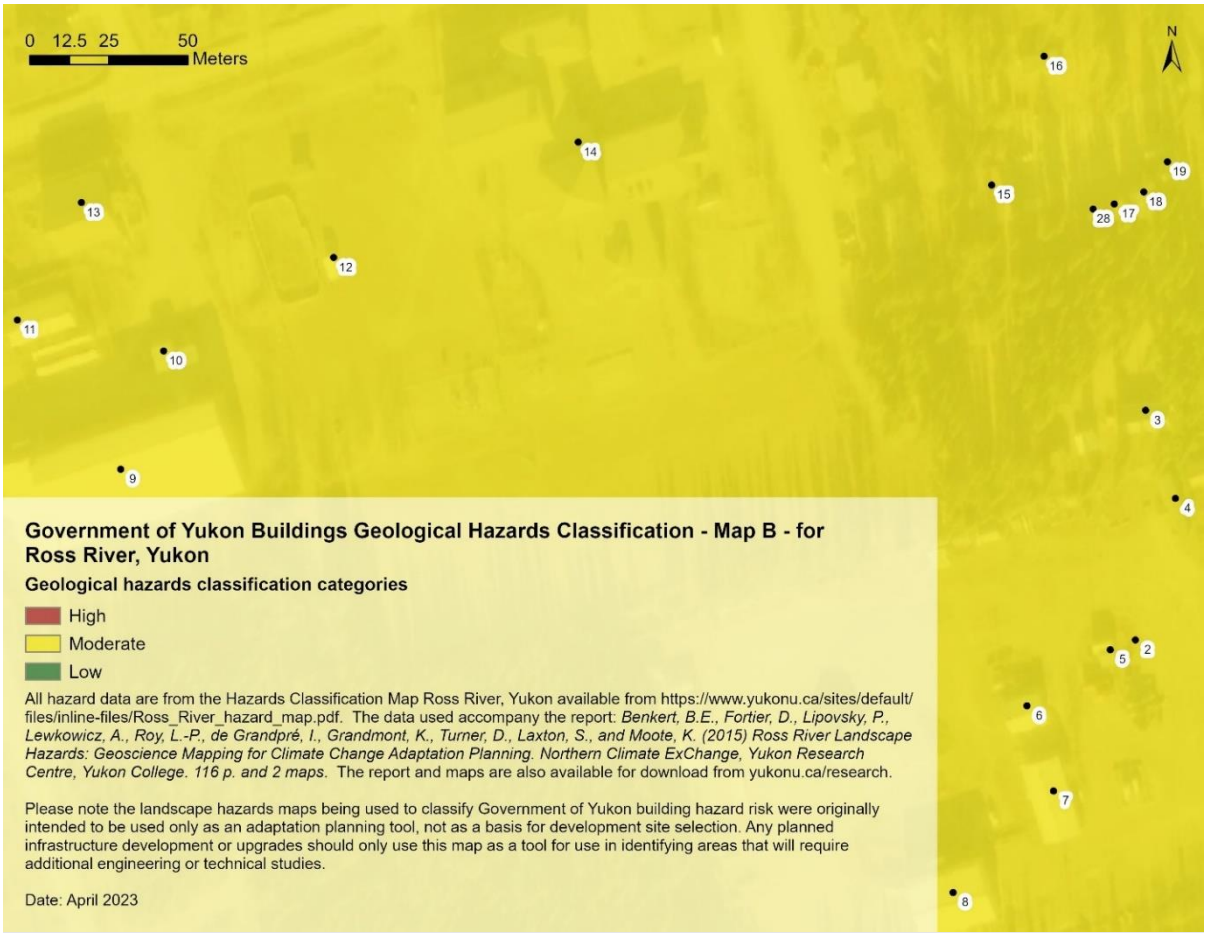


**Figure 3.9.3** Government of Yukon Buildings Geological Hazards Classification – Map B - for Ross River.

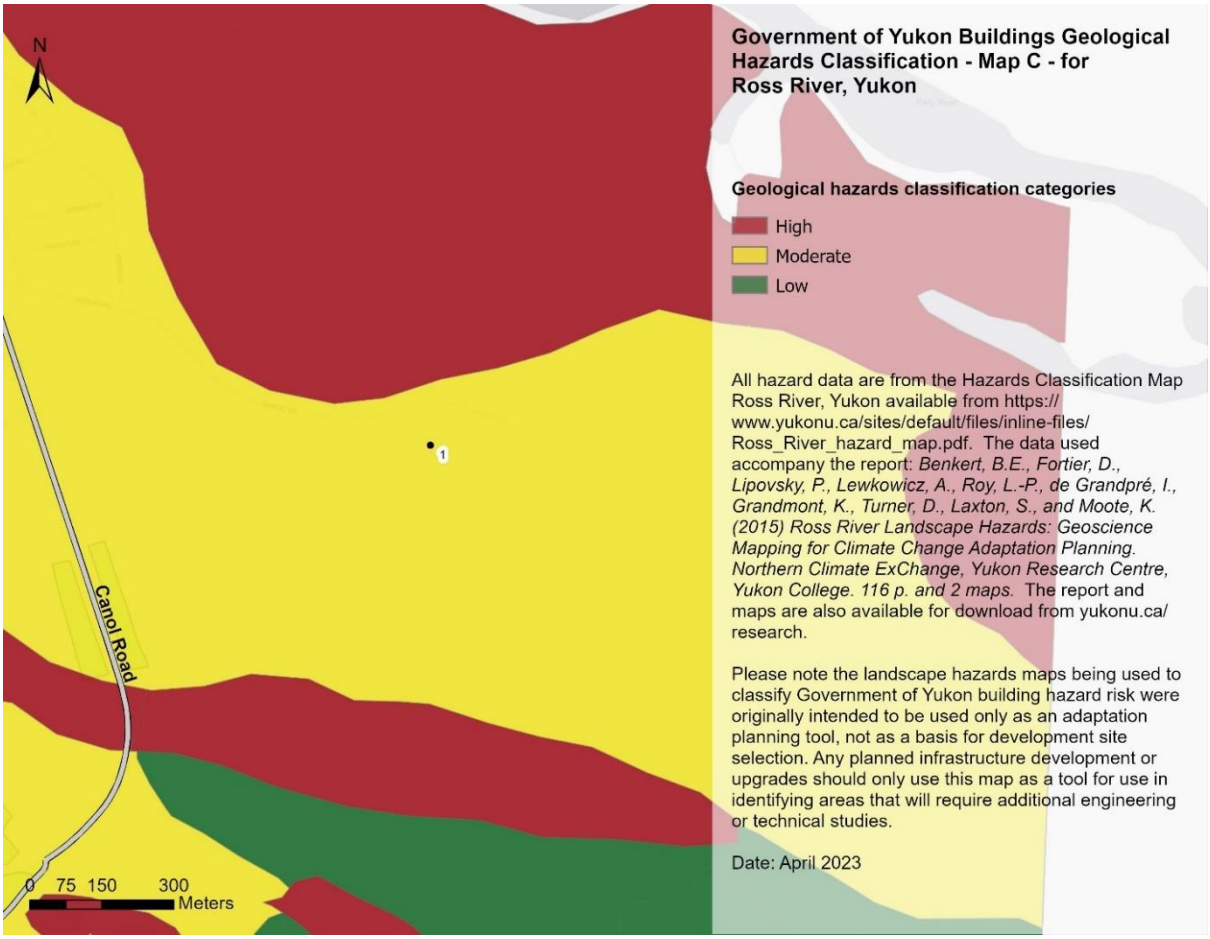


**Figure 3.9.4** Government of Yukon Buildings Geological Hazards Classification – Map C - for Ross River.

**Table 3.9.1 Government of Yukon Buildings Geological Hazards Classification for Ross River.**

| Building ID | Building name | Geological hazard rating | Geological hazard type |
|---|---|---|---|
| 1 | Airport Terminal - Ross River | Moderate | Ice-rich permafrost |
| 2 | Storage - Ross River | Moderate | Ice-rich permafrost |
| 3 | Warehouse Workshop - Ross River | Moderate | Ice-rich permafrost |
| 4 | Crew Residence - Ross River | Moderate | Ice-rich permafrost |
| 5 | Power Plant Storage - Ross River | Moderate | Ice-rich permafrost |
| 6 | Storage Cold - Maintenance Compound - Ross River | Moderate | Ice-rich permafrost |
| 7 | Grader Station - Ross River | Moderate | Ice-rich permafrost |
| 8 | Grader Station - Ross River | Moderate | Ice-rich permafrost |
| 9 | Arena - Ross River | Moderate | Ice-rich permafrost |
| 10 | Storage Zamboni Shelter - Ross River | Moderate | Ice-rich permafrost |
| 11 | Swimming Pool - Ross River | Moderate | Ice-rich permafrost |
| 12 | Outdoor Rink Warming Shed - Ross River | Moderate | Ice-rich permafrost |
| 13 | Multi Use/Community Hall - Ross River | Moderate | Ice-rich permafrost |

| | | | |
|---|---|---|---|
| 14 | Ross River School | Moderate | Ice-rich permafrost |
| 15 | Workshop/Garage - Ross River | Moderate | Ice-rich permafrost |
| 16 | District Office Field Operations - Ross River | Moderate | Ice-rich permafrost |
| 17 | Propane Shed - Ross River | Moderate | Ice-rich permafrost |
| 18 | Garage Storage - Ross River | Moderate | Ice-rich permafrost |
| 19 | Storage Building - Ross River | Moderate | Ice-rich permafrost |
| 20 | Water Treatment Plant and Firehall - Ross River | Moderate | Ice-rich permafrost |
| 21 | Health Centre - Ross River | Moderate | Ice-rich permafrost |
| 22 | Garage - Ross River | Moderate | Ice-rich permafrost |
| 23 | Nurses Residence - Ross River | Moderate | Ice-rich permafrost |
| 24 | FMRS Office/Shop - Ross River | Moderate | Ice-rich permafrost |
| 25 | Storage Cold FMRS - Ross River | Moderate | Ice-rich permafrost |
| 26 | Pumphouse - Ross River | Moderate | Ice-rich permafrost |
| 28 | Storage Building - Ross River | Moderate | Ice-rich permafrost |

## 3.10 Whitehorse and surrounding areas

The image file used to classify YG building wildfire exposure is accompanied by a detailed description of the method used to quantify wildfire exposure, available at https://sites.google.com/alaska.edu/jenschmidt/wildfire/aura/wildfire-exposure & https://drive.google.com/file/d/1HdiyEFDeO4k0iETtLN8qvbis5NVwzhlM/view. The method is based on one developed by J.L. Beverly (Beverly et al. 2010; Beverly 2021) and adapted by J.I. Schmidt.

The exposure rating category descriptions are as follows:

> Very Low: 0-20, exposure to hazardous/highly flammable vegetation in the surrounding area
>
> Low: 20-40, low exposure to hazardous/highly flammable vegetation in the surrounding area
>
> Moderate: 40-60, moderate exposure to hazardous/highly flammable vegetation in the surrounding area.
>
> High: 60-80, significant exposure to hazardous/highly flammable vegetation in the surrounding area.
>
> Extreme: 80-100, considerable exposure to hazardous/highly flammable vegetation in the surrounding area.

Following are the maps and the table with information on wildfire exposure hazards related to YG buildings.

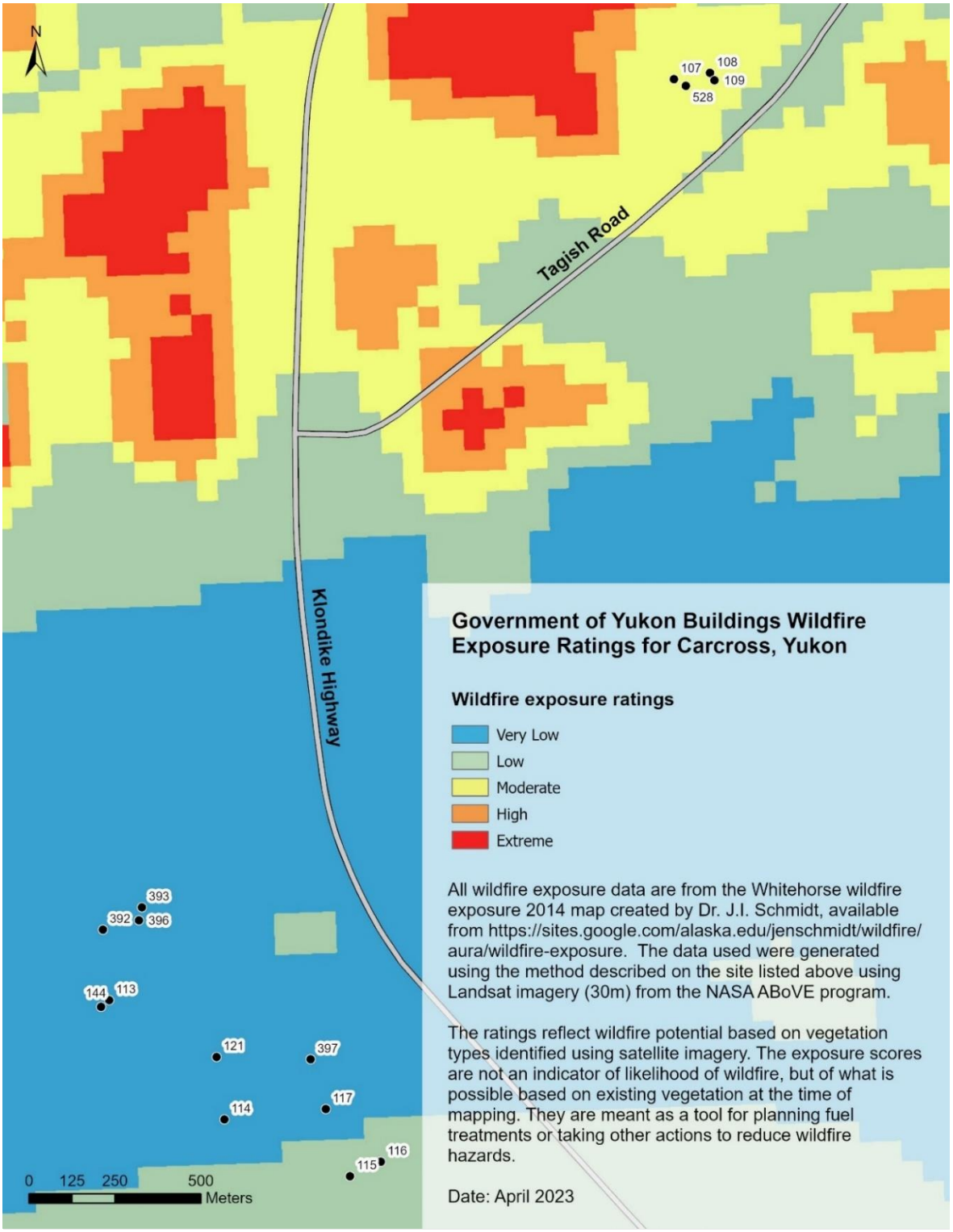


**Figure 3.10.1** Government of Yukon Buildings Wildfire Exposure Ratings for Carcross, Yukon.

**Table 6.9.1. Government of Yukon Buildings Wildfire Exposure Ratings for Carcross, Yukon**

| Building ID | Building name | Fire hazard exposure | Fire smarting within 500 m | Fire smarting date |
|---|---|---|---|---|
| 107 | Grader Station | Moderate | Planned | |
| 108 | Warehouse | Moderate | Planned | |
| 109 | Shed Salt Storage | Moderate | Planned | |
| 113 | Water Treatment Plant | Very low | | |
| 114 | Health Centre | Very low | | |
| 115 | Tutshi Memorial | Low | Planned/Some fire smarting done | 2007-2013 |
| 116 | Carving Facility | Low | Planned/Some fire smarting done | 2007-2013 |
| 117 | Tourism Pavillion | Very low | | |
| 121 | Isabelle Pringle Public Library | Very low | | |
| 144 | Emergency Medical Services | Very low | | |
| 392 | Ghuch Tla Community School | Very low | | |
| 393 | Swimming Pool | Very low | | |
| 396 | Recreational Office_Pool Apartment | Very low | | |
| 397 | Firehall | Very low | | |
| 528 | Highways Maintenance Compound | Moderate | Planned | |

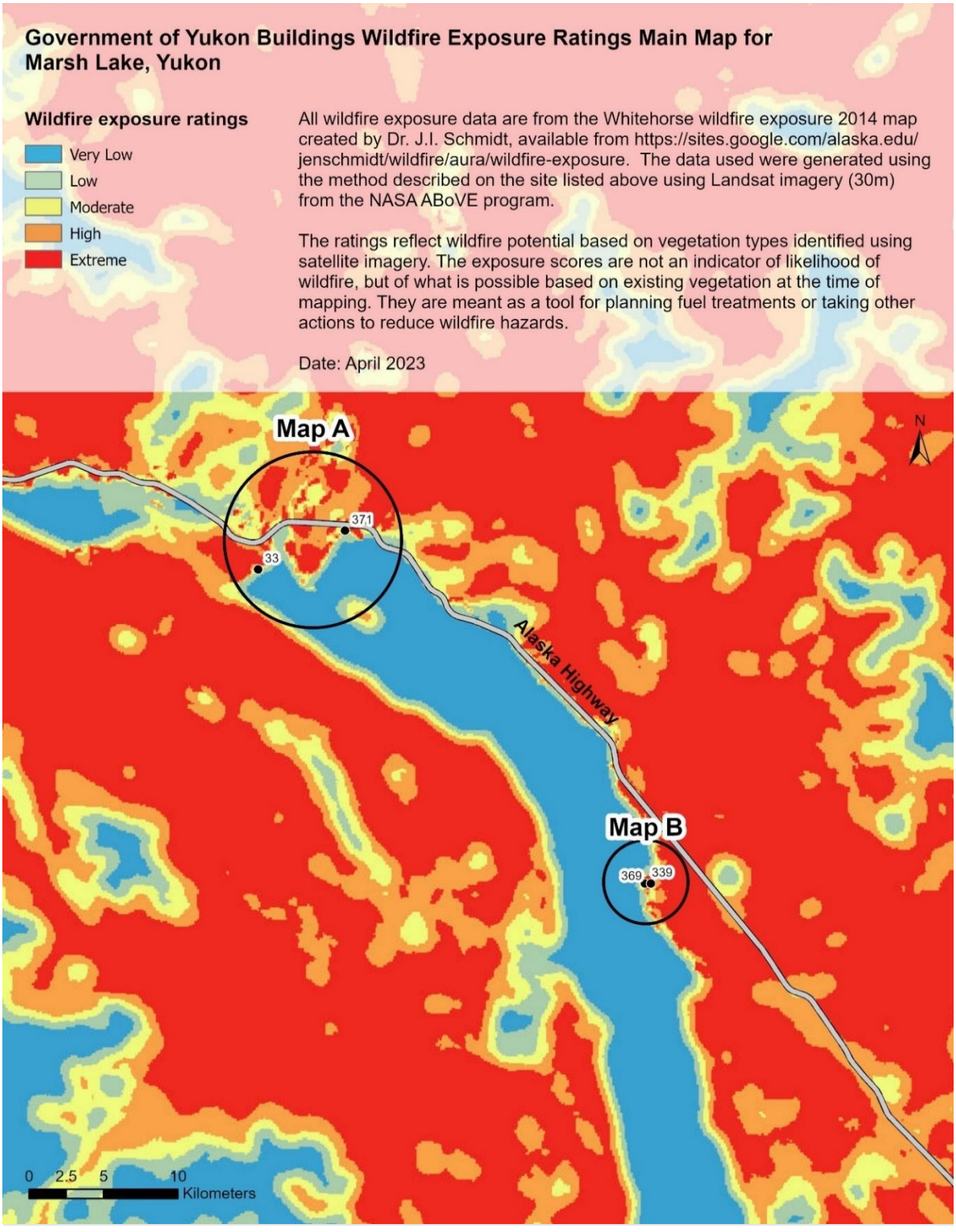


**Figure 3.10.2** Government of Yukon Buildings Wildfire Exposure Ratings Main Map for Marsh Lake, Yukon.

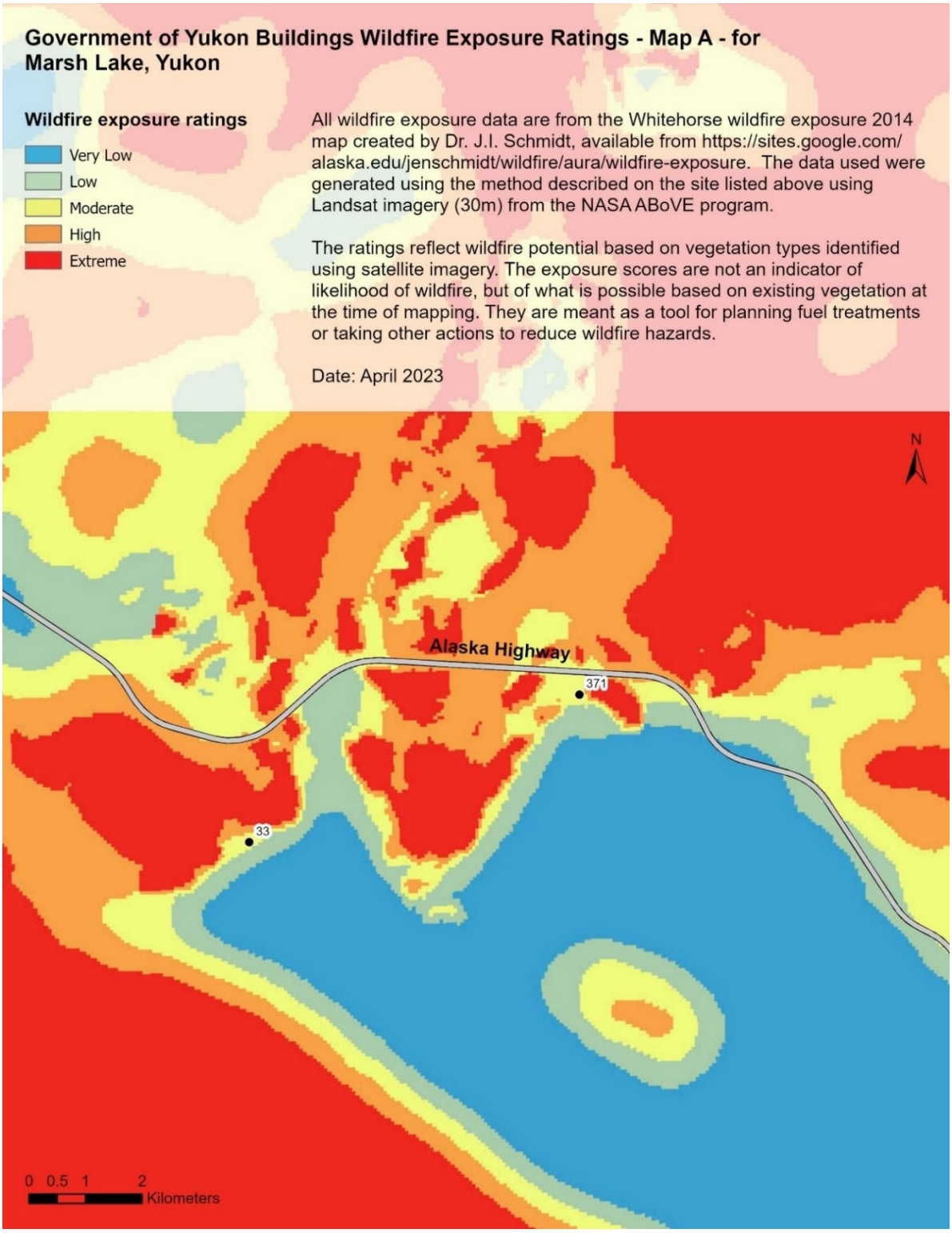


**Figure 3.10.3** Government of Yukon Buildings Wildfire Exposure Ratings – Map A - for Marsh Lake, Yukon.

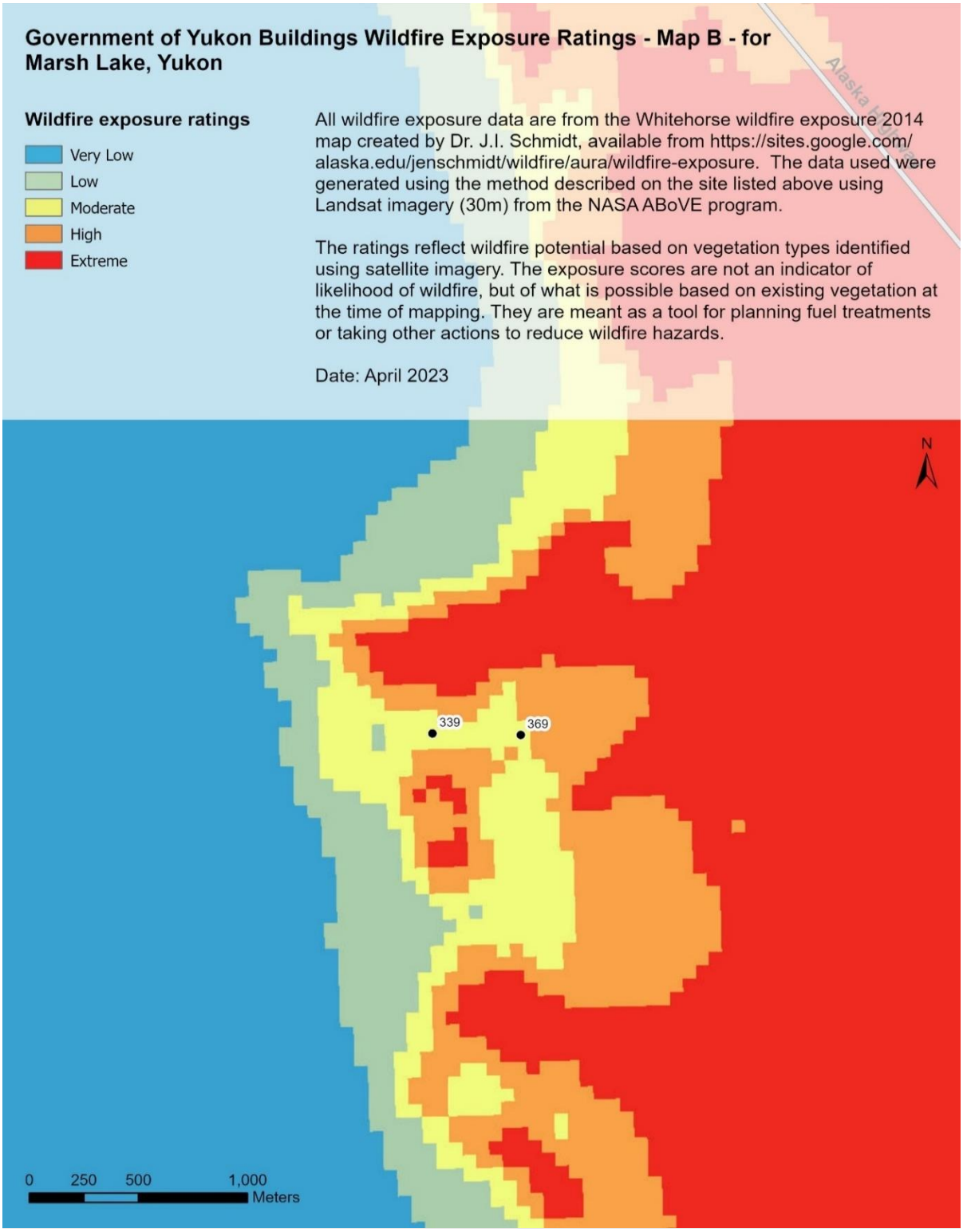


**Figure 3.10.4** Government of Yukon Buildings Wildfire Exposure Ratings – Map B - for Marsh Lake, Yukon.

**Table 3.10.1 Government of Yukon Buildings Wildfire Exposure Ratings for Marsh Lake, Yukon.**

| Building ID | Building name | Fire hazard exposure | Fire smarting within 500 m | Fire smarting date |
|---|---|---|---|---|
| 33 | Swan Haven Viewing Facility | Moderate | | |
| 339 | Firehall - Lakeview Judas Creek | Moderate | | |
| 369 | Firehall & Community Centre - Marsh Lake | Moderate | | |
| 371 | Water Treatment Plant - Army Beach | Moderate | | |

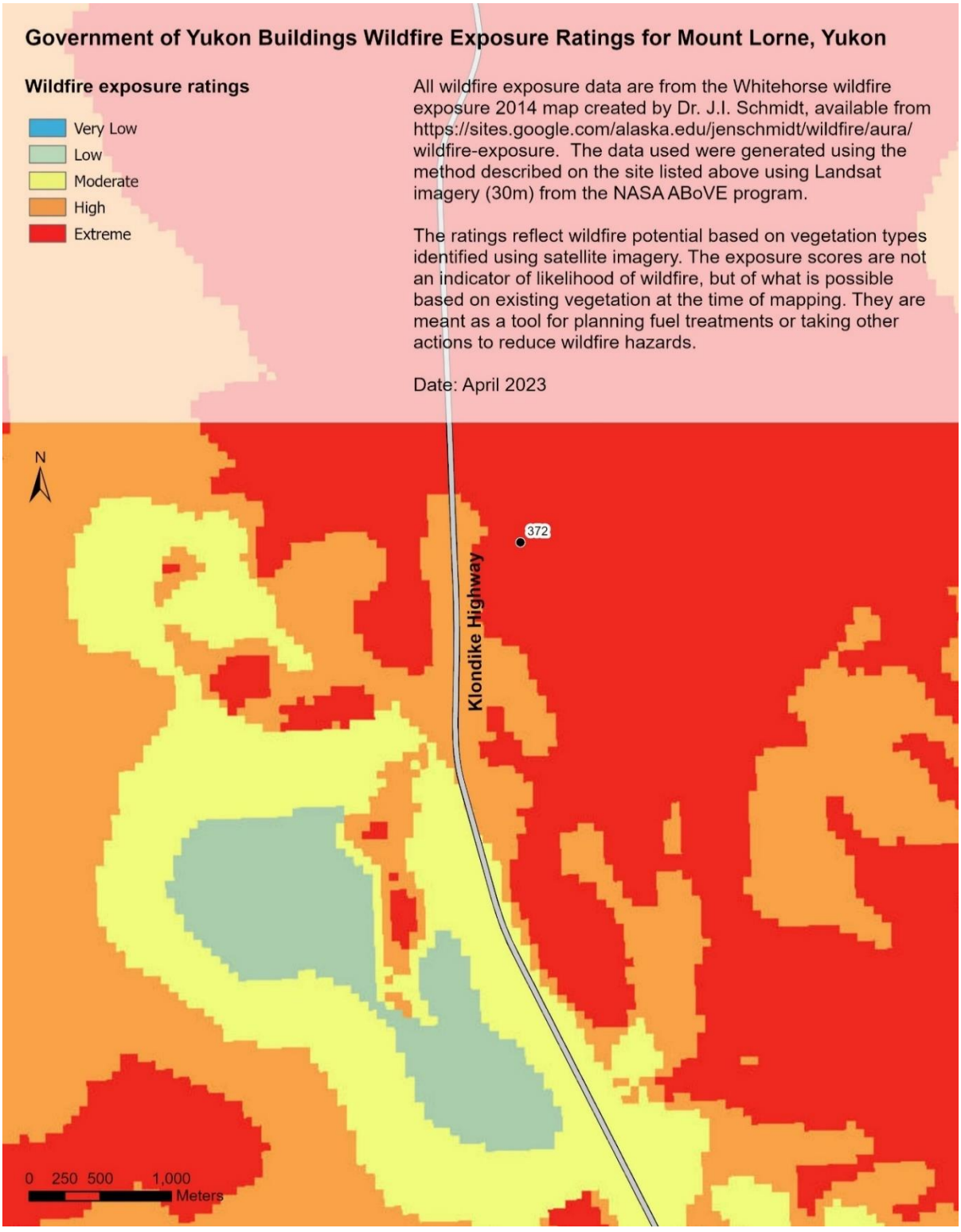


**Figure 3.10.5** Government of Yukon Buildings Wildfire Exposure Ratings for Mount Lorne, Yukon.

**Table 3.10.2 Government of Yukon Buildings Wildfire Exposure Ratings for Mount Lorne, Yukon.**

| Building ID | Building name | Fire hazard exposure | Firesmarting within 500 m | Firesmarting date |
|---|---|---|---|---|
| 372 | Firehall - Mount Lorne | Extreme | Planned/no information | |

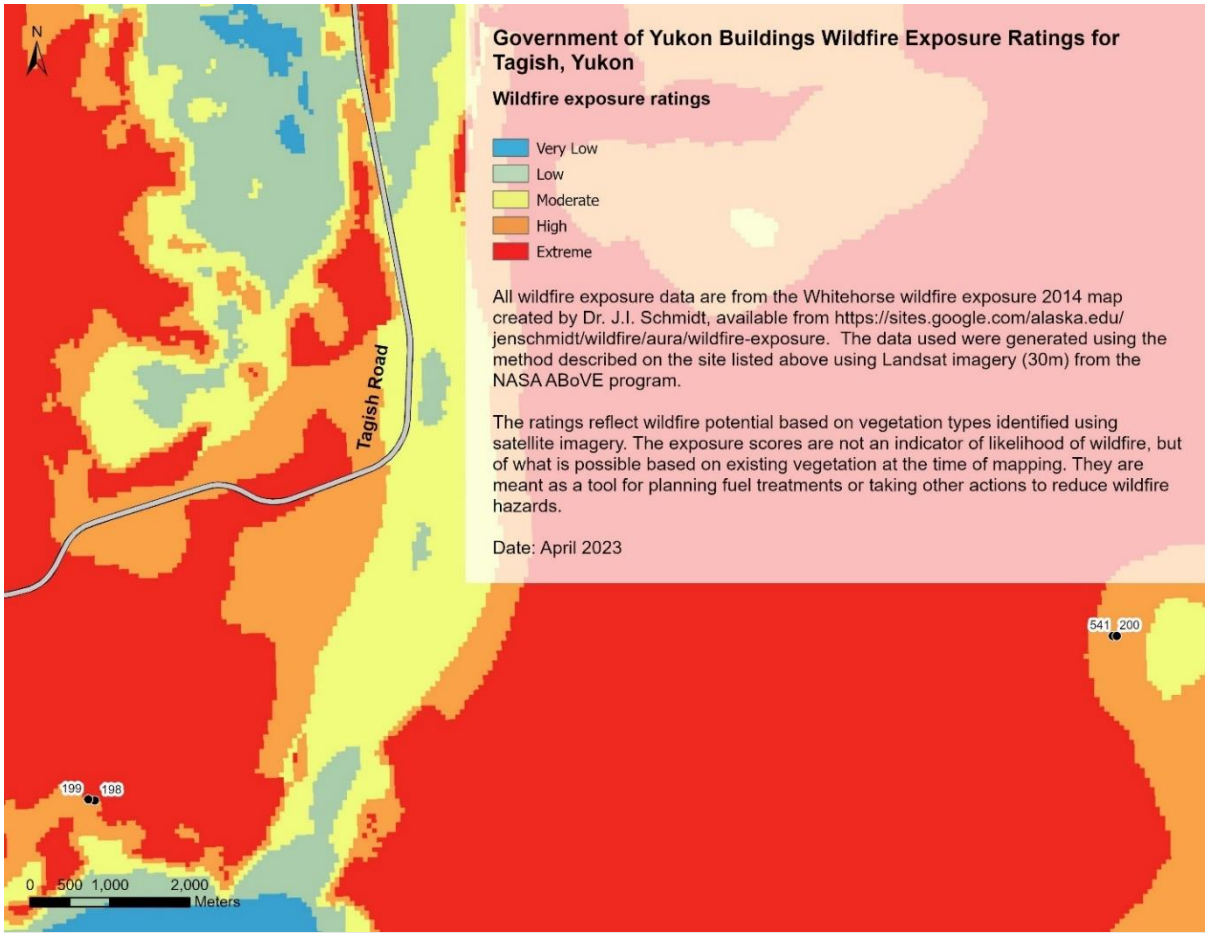


**Figure 3.10.6** Government of Yukon Buildings Wildfire Exposure Ratings for Tagish, Yukon.

**Table 3.10.3 Government of Yukon Buildings Wildfire Exposure Ratings for Tagish, Yukon.**

| Building ID | Building name | Fire hazard exposure | Fire smarting within 500 m | Fire smarting date |
|---|---|---|---|---|
| 198 | Firehall - Tagish | Extreme | Completed | 2008-2012 |
| 199 | Water Treatment Plant - Tagish | High | Completed | 2008-2012 |
| 200 | Fire Lookout Cabin - Tagish | High | | |
| 541 | Fire Lookout Tower - Tagish_Jubilee | High | | |


**Figure 3.10.7** Government of Yukon Buildings Wildfire Exposure Ratings for Alaska Highway South of Whitehorse, Yukon.

**Table 3.10.4 Government of Yukon Buildings Wildfire Exposure Ratings for Alaska Highway South of Whitehorse, Yukon.**

| Building ID | Building name | Fire hazard exposure | Fire smarting within 500 m | Fire smarting date |
|---|---|---|---|---|
| 325 | Golden Horn Elementary School | High | Some fire smarting done | 2021 |
| 329 | Whitehorse Cadet Training Centre - Wolf Creek | Extreme | Some fire smarting done | 2013 |
| 332 | Storage Shed - Golden Horn | High | Some fire smarting done | 2021 |
| 340 | Firehall - Golden Horn_Old | Moderate | Some fire smarting done | |
| 341 | Firehall - Golden Horn | Moderate | Some fire smarting done | 2011 |

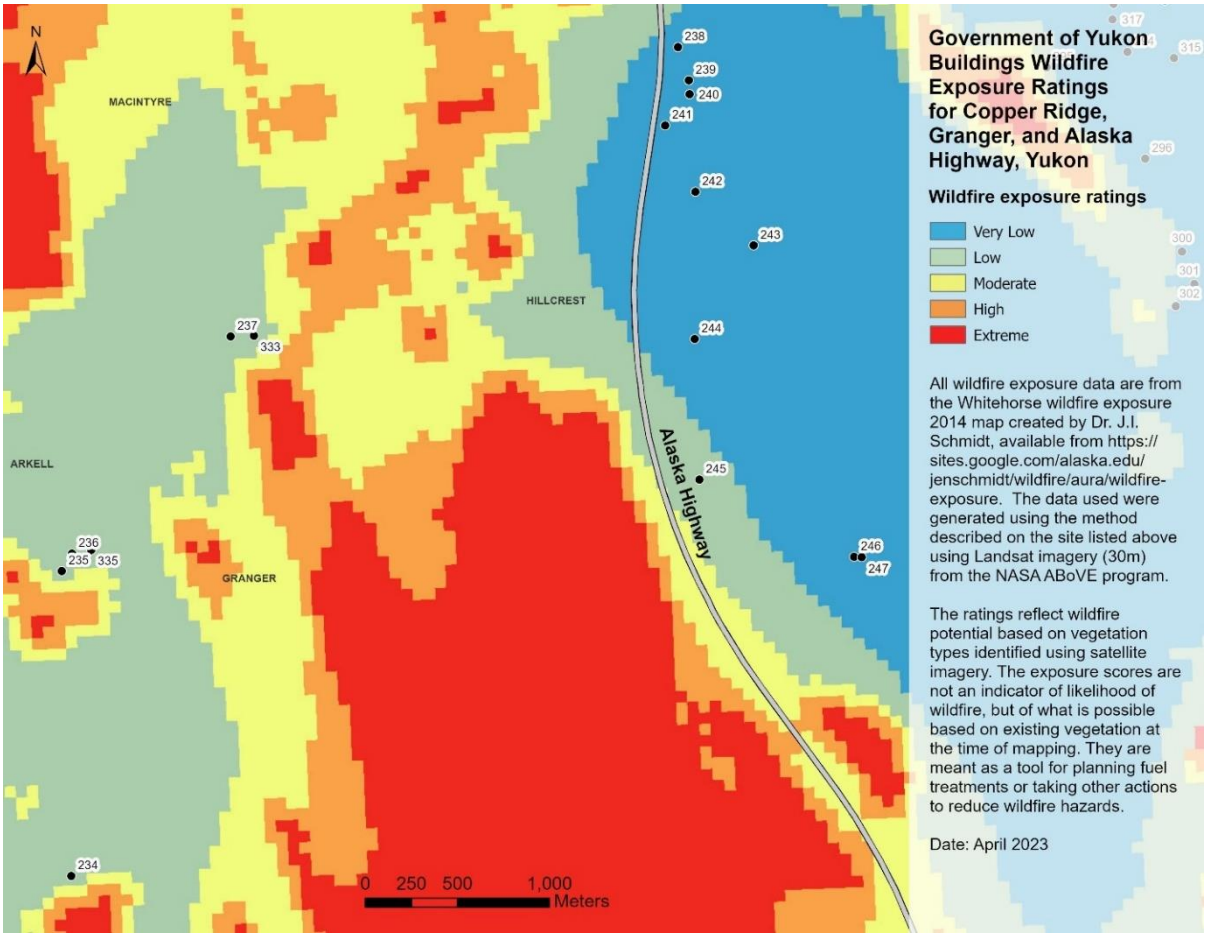


**Figure 3.10.8** Government of Yukon Buildings Wildfire Exposure Ratings for Copper Ridge, Granger and Alaska Highway, Yukon.

**Table 3.10.5 Government of Yukon Buildings Wildfire Exposure Ratings for Copper Ridge, Granger and Alaska Highway, Yukon.**

| Building ID | Building name | Fire hazard exposure | Fire smarting within 500 m | Fire smarting date |
|---|---|---|---|---|
| 234 | Copper Ridge Place | Low | Some fire smarting done | 2014-2021 |
| 235 | École Émilie Tremblay – Portable | Low | Some fire smarting done | 2015-2016 |
| 236 | École Émilie Tremblay School | Low | Some fire smarting done | 2015-2016 |
| 237 | Elijah Smith Elementary School | Low | Some fire smarting done | 2005-2020 |
| 238 | Storage Bldg _old atb firehall | Very low | | |
| 239 | Warehouse_Hangar E - Whitehorse | Very low | | |
| 240 | Warehouse_Hangar D - Whitehorse | Very low | | |
| 241 | Airport Maintenance Facility - Whitehorse | Very low | | |
| 242 | Combined Services Building - Airport Whitehorse | Very low | | |
| 243 | Airport Terminal - Erik Nielson Whitehorse International Airport | Very low | | |
| 244 | Transportation Museum | Very low | | |
| 245 | Beringia Centre | Low | Some firesmarting done | 2013 |
| 246 | Air Tanker Base - Cold Storage - Whitehorse | Very low | | |

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|---|---|---|---|---|
| 247 | Air Tanker Base - Whitehorse | Very low | | |
| 333 | Elijah Smith Elemenatry School - Portable | Low | Some firesmarting done | 2005-2020 |
| 335 | École Émilie Tremblay - Portable 2 | Low | Some firesmarting done | 2015 |

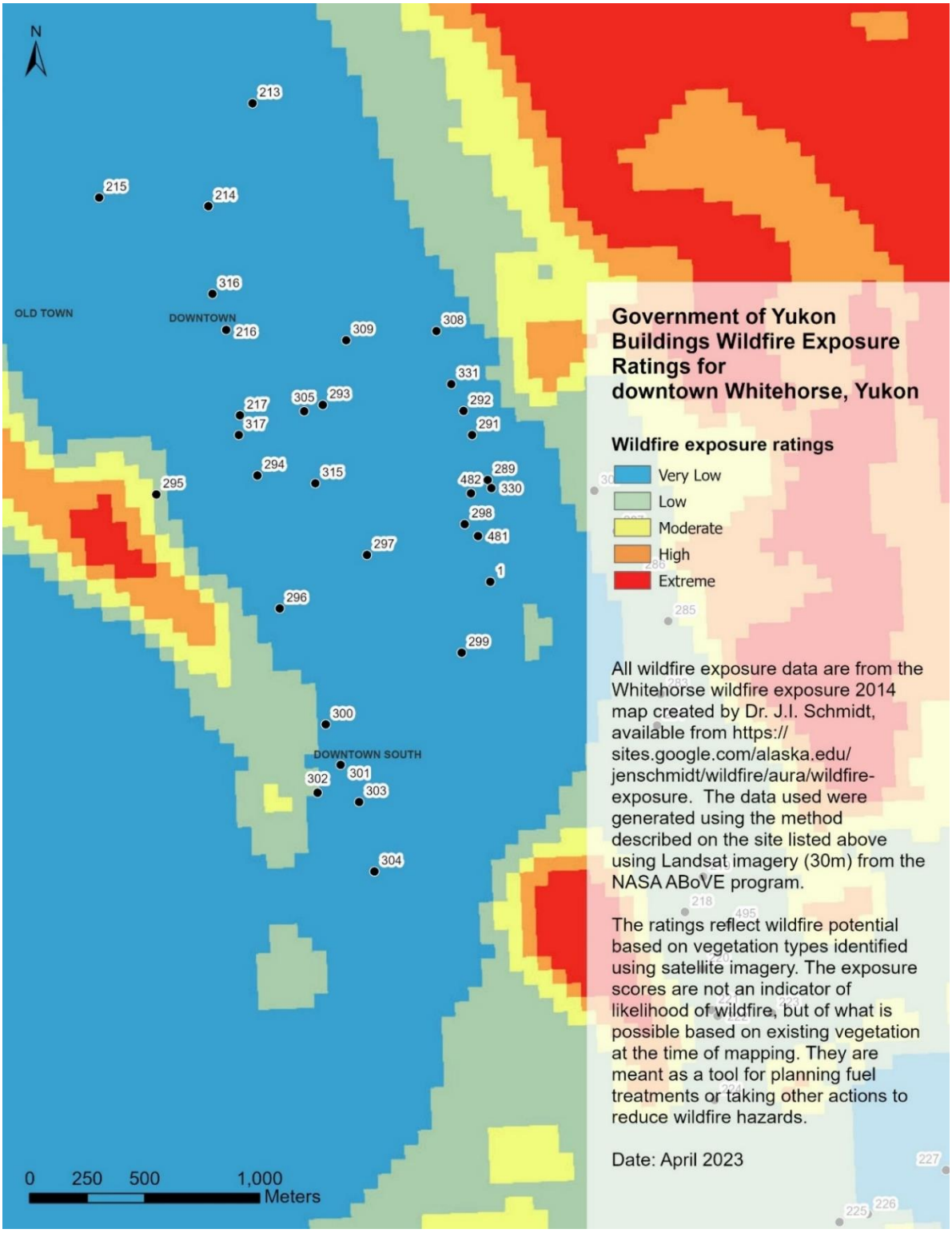


**Figure 3.10.9** Government of Yukon Buildings Wildfire Exposure Ratings for Downtown Whitehorse, Yukon.

**Table 3.10.6 Government of Yukon Buildings Wildfire Exposure Ratings for Downtown Whitehorse, Yukon.**

| Building ID | Building name | Fire hazard exposure | Fire smarting within 500 m | Fire smarting date |
|---|---|---|---|---|
| 1 | Main Administration Building - Whitehorse | Very low | | |
| 213 | Liquor Store - Whitehorse | Very low | | |
| 214 | Whitehorse Elementary School | Very low | | |
| 215 | 6th Avenue Continuing Care Facility - Whitehorse | Very low | | |
| 216 | Yukon Workers Compensation Health and Safety Board | Very low | | |
| 217 | Wood Street Centre | Very low | | |
| 289 | Waterfront Residence | Very low | | |
| 291 | Warehouse Bldg (old firehall) | Very low | | |
| 292 | Whitepass Train Building | Very low | | |
| 293 | TC Richards Building | Very low | | |
| 294 | Taylor House | Very low | | |
| 295 | Sarah Steele Building | Low | | |
| 296 | Children's Receiving Home - Boys | Very low | | |
| 297 | Pelly Block - Youth Justice | Very low | | |
| 298 | Tourism Business Centre/VIC | Very low | | |
| 299 | Climate Change Secretariat | Very low | | |
| 300 | RYTS - Annex | Very low | | |
| 301 | Mountain Ridge | Very low | | |
| 302 | St. Elias Adult Group Home | Low | | |
| 303 | Children's Receiving Home - Girls | Very low | | |

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|---|---|---|---|---|
| 304 | Youth Achievement Centre | Very low | | |
| 305 | Lynn Building | Very low | | |
| 308 | Roundhouse_Train Shed - Whitehorse | Very low | | |
| 309 | Yukon Justice Centre | Very low | | |
| 315 | Taku Building | Very low | | |
| 316 | Whitehorse Emergency Center | Very low | | |
| 317 | National Air Pollution Surveillance Trailer | Very low | | |
| 330 | Waterfront Residence | Very low | | |
| 331 | Waterfront Groundshack | Very low | | |
| 481 | Parking Lot - Tourism | Very low | | |
| 482 | Parking Lot - Riverside Closeleigh Manor | Very low | | |

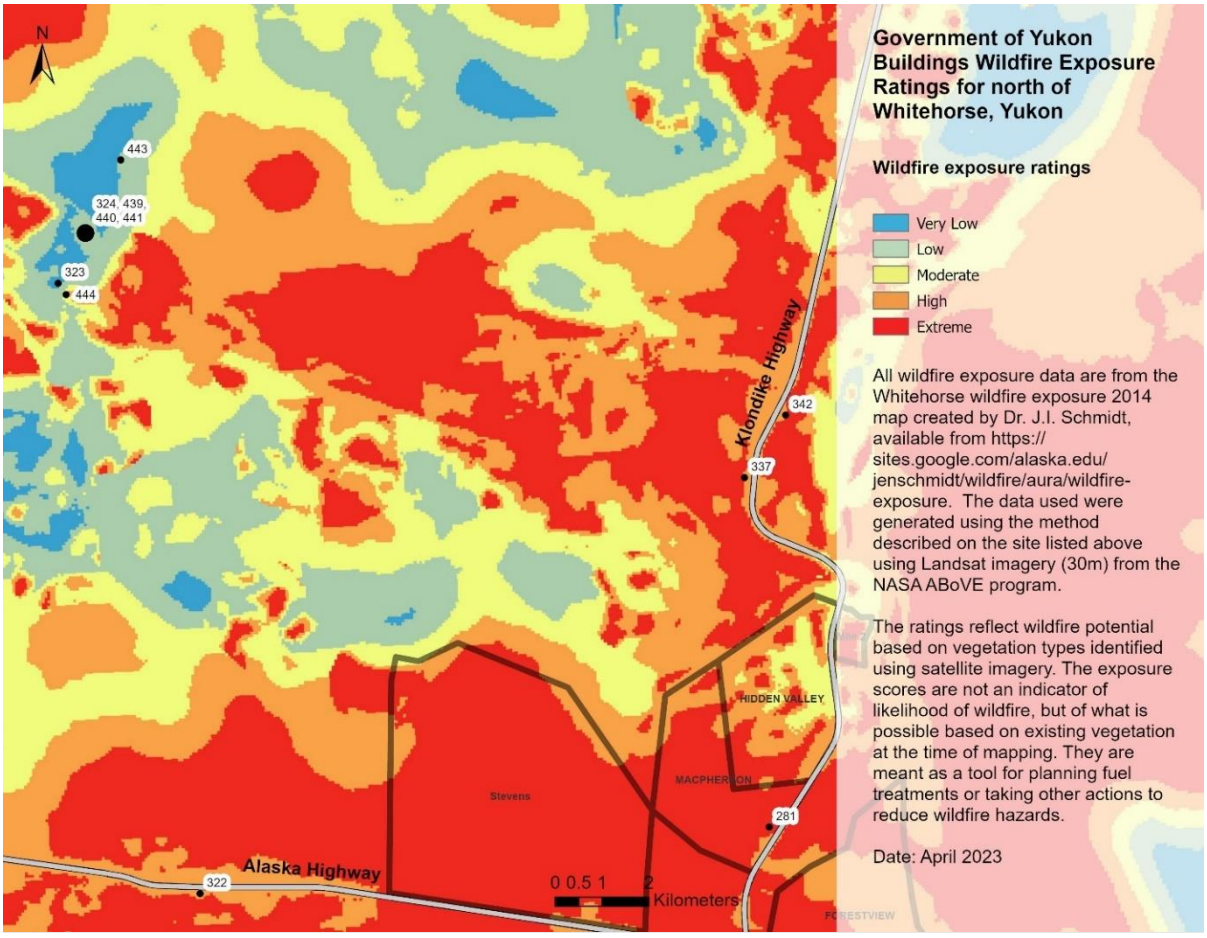


**Figure 3.10.10** Government of Yukon Buildings Wildfire Exposure Ratings for North of Whitehorse, Yukon.

**Table 3.10.7 Government of Yukon Buildings Wildfire Exposure Ratings for North of Whitehorse, Yukon.**

| Building ID | Building name | Fire hazard exposure | Fire smarting within 500 m | Fire smarting date |
|---|---|---|---|---|
| 281 | Hidden Valley Elementary School | Extreme | Completed | 2017-2018 |
| 322 | Firehall - Ibex Valley | High | Completed | 2011 |
| 323 | Yukon Wildlife Preserve Information Cabin | Low | | |
| 324 | Yukon Wildlife Preserve Hay Barn | Low | | |
| 337 | Gunner Neilson_Mickey Lammers Forestry Interpretive Center | High | | |
| 342 | Firehall & Community Centre - Hootalinqua | Extreme | Completed | 2012 |
| 439 | Yukon Wildlife Preserve Barn_Shop | Low | | |
| 441 | Yukon Wildlife Preserve Main | Low | | |
| 440 | Yukon Wildlife Preserve Falcon_Animal Handle | Low | | |
| 443 | Yukon Wildlife Preserve Learning Centre | Low | | |
| 444 | Yukon Wildlife Preserve - Shop_Apt | High | | |

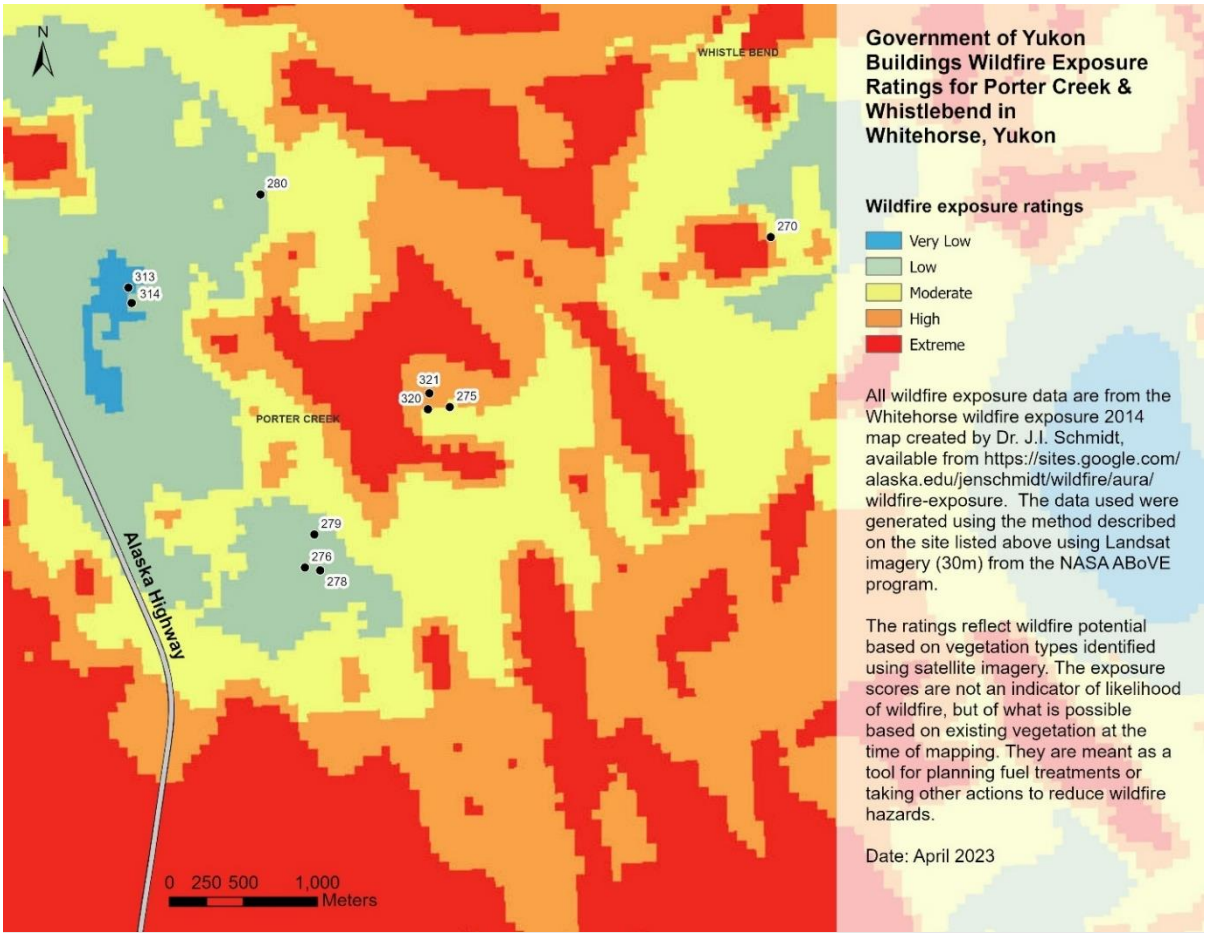


**Figure 3.10.11** Government of Yukon Buildings Wildfire Exposure Ratings for Porter Creek & Whistlebend in Whitehorse, Yukon.

**Table 3.10.8 Government of Yukon Buildings Wildfire Exposure Ratings for Porter Creek & Whistlebend in Whitehorse, Yukon.**

| Building ID | Building name | Fire hazard exposure | Fire smarting within 500 m | Fire smarting date |
|---|---|---|---|---|
| 270 | Whistle Bend Continuing Care Facility | Moderate | | |
| 275 | Porter Creek Secondary School | Moderate | Some fire smarting done/Tendered | 2005-2020 |
| 276 | Jack Hulland Elementary School | Low | | |
| 278 | Jack Hulland Elementary School - Portable | Low | | |
| 279 | Jack Hulland Elementary School - Services Maintenace Shop | Low | | |
| 280 | Holy Family Elementary School | Low | | |
| 313 | 22 Wann Road - Main House | Very low | | |
| 314 | 22 Wann Road - Shop | Low | | |
| 320 | Porter Creek Secondary School - Portables 161_162 | Moderate | Some firesmarting done/Tendered | 2005-2020 |
| 321 | Porter Creek Secondary School - Portable _165 | High | Some firesmarting done/Tendered | 2005-2020 |

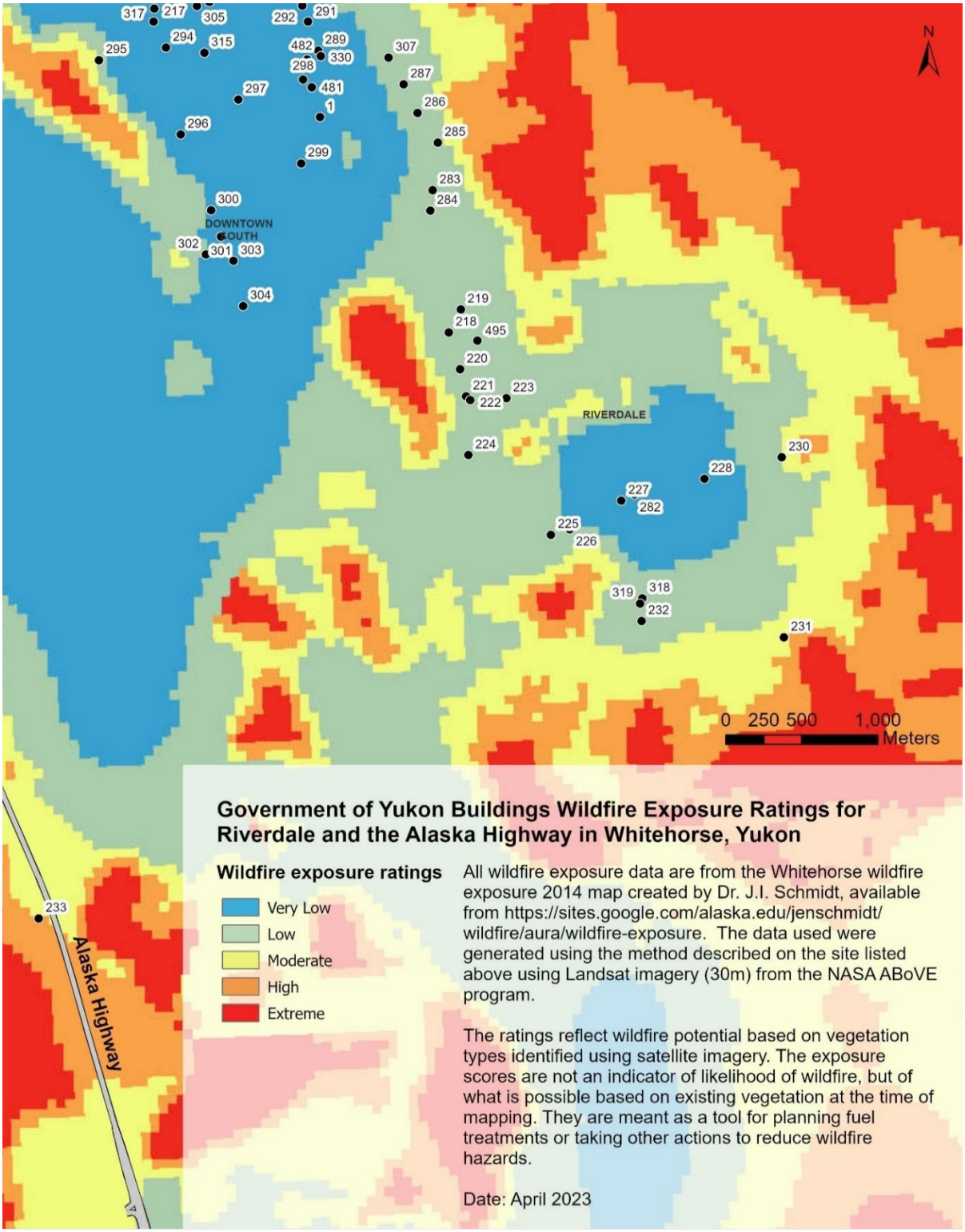


**Figure 3.10.12** Government of Yukon Buildings Wildfire Exposure Ratings for Riverdale in Whitehorse, Yukon.

**Table 3.10.9 Government of Yukon Buildings Wildfire Exposure Ratings for Riverdale in Whitehorse, Yukon.**

| Building ID | Building name | Fire hazard exposure | Fire smarting within 500 m | Fire smarting date |
|---|---|---|---|---|
| 218 | F.H. Collins Weight Room | Low | Some fire smarting done | 2008-2009 |
| 219 | F.H. Collins Secondary School | Low | Some fire smarting done | 2008-2009 |
| 220 | F.H. Collins Tech Ed Wing | Low | Some fire smarting done | 2008-2009 |
| 221 | Teen Parent Centre | Low | Some fire smarting done | 2008-2009 |
| 222 | Storage Shed - Teen Parent Centre | Low | Some fire smarting done | 2008-2009 |
| 223 | Selkirk Elementary School | Low | Some fire smarting done | 2008-2009 |
| 224 | Gadzoosdaa Residence | Low | Some fire smarting done | 2009 |
| 225 | Christ the King Elementary School | Low | | |
| 226 | Christ the King Elementary Reading Recovery | Low | | |
| 227 | Macaulay Lodge | Very low | | |
| 228 | RYTS - Klondike | Very low | | |
| 230 | Liard Group Home | Moderate | Completed | no date information |
| 231 | Grey Mountain Elementary | Moderate | Completed | no date information |
| 232 | Vanier Catholic Secondary School | Low | Some firesmarting done | 2009 |

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|---|---|---|---|---|
| 233 | Weigh Station - Whitehorse | High | | |
| 282 | Storage Shed - Macauley Lodge | Very low | | |
| 283 | Storage Shed Education Compound | Low | | |
| 284 | Education Building | Low | | |
| 285 | Emergency Medical Services - Whitehorse | Low | | |
| 286 | 2 Hospital Road | Low | | |
| 287 | 4 Hospital Road | Low | | |
| 307 | Thompson Centre | Low | | |
| 318 | Vanier Catholic Secondary School - Portable | Low | Some fire smarting done | 2009 |
| 319 | Vanier Catholic Secondary School - Portable | Low | Some fire smarting done | 2009 |
| 495 | Centre Scolaire Communautaire Paul-Émile-Mercier | Low | Some fire smarting done | 2008-2009 |

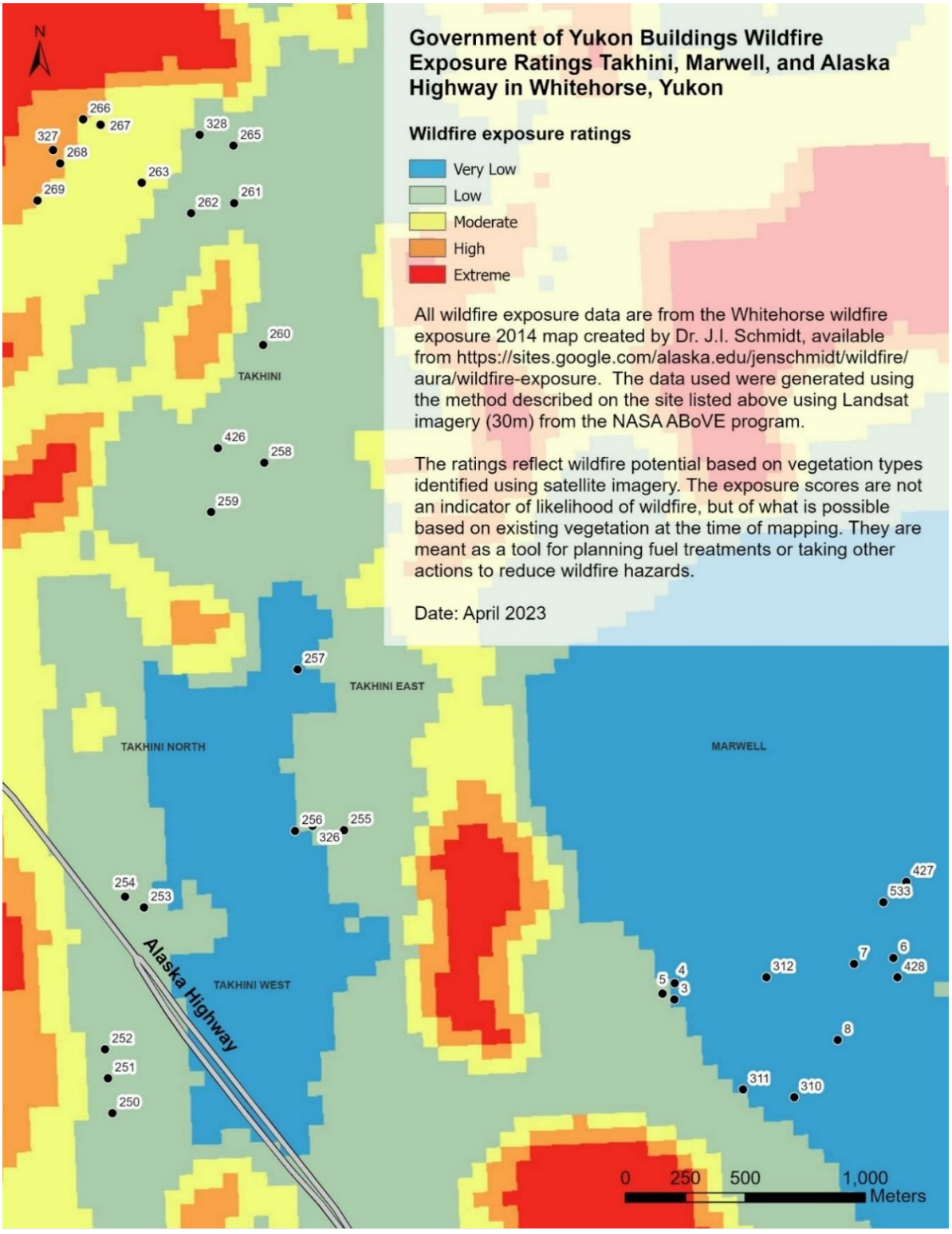


**Figure 3.10.13** Government of Yukon Buildings Wildfire Exposure Ratings for Takhini and Marwell in Whitehorse, Yukon.

**Table 3.10.10 Government of Yukon Buildings Wildfire Exposure Ratings for Takhini and Marwell in Whitehorse, Yukon.**

| Building ID | Building name | Fire hazard exposure | Fire smarting within 500 m | Fire smarting date |
|---|---|---|---|---|
| 3 | FMRS Office_Shop - Whitehorse | Very low | | |
| 4 | Paint Shop | Very low | | |
| 5 | Warehouse - Quonset Hut | Low | | |
| 6 | Storage Building - Whitehorse Grader Station | Very low | | |
| 7 | Storage Municipal Service - Whitehorse | Very low | | |
| 8 | Workshop_Offices Parks | Very low | | |
| 250 | Emergency Response Centre | Low | | |
| 251 | Central Operations Complex | Low | | |
| 252 | Small Engine Repair Shop | Low | | |
| 253 | H.S. Bostock Core Library | Low | | |
| 254 | Field Operations Office Building - Whitehorse | Low | | |
| 255 | 461 Range Road | Low | | |
| 256 | Core Library | Very low | | |
| 257 | Takhini Elementary School | Very low | | |
| 258 | Whitehorse Correctional Centre | Low | | |
| 259 | Takhini Haven | Low | | |
| 260 | Young Offenders Facility | Low | | |
| 261 | Arts Centre | Low | | |
| 262 | Archives | Low | | |

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|---|---|---|---|---|
| 263 | Yukon College | Moderate | | |
| 265 | Yukon College - Centre for Northern Innovation in Mining | Low | | |
| 266 | Yukon College - Northern Science Centre | High | | |
| 267 | Yukon College Residence | Moderate | | |
| 268 | Yukon College - Artic Research Lab | High | | |
| 269 | Yukon College - New Residence | High | | |
| 310 | Supply Services & Stores | Very low | | |
| 311 | Mechanical Workshop Marwell | Very low | | |
| 312 | Liquor Warehouse and Office | Very low | | |
| 326 | Mine Rescue Station | Low | | |
| 327 | Garage Storage - Yukon College | High | | |
| 328 | Yukon College - Multipurpose | Low | | |
| 426 | Whitehorse Correctional Centre Administration Trailer | Low | | |
| 427 | Shed Open Storage Grader Station - Whitehorse | Very low | | |
| 428 | Storage Building - Whitehorse Grader Station | Very low | | |
| 533 | Highways Maintenance Compound - Whitehorse | Very low | | |

# 4 Knowledge gaps and recommended actions

### 4.1.1 Geological hazards

The geological hazard information should only be used to identify when further engineering and technical studies are required to select building sites or consider mitigations.

The data used to classify YG buildings according to geologic hazards identified is 7-12 years old and only included Burwash Landing, Destruction Bay, Dawson City, Faro, Mayo, Old Crow, Pelly Crossing, and Ross River. Updated geological hazard mapping is underway, and once more current and complete data is available, it should be applied to improve the usefulness of the building hazard information. Follow-up with the key contacts listed in section 1.1 is critical to improving the usefulness of the map products.

### 4.1.2 Wildfire exposure

The AURA project's planned completion date is September 2023 and the project lead, Dr. I.J. Schmidt, will likely have updated wildfire exposure data within the coming months. The data used to classify YG building wildfire exposure risk is from 2014, and any updated data would more accurately reflect the risks in the Whitehorse area. Follow up with Dr. Schmidt (see s. 3.2) may result in updated datasets that could improve the quality of the YG building wildfire exposure information.

Wildfire exposure levels are only one tool for fire mitigation planning. Connecting with YG Wildfire Management Branch to determine if any updated or related data exists could improve fire hazard risk assessment, increase the reliability of the YG building exposure ratings, and provide information missing for Yukon communities outside of the Whitehorse area. Although attempts were made to connect with YG Wildfire Management Branch and fire smarting data was received and recorded within the wildfire exposure spreadsheet, further communication on specific data requirements would be beneficial.

Additional building information may improve the quality of any risk assessment done for YG buildings such as building material, year of construction, etc. Incorporating this information into future risk assessments will be helpful for prioritizing wildfire mitigation efforts.

### 4.1.3 Flood risk

Flood vulnerability information on select YG buildings in Dawson City and Old Crow are currently not superposed to government-approved flood hazard maps. Although the data collection and modelling was done more recently than the other hazard categories, there remains uncertainty in predicting how often flood events may happen and what their severity might be given the expected frequency of extreme weather events in the region and a relatively short record of annual maximum water levels.

The flood vulnerability mapping was conducted for two Yukon communities. Government-led flood mapping for all flood-prone Yukon communities is underway and follow up with key contacts listed in section 1.3 is critical for obtaining flood hazard information for other Yukon communities.

A review of the methodology in the reports that accompany the flood vulnerability mapping for Dawson City and Old Crow can assist in determining important building information when looking at flood vulnerability such as first (ground) floor elevation, presence of a basement or crawlspace, etc. If further information on YG buildings is available, it could be complementary to the flood hazard mapping currently underway.

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