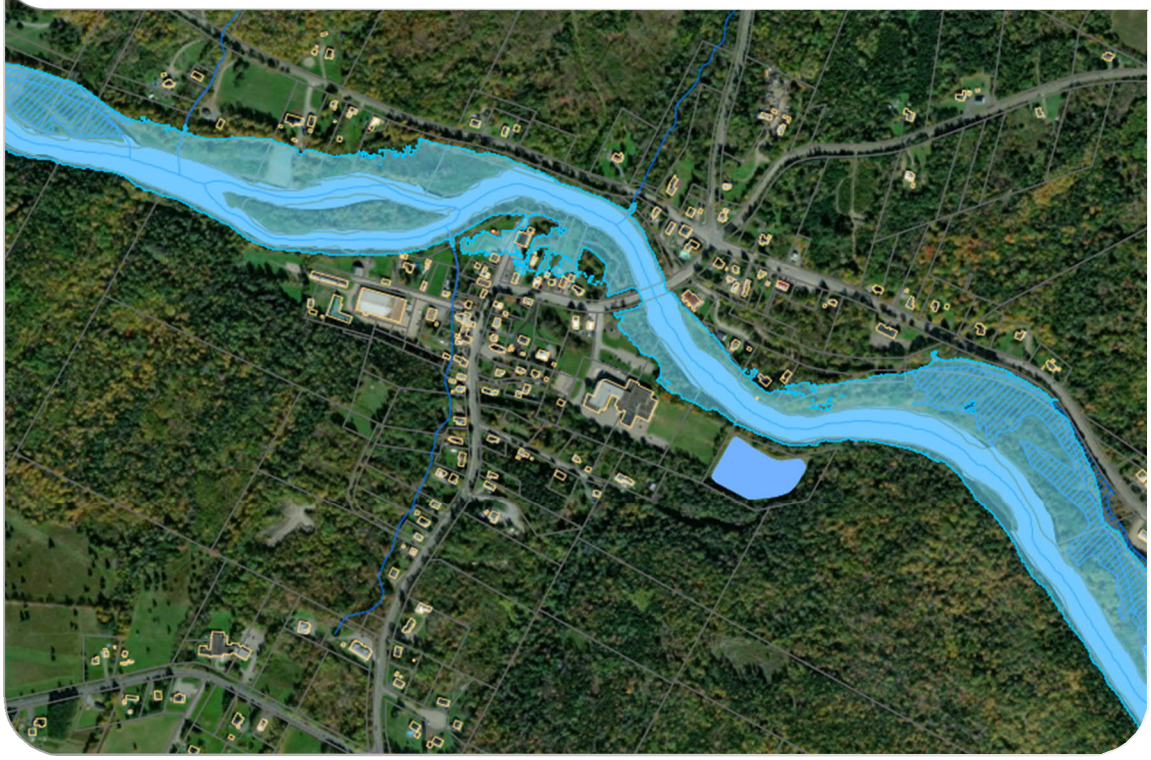
DILLON CONSULTING

NASHWAAK RURAL COMMUNITY

Climate Change Adaptation Plan



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Acronyms, Abbreviations, Definitions

2050s	30-year record covering the years 2041 to 2070, collectively referred to as “2050’s”.
2080s	30-year record covering the years 2071 to 2100, collectively referred to as “2080’s”.
CCAP	Climate Change Adaptation Plan
CDD	Cooling Degree Days
ECCC	Environment Climate Change Canada
GCM	Global Climate Model
GHG	Greenhouse Gasses
H&S	Health and Safety
HDD	Heating Degree Days
HVAC	Heating, Ventilation, and Air Conditioning
mm	Millimetre
NRC	Nashwaak Rural Community
O&M	Operations and Maintenance
PIEVC	Public Infrastructure Engineering Vulnerability Committee (CCRA Framework)
RCP	Representative Concentration Pathway
SPEI	Standardized Precipitation Evapotranspiration Index

Executive Summary

In 2024, Dillon Consulting Limited (Dillon) worked collaboratively with Nashwaak Rural Community (NRC) to assist with the development of a Climate Change Adaptation Plan (CCAP). The main objectives of this CCAP are to identify the climate change vulnerabilities of specific community infrastructure assets and components, and to develop strategic adaptation measures and an implementation plan that will increase the community's resilience to climate change impacts.

The development of this CCAP included six main steps:

- **Background Review** – literature review and social vulnerability review to determine the initial list of vulnerabilities;
- **Community Engagement** – one-on-one interviews with key NRC staff to identify vulnerabilities and potential adaptation measures through a more experiential lens. An online community survey was also published for the general public to gather more input;
- **Vulnerability Identification** – risk scores of identified vulnerabilities are calculated to present a hierarchy of risks;
- **Adaptation Planning** – recommended adaptation measures are developed for medium to extreme risk vulnerabilities identified;
- **Implementation Planning** – identified adaptation options are ranked from highest to lowest relative priority based on their risk level, timeline for implementation, estimated cost, and responsible parties are identified; and
- **Reporting** – developed a draft and final CCAP report.

In summary, the climate change vulnerability assessment completed for NRC identified **four (4) extreme, twelve (12) high, seventeen (17) medium, twenty (20) low risk interactions** from the vulnerability assessment. Medium, high, and extreme risks were prioritized and brought forward to the adaptation planning process. The high-level flood risk assessment found various segments of the community's road infrastructure and buildings to be vulnerable to the 1-in-20 year flood event in the year 2100, as well as the 1-in-100 year flood event for present day.

Adaptation options were assigned to medium, high, and extreme risk interactions identified for NRC's assets to increase the community's resilience and the capacity to respond to future climate events. Upon completion of the adaptation planning process, an implementation plan was developed to support the prioritization of adaptation options, taking into account the risk scores calculated as well as input from community stakeholders.

As the global climate grows unstable, the frequency and severity of inclement weather such as very hot days, heavy precipitation, or even drought-like conditions can also be anticipated to increase. More

extreme multi-variable dependent events such as wildfire remain difficult to accurately predict but the significant impacts they can bring to a community necessitates a robust and comprehensive emergency management plan.

In total, thirty-four (34) unique adaptation options were identified to support climate resilience within the community. This Climate Change Adaptation Plan identifies a path forward for the community to proactively prepare for the anticipated climate change impacts for the region. As time progresses, new climate information and modelling technologies will emerge and so this plan will require ongoing monitoring and review of the adaptation measures and implementation plan outlined in **Section 3.0** of this report.

1.0 Introduction

Nashwaak Rural Community (NRC) is situated in central New Brunswick, within York County. With an estimated population of 4,755 in 2021 according to Statistics Canada. NRC lies along the Nashwaak River, a tributary of the Saint John River. NRC was incorporated as a result of the 2023 New Brunswick local governance reforms and includes the former Village of Stanley and portions of the local service districts of Stanley, Saint Marys, Estey's Bridge, and Douglas.

Climate change has presented economic, environmental, and public safety risks to communities throughout New Brunswick. Over the past century, New Brunswick has seen an increase in average temperatures, changes in precipitation patterns with more frequent heavy rainfall events and variations in snowfall patterns. There has also been a rise in the frequency and intensity of extreme weather events, such as storms and flooding, which has impacted more rural communities in New Brunswick. The purpose of this project is to investigate climate change related risks on the community and develop potential adaptation strategies to mitigate the identified and prioritized risks.

1.1 Background Information and Project Purpose

NRC obtained funding from the Environmental Trust Fund (ETF) of New Brunswick to develop a Climate Change Adaptation Plan (CCAP). The ETF aids with action-oriented projects with tangible and measurable results, aimed at protecting, preserving and enhancing the natural environment. Dillon Consulting Limited (Dillon) was engaged by NRC to identify potential impacts of climate change on the community's various systems. The project consists of a Climate Change Vulnerability Assessment, key stakeholder engagement, and development of a final Climate Change Adaptation Plan including an implementation plan.

2.0 Approach and Methodology

This plan identifies the infrastructure vulnerabilities and focuses on recommending potential adaptation options for each vulnerability identified. Additionally, a high-level implementation plan was also developed to support NRC's decision making in prioritizing the actions identified within this CCAP. The components of the Plan included completion of the following tasks as shown in **Table 1** below.

The development of the adaptation options and implementation plan presented in this report was built upon the various risks identified in the vulnerability assessment and from the knowledge and input of NRC representatives through targeted interviews by Dillon staff.

Table 1: Project Task Summary

Phase	Task	Subtasks
Vulnerability Assessment	**Background Review**	Reviewed infrastructure data and compiled a list of critical infrastructure, core services, and external service providers;
		Reviewed past reports or plans completed for the Community;
		Compiled existing climate change data and projections for the Community;
		Reviewed flood maps available through the Province of NB;
	Targeted Interviews	Conducted one-on-one, key person interviews with NRC staff and residents who hold detailed knowledge of the community's infrastructure, population, and history as it pertains to climate change impacts;
		Compiled an initial list of climate change vulnerabilities within the community;
	Vulnerability Assessment	Completed a vulnerability assessment matrix and compiled vulnerability assessment results into a list of high, medium, or low risk climate change vulnerabilities;
		Completed a qualitative spatial assessment to identify potential flood-vulnerable assets
Adaptation Planning	**Adaptation Planning & Implementation Plan Workshop**	Reviewed the prioritized list of infrastructure and social vulnerabilities;
		Developed adaptation measures and other recommendations to address the medium, high, and extreme risk interactions identified from the vulnerability assessment;
		Created a distilled list of adaptation measures and additional considerations to be considered for final reporting;
		Developed a high-level implementation plan that provides information on the adaptation options' estimated level of costs, timeline for implementation, and responsible parties.
	Final Reporting	Prepared and submitted a draft and final CCAP document to the Community for approval;

2.1 Background Review Process

The background review component of this project involved the review of infrastructure and planning data provided by the community. In addition to physical built infrastructure, the review also examined population data to understand the potential vulnerable populations that are present within NRC. The background review process included a review of the climate hazards that could impact NRC infrastructure and vulnerable populations. As a result of this review, a vulnerable population and infrastructure component listing was established, and a prioritized list of vulnerabilities were compiled (**Section 2.2**).

The component listing compiled for this project was informed by several sources, namely:

1. **Nashwaak Rural Community 2023 Asset Inventory,** which contains general information related to building name, location, construction year, and improvement costs;
2. **The Village of Stanley 2022 Emergency Action Plan**, which defines the immediate response to specific identified high-risk emergencies, municipal actions, and the contact numbers of those that can provide immediate help;
3. **Stakeholder Interviews**, where community representatives provided information on their climate-change related experiences and concerns, as well as the infrastructure and/or population groups that they interface with on a regular basis.
4. **Census Data,** which provided information relating to population groups present within the community, disaggregated by either age, socio-economic, or ethnic indicators.
5. **Rural Plans**, which provided information relating to regional planning policies and regulations for various communities that are part of Nashwaak Rural Community

The infrastructure components considered as part of this assessment are shown in **Table 2**, below.

Table 2: Infrastructure Components

Asset Category	Component
Buildings	Foundation/Structure
	Roof
	Exterior Finishes
	Windows & Doors
	Mechanical Systems (HVAC)
	Electrical Systems
	Power Lines
Transportation	Hardscaping (Asphalt & Concrete Surface)
	Walking Trails (Gravel or Natural)
	Signage and Streetlights
Fleet	Fire Department Vehicles

Asset Category	Component
Wastewater and Stormwater	Wastewater Lagoon
	Lift Station
	Culverts & Ditches
	Groundwater Wells (Private)
	Storm Sewer
Natural Infrastructure	Green Infrastructure
	River and Waterways
	Riverbanks
People	Seniors
	People with Disabilities
	People in Core Housing Need
	Low-Income Households

2.1.1 Review of Climate Hazards

Using publicly accessible climate toolkits and studies, historical and projected climate data were collected to inform our understanding of anticipated changes in the climate. Historical conditions were compiled for the period 1981 to 2010. Climate change projections were then calculated for the time periods "2050s" (2041 – 2070) and "2080s" (2071 – 2100) using an ensemble average of various Global Climate Models (GCMs) with an emission scenario using the Representative Concentration Pathway (RCP) 8.5, demonstrating a "business as usual" scenario, with continued fossil fuel consumption going forward. The use of a large ensemble of models provides the best estimate of climate change since the average of the ensemble is the standard best practice methodology for climate change projections. The following sources were utilized:

- **Climate Data Canada**, an online climate data portal produced collaboratively by Canada's leading climate organizations and supported, in part, by the Government of Canada;
- **The Climate Atlas of Canada**, an online database with downscaled climate data that integrates interactive web design with climatology, cartography, and storytelling to better support education and applied decision-making;
- ***"Possible Impacts of Climate Change of Wind Gusts under Downscaled Future Climate Conditions: Updated for Canada" by Cheng et al.,*** a research article exploring future projections of wind gust events across various Canadian regions.

However, snow accumulation potential was assessed qualitatively based on available precipitation and cold weather data, and anecdotal information gathered from key stakeholders.

Dillon's review of regional climate hazards has identified several climate change impacts of concern (**Table 3**), namely extreme high temperatures, heavy rainfall events, drought conditions. These parameters are expected to increase in frequency in the future.

Table 3: Climate Data Projections

Climate Hazard	Definition/Threshold	Unit	Historical	2080s	Projected Trend
Heat/ Drought	**Very Hot Days** Average number of days per year with a maximum temperature >= 30°C	Days/year	8.2	62.0	↑
	Cooling Degree Days[1] Average number of cooling demand per year against the baseline of 18°C	CDD	139.4	689.0	↑
	No. of Heat Waves[2] Average number of heat waves per year	Heat waves/year	0.5	5.3	↑
	Average Length of Heat Waves Average length of heat waves in days	Days	1.7	7.3	↑
	12 Month SPEI[3] A drought index based on the difference between precipitation (P) and potential evapotranspiration (PET). Negative values indicate water deficit. The lower the value, the greater the risk of a drought.	-	0.07	0.02	↓
Cold	**Winter Days** Average number of days per year with minimum temperatures < -15°C	Days/year	40.8	2.8	↓
	Heating Degree Days[4] Average number of heating demand per year against the baseline of 18°C	HDD	4646.5	2985.1	↓
	Ice Days Average number of days per year with a maximum temperature <= 0°C	Days/year	72.1	21.5	↓
Heavy Precipitation	**Total Annual Precipitation** Average total annual precipitation in the form of rainfall and snow	mm/year	1221.3	1434.0	↑
	Wet Days >= 20 mm Average number of days per year with precipitation >= 20 mm (rain and snow combined)	Days/year	12.6	18.6	↑
	Maximum 5-Day Precipitation Average amount of precipitation that falls over a consecutive 5-day period	mm	81.3	101.1	↑
Freeze-Thaw	**Freeze-Thaw Cycles**[5] Average number of freeze-thaw cycles per year	Cycles/year	81.8	68.1	↓
High Wind Gusts	**High Winds >= 50 km/h** Average number of days per year with wind gusts >= 50 km/h	Days/year	23.5	25.9	↑
	High Winds >= 70 km/h Average number of days per year with wind gusts >= 70 km/h	Days/year	5.5	6.6	↑

Notes:

[1]Cooling Degree Days is a metric used to quantify cooling demand. CDD is calculated by subtracting 18°C from the average daily temperature for each day of a specified time period. Increases in CDD indicate increasing cooling needs due to an increase in average daily temperatures.

[2]Heat waves occur when at least 3 days in a row reach or exceed 30°C.

[3]The Standardized Precipitation Evapotranspiration Index (SPEI) classifications of drought; **Extremely wet (1.83 ≤ SPEI); Severely wet (1.82 < SPEI < 1.43); Moderately wet (1.42 < SPE < 1.43); Near normal (-1.0 ≤ SPEI ≤ 1.0); Moderate drought (-1.42 < SPEI < -1.0); Severe drought (-1.82 < SPEI < -1.43); Extreme drought (SPEI ≤ -1.83)**

[4]Heating Degree Days is a metric used to quantify heating demand. HDD is calculated by subtracting the average daily temperature from 18°C for each day of a specified time period. Decreases in HDD indicate decreasing heating needs due to an increase in average daily temperatures.

[5]A freeze-thaw cycle occurs when the daily maximum temperature exceeds 0°C and the daily minimum temperature is less than or equal to -1°C.

2.1.1.1 Data Limitations

The data gathered depicts the average of statistically downscaled data from twenty-four (24) climate models. It is standard practice in climatological studies to use data from a range of models (as opposed to a single model), to represent the uncertainty associated with the modeling process. It is important to acknowledge that there will invariably be an element of uncertainty associated with the projections provided by climate models regarding the anticipated changes in our climate.

Furthermore, it is challenging to predict with absolute certainty the specific outcomes of climate change. However, the level of confidence in potential impacts varies on a case-by-case basis, depending on the type of climate change associated with the impact and the nature of the relationship between the change and its resulting effects.

For example, there may be a higher degree of confidence when suggesting that an increase in the frequency of hot days will likely lead to an increased risk of heat-related illnesses strokes in human environments (unless proactive adaptation measures are implemented), but a lower degree of confidence that the increased number of hot days will increase the severity of thunderstorms (which require specific kinds of meteorological conditions). Therefore, while there exists a relatively straightforward cause-and-effect relationship between elevated outdoor temperatures and heat-related illnesses, the development of thunderstorms involves a more complex interplay of meteorological variables.

2.1.2 Community Engagement

Engagement was conducted on two fronts: a targeted interview with key stakeholders, and an online community-wide survey.

Dillon held four (4) targeted interviews between November 21 and November 25 of 2024 with community leaders and staff to gather input in helping identify climate change vulnerabilities and understand their first-hand observations of the impacts of climate change in their local communities. Interviewees are listed in **Table 4** below.

Table 4: Targeted Interviewees

Name	Role
Stephen Bliss	Fire Chief
Gary Spencer	Owner/Engineer of Spencer Environmental
Pam Stanley	Executive Director of Just Friends Food Bank
Amy Floyd	Former Ward Councillor

Interviews were tailored to each participant's respective areas of expertise so that insights gathered were both relevant and highly valuable. The interviews included questions directed towards the identification of past climate change impacts to specific infrastructure assets or vulnerable population groups that Dillon identified during the background review process. Participants were also asked about any adaptation options that they would like to see considered in the Climate Change Adaptation Plan where appropriate. The approach taken towards the development of this CCAP was driven by historical and projected climate data and an engagement process that facilitated stakeholder collaboration and leadership participation.

The engagement survey was published online and kept online from November 2024 to January 2025. It featured a series of questions asking participants to identify or rank climate change impacts that they were concerned of the most, as well as adaptation options that they would recommend. An example of such a question is shown in **Figure 1** below. The complete survey results are available in **Appendix A**.

The engagement concluded with flooding, wildfire, and heavy precipitation as the top three climate change impacts of concern in both the interviews and survey.

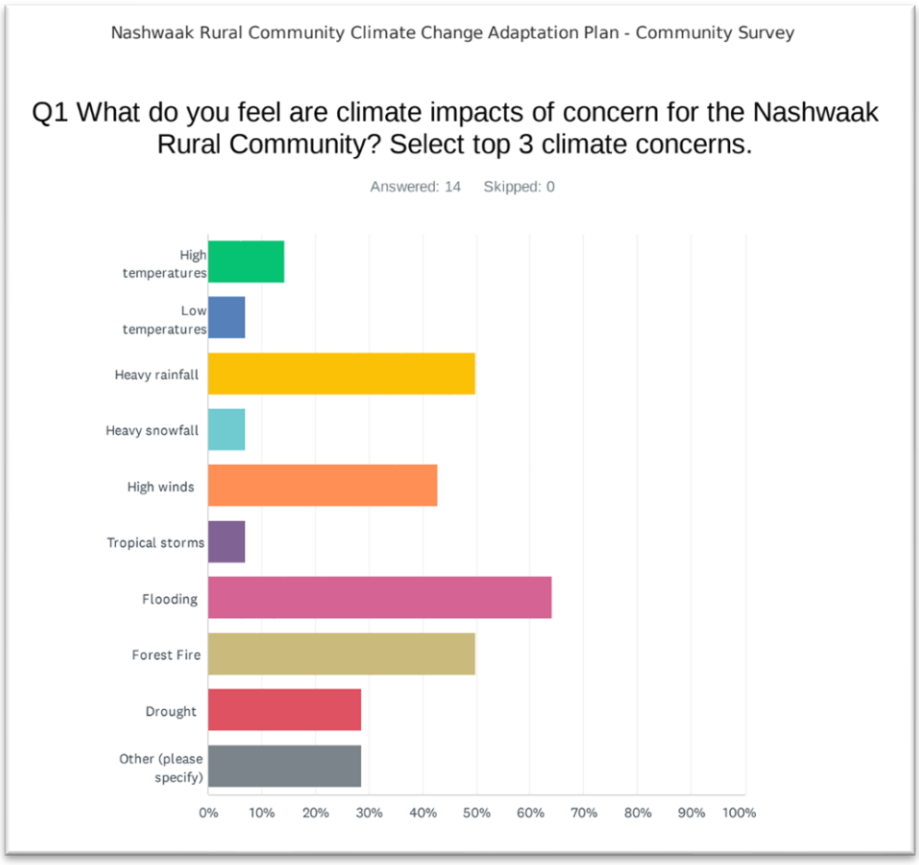

Figure 1: Results of Question 1 of 9 from the Community Survey

The climate-related concerns reported throughout engagement were then carried over into the vulnerability assessment and adaptation planning process, where adaptation and preventative measures were developed for each medium, high, and extreme-risk climate hazard and infrastructure interaction. The risks identified are discussed in greater detail in the sections that follow.

2.2 Vulnerability Assessment

Three vulnerability assessments were conducted: an infrastructure vulnerability assessment, a spatial assessment, and a social vulnerability assessment, whereby:

- The **infrastructure assessment** focused on the interactions between community infrastructure and climate hazards of concern, independent of their location within the community;
- The ***spatial assessment*** focused on a high-level analysis of available flood hazard maps of the community provided by ***New Brunswick Flood Hazard Maps***; and
- The **social vulnerability assessment** focused on the interactions between specific vulnerable population groups and climate hazards of concern, independent of their location within the community.

2.2.1 Infrastructure Assessment Methodology

The methodology used for this assessment is in alignment with risk management guidelines and the risk management process described within. The process required executing four key steps to complete the vulnerability assessment of community infrastructure. These are:

1. Identify potential **risk interactions** between infrastructure components and climate hazards;
2. Determine **likelihood of occurrence** for climate hazards using current climate data and future climate projections;
3. Determine the **severity of an impact** of each feasible interaction between a climate hazard and an infrastructure component; and
4. Calculate the **risk score** corresponding to defined risk levels (i.e., very low, low, medium, high, or extreme) by multiplying the likelihood of occurrence with the severity of the impact. The calculation of the interaction risk score is based on the following fundamental equation: **Risk = Likelihood x Severity,** where:
    - 4.1. **Likelihood** is the statistical frequency/probability of specific climate hazard thresholds being reached historically, and in the future; and
    - 4.2. **Severity** is a measurement of the climate hazard's consequence of impact on a particular asset, should that hazard occur.

2.2.1.1 Identifying Risk Interactions

Possible risk interactions between the studied climate hazards and community infrastructure were identified and recorded using an interaction matrix. The interaction matrix was then further expanded through the formation of vulnerability statements which provided initial general descriptions of the expected impacts because of the risk interaction.

For example, one initially identified interaction was between the wastewater lagoon and heavy precipitation, and the corresponding vulnerability statement for this interaction identified a concern regarding the increased risk of overtopping where untreated or partially treated wastewater can spill over embankments and flow into surrounding land or bodies of water. The risk scores and vulnerability statements were then confirmed and distilled with consultations within the Dillon Team.

2.2.1.2 Likelihood of Occurrence

For the purposes of this project, the probability scores were defined using a scale of 1 to 5, with 1 considered to be of the lowest probability (Highly Unlikely) and 5 being the highest probability (Highly Probable).

The likelihood scoring criteria was tailored for the project by Dillon and was informed by criteria successfully applied on similar assessments and was adapted from (ISO) 31000:2018 Risk Management Guidelines. To assign a likelihood score, the historical and future occurrence probability values were calculated based on the historical and projected climate data for each climate hazard. Historical climate data was assigned a score from 1 to 5 based on professional judgement using the criteria outlined in **Table 5** below. Historical climate data was assigned a score of "Somewhat Likely" (3) or "Likely" (4). Assigning a future probability score for each climate hazard required a simple calculation to relate the future projection back to the historical climate value.

Table 5: Likelihood of Occurrence

Likelihood Score	Descriptor	Probability of event occurring in a year (%)
1	Highly Unlikely	≤ 1
2	Possible	1 – 19
3	Somewhat Likely	20 – 49
4	Likely	50 – 98
5	Highly Probable	≥ 99

2.2.1.3 Severity of Impact

The consequences of climate change impacts were assessed internally by the Dillon team and confirmed through the adaptation planning workshop. **Table 6** displays the scale used to score the severity of the interactions.

Table 6: Interactions severity ratings

Severity Rating	Classification	Consequence Types	
		Health & Safety	Infrastructure
1	Very Low	No effect	No permanent damage
2	Low	Minor short-term impacts	Minor asset or system damage, minor repairs
3	Medium	Few injuries, or modest temporary impact quality of life	Moderate asset or system damage, minor repairs and some equipment replacement
4	High	High possibility of injuries or chronic health issues, or major temporary impact on quality of life	Significant damage, loss, or require repairs or complete replacement
5	Extreme	Serious injuries or illnesses, major permanent impact on quality of life, or fatalities	Major damage, loss, or require complete replacement

2.2.1.4 Interaction Risk Score

Following principles of ISO 3100:2018, probability and severity scores were plotted on a risk matrix, as shown in **Figure 2**, below. The Risk Matrix is a standard tool for considering probability and impact severity to assess risk for a given hazard. Each risk level is associated with a different colour and warrants different responses.

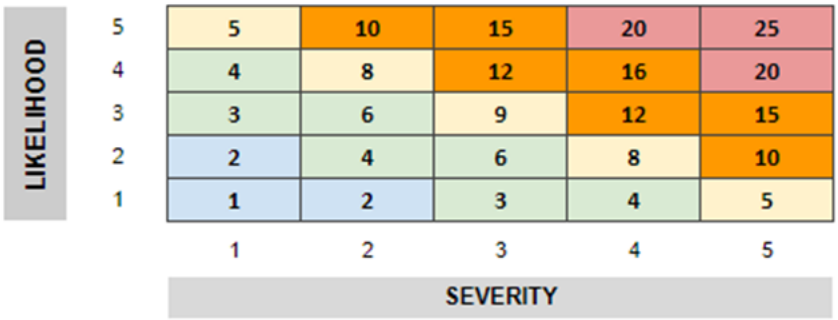

Figure 2: Risk matrix

Risk Classification	Rating	Recommended Risk Treatment
Very Low	**1 – 2**	Tolerable: risks do not require further consideration
Low	**3, 4 and 6**	Monitor: controls or coping strategies recommended
Medium	**5, 7 – 9**	Requires some attention: some controls required to reduce risk levels. Monitor risk for changes over time.
High	**10 – 16**	Requires much attention: high priority control measures required
Extreme	**20 – 25**	Not acceptable: significant controls required

Figure 3: Risk Scoring Criteria

A very low score (i.e., blue square in the matrix above) signifies a minimal risk event that does not require further consideration. A low score (i.e., green square) signifies a low risk where existing measures are sufficient to manage the risks, but eventual control strategies should be a consideration. A medium score (i.e., yellow square) signifies a medium risk where action may be required, or risks may be closely monitored and managed by continuous improvement. A high score (i.e., orange square) signifies a high risk where high priority is required. An extreme score (i.e., red square) signifies an unacceptable risk requiring immediate or significant controls to be implemented.

2.2.2 Infrastructure Assessment

2.2.2.1 Infrastructure Assessment Results

Based on the results of the infrastructure assessment, a total of **four (4) extreme, twelve (12) high, seventeen (17) medium, twenty (20) low risk interactions** were identified. These risks are presented in **Figure 4** in the next page and further expanded in greater detail in **Appendix B**. Each identified risk was assigned an identifier code for ease of reference in the adaptation planning process.

	Infrastructure	Climate Parameters						
		High Temperatures	Low Temperatures	Heavy Precipitation	Freeze-Thaw Cycles	Snow Accumulation (Winter Storm)	High Wind Gusts	Drought Conditions
	FUTURE (RCP8.5) - Probability of Occurence	5	2	4	4	2	3	3
Building Infrastructure								
Building	Foundation/Structure			B1	B2			
	Roof	B3		B4	B5	B6	B7	
	Exterior Finishes	B8		B9				
	Windows & Doors	B10		B11	B12		B13	
	Mechanical Systems	B14		B15			B16	
	Electrical Systems	B17					B18	
	Power lines						B19	
Transportation	Hardscaping (Asphalt & Concrete Surface)	T1		T2	T3			
	Walking Trails (Gravel or Natural)			T4				
	Signage and Streetlights						T5	
Fleet	Fire Department Vehicles	F1						
Wastewater and Stormwater	Wastewater Lagoon			W1				
	Lift Station			W2				
	Culverts & Ditches			W3		W4	W5	
	Groundwater Wells (Private)			W6				W7
	Stormsewer			W8	W9			
Natural Infrastructure	Green infrastructure	N1		N2				N3
	River and Waterways							N4
	Riverbanks			N5				
People	Seniors	P1	P2	P3				
	People with disabilities	P4	P5	P6				
	People in core housing need	P7	P8	P9			P10	
	Low-Income Households	P11	P12	P13			P14	

Figure 4: Infrastructure Assessment Results

2.2.2.2 Flooding and Wildfire Assessment Results

Wildfire risk was assessed primarily based on their **severity scores** (**Table 7**), as wildfires are driven by a complex combination of environmental, climatic, and human-related factors. Key elements such as temperature fluctuations, which can accelerate the drying of vegetation, and prolonged drought-like conditions that can increase the chances of ignition and rapid spread. Precipitation patterns also play an important role, as reduced or irregular rainfall can create drier landscapes more susceptible to fires. Additionally, human activities, such as land use changes, accidental ignitions, or intentional fire-setting, can contribute to wildlife occurrences. Hence, assigning a **likelihood score** could not be done with a sufficient level of certainty.

Table 7. Wildfire Severity Scores

Impact Category	Impact Statement		Severity
Life and Property	Loss of Infrastructure	Wildfires pose a significant threat to homes, buildings, and infrastructure, particularly in rural areas where properties are often more dispersed and lack firebreaks or fire-resistant construction. Remote locations face additional challenges, including limited access for evacuation and delayed firefighting response.	5
	Displacement of Residents	Wildfires often necessitate large-scale evacuations, forcing community members to leave their homes and communities behind. For many, this displacement can result in the loss of not only their homes but also their livelihoods, personal belongings, and deep-rooted connections to their local environment.	5
Health and Safety	Air Quality & Respiratory Issues	Wildfires generate smoke, which can travel vast distances. This smoke contains fine particulate matter and harmful pollutants that, when inhaled, can lead to severe respiratory issues. Vulnerable populations, such as children, the elderly, and individuals with pre-existing conditions like asthma or heart disease, are particularly at risk of experiencing exacerbated health problems.	5
	Increased Risk of Injuries & Fatalities	Beyond direct exposure to flames, wildfires can cause injuries or fatalities through car accidents during evacuations, smoke inhalation, or accidents involving falling trees or debris. It is reported that many of the Community's roads need repair due to ageing, washouts from flooding, or increased wear from diverted traffic. If roads are under repair, rapid response during emergencies may be more difficult.	5

Flooding is among the most serious natural hazards facing New Brunswick today. Inland flooding is a type of flood event caused by heavy rainfall or a combination of rainfall and snowmelt. Flood risks are especially high during the spring, when contributions from melt of the winter snow and ice pack create peak runoff conditions that exceed local drainage capacities.

Flooding was assessed similarly based on **severity scores** (**Table 8**) and a high-level assessment of flood maps (**Appendix C**). Some risk factors include precipitation patterns, as heavier rainfall can overwhelm drainage systems and lead to ponding. The community's proximity to rivers and waterways plays a significant role in determining flood vulnerability. Additionally, human activities within and adjacent to the community, such as urbanization or clear-cutting, can exacerbate flood risks by altering drainage patterns. Given the multifaceted nature of these factors, assigning a precise likelihood score could not be done with a sufficient level of certainty.

Table 8: Flooding Severity Scores

Impact Category		Impact Statement	Severity
Life and Property	**Loss of Infrastructure**	Flooding can cause significant damage to infrastructure, including road washouts, bridge collapses, and the inundation of homes, businesses, and public buildings. Such damage can severely disrupt transportation networks, making it difficult for emergency services to respond and for residents to evacuate or access essential resources. Critical services, such as electricity, water supply, and communication systems, are also vulnerable to flooding, leading to widespread outages and further complicating recovery efforts. These disruptions often culminate in substantial economic setbacks, as the costs of repairs, replacements, and lost productivity can be immense.	4
	Displacement of Residents	Flooding often forces evacuations, displacing community members and causing the loss of homes, livelihoods, and connections to their local environment. This can lead to emotional, psychological, and economic challenges, with some households potentially being permanently uprooted. This disrupts social networks, cultural ties, and long-term stability, leaving lasting impacts on mental health and community cohesion.	4

2.2.3 Spatial Assessment

A high-level assessment of several flood maps at four key regions (Former Village of Stanley, Village of Nashwaak, Penniac, and Penniac East) in the community was also conducted under the following flood scenarios:

1. The present day 1-in-100 year flood event; and
2. The present day and future 2100 1-in-20 year flood event (with climate change).

Flood limits were sourced from ***New Brunswick Flood Hazard Maps***, an online accessible tool that allows users to explore areas that may experience potential flooding on the coast and near rivers in New Brunswick. An example of one map developed is shown in **Figure 5** below, which showcases the present day and future 2100 1-in-20 year flood event in the Former Village of Stanley. New Brunswick Flood Hazard Maps did not feature complete data for the future 2100 1-in-100 year flood event. For this reason, only the present day variant was assessed. The complete set of flood maps is available in **Appendix C**.

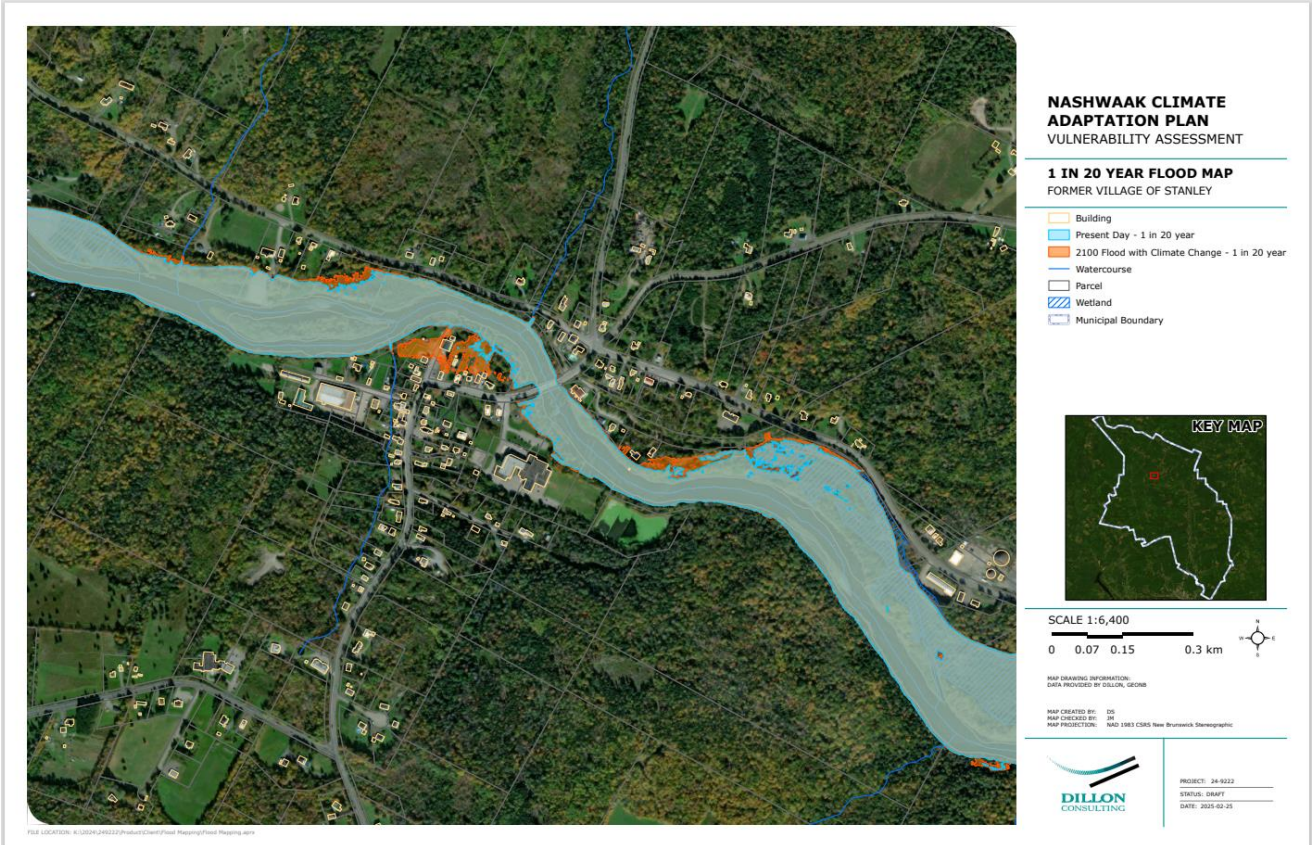

Figure 5: 1-in-20 Year Flood Map - Former Village of Stanley

Several key observations made are as follows.

Former Village of Stanley

For both the present day 1-in-100 year flood event and the 2100 1-in-20 year flood event, Main Street access to the Fire Hall is at high risk of flooding. Buildings adjacent to the fire hall located north of Bridge Street are also at high risk of flooding as they are located close to the flood limits.

Village of Nashwaak

For both the present day 1-in-100 year flood event and the 2100 1-in-20 year flood event, parts of Nashwaak Village Road is anticipated to be flooded as well as many buildings sitting on the eastern side of the road.

Penniac East

For both the present day 1-in-100 year flood event and the 2100 1-in-20 year flood event, buildings located on the south side of Penniac Road (e.g., properties immediately adjacent to 154 Penniac Road) are projected to be below the flood limits and therefore have high flood risks.

Penniac

For both the present day 1-in-100 year flood event and the 2100 1-in-20 year flood event, Parts of Canada Street and Price Road are projected to be flooded. Furthermore, several buildings located on Price Road (e.g., around 834 Canada Street) and the southern side of Penniac Road (e.g., around 154 Penniac Road) are projected to be under high flood risks.

Transportation infrastructure is vital for ensuring connectivity, mobility, and access to emergency services within and beyond a community. Road networks enable emergency vehicles to navigate effectively, making their design and resilience critical for public safety. A key concern is the potential flooding of access roads, which could disrupt connectivity, delay emergency response times, and hinder evacuation efforts—particularly for vulnerable populations such as the elderly, people with disabilities, or those with pre-existing health conditions. The vulnerability assessment highlights several roads at risk of flooding, which, if compromised, could sever critical links and exacerbate risks during emergencies. Addressing these vulnerabilities is essential to maintaining reliable access for emergency services and ensuring community safety.

2.2.4 Social Vulnerability Assessment

2.2.4.1 Secondary Research on Social Vulnerability

To understand the potential climate impacts to more vulnerable groups within the community, Dillon conducted secondary research using census data and Environics Analytics to gain insight into social vulnerabilities in NRC. Due to municipal restructuring as a result of local governance reform, some

variables for the NRC are not available as part of the Census 2021 data. For the variables of suitable housing, households paying over 30% of their income for shelter costs, and residents of homes with major repairs needed, an average was pulled from the Village of Stanley, Stanley Parish, and St. Mary's Parish.

Census Variables indicating vulnerability among the NRC population with a provincial comparison were selected from a baseline report provided by the New Brunswick Department of Health, which included age-related, socio-cultural, and socio-economic indicators.

NRC diverges from the remainder of New Brunswick within two key areas: socio-cultural and core housing needs. Concerning, socio-cultural indicators, NRC has a smaller percentage of residents who are recent immigrants, visible minorities, with Indigenous identity, and without knowledge of English or French. NRC has more significant percentage of residents paying over 30% of their income for shelter costs and living in dwelling units in needing repair (Statistics Canada 2021).

The population of NRC grew 5% from 2016 to 2021, at a rate slightly higher than the Province of New Brunswick. The most vulnerable age groups to climate change risks are those between 0 - 4 and over 65. NRC has a similar age breakdown to the province as a whole. NRC has 5% of its population under 4 years of age, compared to 4% across New Brunswick, and 21% of NRC is above 65, compared to 23% of the province (Statistics Canada 2021).

Within the NRC, 9% of residents spend over 30% of their income on shelter. When examining the Village of Stanley specifically, this percentage increases to 16%, which is significantly greater than Saint Mary's Parish (7%), Stanley Parish (5%) and the province as a whole (8%). NRC has a higher proportion of residents in need of significant repairs (10% vs 10%), though in Stanley Parish, the percentage of dwellings needing major maintenance rises to 18% (Statistics Canada 2021).

The CCAP interviews reveal specific vulnerable groups and socio-economic vulnerabilities that impact the population. A general lack of awareness and understanding of climate change presents a barrier to developing and implementing climate adaptation or mitigation measures. Some residents suffer from generational poverty and have low incomes, making them particularly vulnerable during climate emergencies as they often lack the financial means to invest in adaptation measures such as improved insulation, stronger building materials, or flood defences. Two other groups discussed were the elderly and those with pre-existing health conditions. Both groups face mobility constraints, including the inability to drive and physical mobility issues, that can add difficulty in evacuating during extreme weather events such as floods and wildfires. For these reasons, seniors, people with disabilities or pre-existing health conditions, low-income households, and those with core housing needs were identified as the primary vulnerable population groups that would be assessed throughout the vulnerability assessment.

3.0 Adaptation and Implementation Planning

Potential adaptation options for **extreme, high,** and **medium** risk interactions identified during the vulnerability assessment were discussed and developed at the and adaptation and implementation planning interviews.

Adaptation options in the context of this report can be characterized primarily by:

- **Physical adaptation** of infrastructure through repairing, rebuilding, relocating, retrofitting actions; or
- **Policy adaptation** through changes to policies or plans, direction and the goals of the community to better mitigate the impacts of climate change.

The extreme, high, and medium risk interactions were classified by climate hazard of concern. Participants then identified and discussed potential adaptation measures to help mitigate impacts associated with the climate hazards of concern.

To support the implementation of these adaptation measures, a high-level implementation plan was also developed to help community leaders prioritize actions based on level of risk and relative ease of implementation based on three key metrics: **parties potentially responsible for implementation, estimated capital resources required,** and **working timeline.** These criteria are explained in **Table 9** below.

This CCAP identified 34 adaptation measures that could be implemented, and they are ranked from highest to lowest priority in **Table 10**. The table also explores the justifications behind the adaptation options and what impacts have motivated them. The recommendations listed in the table address the extreme, high, and medium risks identified throughout the vulnerability assessment and are a culmination of strategies that have been assessed and confirmed by community stakeholders during the Adaptation and Implementation Planning Workshop. Ongoing review and update of this ranked list is recommended as this CCAP moves forward in time. The ongoing review and update allows integration of new information into adaptation planning, including observations on how effective adaptation measures are after their initial implementation.

Table 9: Implementation Criteria

Responsibilities	Capital Requirements	Timeline
Driver of action is solely the municipality Nashwaak Rural Community (NRC)	**$** (Adaptation is estimated to cost less than $10,000)	**Short term** (Action should be initiated within 0-4 years.)
Municipality may have to consult or coordinate with Federal organizations E.g., Natural Resources Canada, Department of Transport Canada (DTI)	**$$** (Adaptation is estimated to cost between $10,000 and $40,000)	**Medium-to-long term** (Action should be initiated within 5-8 years.)
Municipality could consult or 8coordinate with local organizations E.g., Nashwaak Watershed Association, Local Organizations (e.g., community associations, food banks, community centres, etc.)	**$$$** (Adaptation is estimated to cost greater than $40,000)	**Continuous** (Action to continue or occur repeatedly beyond .)

Table 10: High-Level Implementation Plan

Priority Number	Interaction Description	Interaction Codes (Refer to Appendix B)	Adaptation Option	Type	Responsibilities	Capital Requirement	Timeline
1	**Flooding, Wildfire, High Temperatures, Low Temperatures, High Wind Gusts** People	**P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14**	**Climate Change Impact Awareness & Preparedness Campaign**	**Policy**	**NRC, NBEMO, Local Organizations**	**$**	**Short term**
2	**High Temperatures, Low Temperatures, Drought** People	**P1, P2, P4, P5, P7, P8, P11, P12**	**Incentivizing Green Retrofits**	**Policy**	**NRC, Local Organizations**	**$$**	**Short term**
3	**Flooding, Wildfire**	**General (See Section 2.2.2.2)**	**Localized Emergency Committees**	**Policy**	**NRC, NBEMO, Local Organizations**	**$**	**Short term**
4	**Wildfire**	**General (See Section 2.2.2.2)**	**Integrate FireSmart Program into EMO Plan**	**Policy**	**NRC**	**$$**	**Short term**
5	**Flooding, Wildfire**	**General (See Section 2.2.2.2)**	**Access Homeowner Repair Programs**	**Policy**	**NRC, Provincial Government**	**$$$**	**Continuous**
7	**Drought** Groundwater Wells (Private)	**W7**	**Water Conservation Campaign**	**Policy**	**NRC**	**$$**	**Short term**
8	**Drought** Groundwater Wells (Private)	**W7**	**Aquifer Assessment**	**Policy**	**NRC**	**$$**	**Short term**
9	**Heavy Precipitation** Lift Station	**W2**	**Inflow & Infiltration Assessment**	**Policy**	**NRC**	**$$**	**Short term**
10	**High Temperatures, Heavy Precipitation** Exterior Finishes	**B8, B9**	**Maintenance and Renewal of Exterior Finishes for Municipal Buildings**	**Policy**	**NRC**	**$**	**Continuous**
11	**High Temperatures** Windows & Doors	**B10**	**Installation of Window Blinds**	**Physical**	**NRC**	**$**	**Short term**
12	**Drought** Groundwater Wells (Private)	**W7**	**Municipal Water System Feasibility Assessment**	**Policy**	**NRC**	**$$**	**Continuous**
13	**Heavy Precipitation** Stormsewers	**W8**	**Stormwater Management Modeling**	**Policy**	**NRC**	**$$**	**Continuous**
14	**Wildfire**	**General (See Section 2.2.2.2)**	**Community Fire Risk Assessment**	**Policy**	**NRC, Natural Resources Canada, Local Organizations**	**$$**	**Medium-to-long term**

Priority Number	Interaction Description	Interaction Codes (Refer to Appendix B)	Adaptation Option	Type	Responsibilities	Capital Requirement	Timeline
15	**Flooding**	**General (See Section 2.2.2.2)**	**Improved Floodplain Management**	**Policy**	**NRC**	**$$**	**Medium-to-long term**
16	**Flooding**	**General (See Section 2.2.2.2)**	**Flood-Resilient Infrastructure**	**Physical**	**NRC, DTI**	**$$$**	**Medium-to-long term**
17	**High Temperatures** Roof	**B3**	**Routine Inspections and Maintenance of Roofs for Heat Damage**	**Policy**	**NRC**	**$**	**Continuous**
18	**High Temperatures** Hardscaping (Asphalt & Concrete Surface)	**T1**	**Routine Inspection and Maintenance of Roads**	**Policy**	**NRC, DTI**	**$**	**Continuous**
19	**Heavy Precipitation** Wastewater Lagoon	**W1**	**Upgrade Lagoon Capacity**	**Physical**	**NRC**	**$$$**	**Medium-to-long term**
20	**Heavy Precipitation, Flooding** Riverbanks	**N5**	**Riverbank Restoration and Riparian Buffers**	**Physical**	**NRC, Natural Resources Canada**	**$**	**Medium-to-long term**
21	**Heavy Precipitation, Flooding** Riverbanks	**N5**	**Acquiring Land in High-Risk Flood Areas for Conservation**	**Policy**	**NRC, Natural Resources Canada; Nashwaak Watershed Association**	**$$$**	**Medium-to-long term**
22	**Heavy Precipitation** Culverts & Ditches	**W3**	**Increase Capacity of Ditches and Culverts**	**Physical**	**NRC, DTI**	**$$$**	**Medium-to-long term**
23	**Heavy Precipitation** Stormsewers	**W8**	**Increase Stormsewer Capacity**	**Physical**	**NRC**	**$$$**	**Continuous**
24	**High Temperatures** Roof	**B3**	**Consider Alternative Roof Materials**	**Physical**	**NRC**	**$$-$$$**	**Continuous**
25	**High Temperatures** Hardscaping (Asphalt & Concrete Surface)	**T1**	**Pavement material upgrades**	**Physical**	**NRC, DTI**	**$$$**	**Continuous**

Priority Number	Interaction Description	Interaction Codes (Refer to Appendix B)	Adaptation Option	Type	Responsibilities	Capital Requirement	Timeline
26	**High Temperatures** Mechanical Systems	B14	Routine Inspection and Maintenance of Cooling Systems	Policy	NRC	$	Continuous
27	**High Temperatures** Mechanical Systems	B14	Upgrade Cooling Systems	Physical	NRC	$$$	Continuous
28	**High Temperatures** Electrical Systems	B17	Improving Grid Resilience	Physical	NRC	$	Continuous
29	**High Temperatures** Windows & Doors	B10	Routine Inspection and Maintenance of Windows	Policy	NRC	$	Continuous
30	**Heavy Precipitation** Roof	B4	Proper Installation and Maintenance of Roof Gutters and Downspouts	Physical	NRC	$	Short term
31	**Heavy Precipitation** Exterior Finishes	B11	Waterproofing Exterior Walls and Foundations	Physical	NRC	$	Continuous
32	**Heavy Precipitation** Groundwater Wells (Private)	W6	Well Maintenance Awareness Campaign	Policy	NRC	$$	Continuous
33	**Snow Accumulation** Roof	B6	Routine Snow Removal	Policy	NRC	$	Continuous
34	**High Temperatures** Green Infrastructure	N1	Planting Heat-Tolerant & Drought-Resilient Vegetation	Physical	NRC, Natural Resources Canada	$-$$	Short term

3.1 Adaptation Options

The following section catalogues the 34 adaptations listed above.

3.1.1 Physical Adaptations

Priority 11 - Installation of Window Blinds

Installing blinds on windows can help regulate indoor temperatures by reducing the amount of heat entering or escaping through the glass. During hot weather, closing blinds can block direct sunlight, keeping interiors cooler. By minimizing temperature fluctuations, blinds also help reduce the strain on window materials

Priority 16 - Invest in Flood-Resilient Infrastructure

Investing in flood-resilient infrastructure can be a critical strategy for protecting communities from flood impacts. This can involve elevating critical infrastructure such as roads, bridges, and utilities to withstand flooding and maintain their functions during and after flood events. Several roads have been identified to be at high risk of flooding, such as Main Street (Stanley), Nashwaak Village Road (Village of Nashwaak), Penniac Road, Price Road, and Canada Street (Penniac). Constructing flood barriers, levees, or retention ponds in strategic locations can also help divert or contain floodwaters, reducing damage to homes, businesses, and municipal facilities.

Priority 19 - Upgrade Lagoon Capacity

Lagoon expansion through increasing hydraulic capacity (i.e. dredging). Increasing hydraulic capacity address the issue of overflow by providing more room to hold both wastewater and stormwater during heavy rainfall events.

Priority 20 - Riverbank Restoration and Establish Riparian Buffers

Establishing vegetated strips of land along riverbanks with native plants, trees, and grasses can significantly reduce erosion and improve water absorption, which can help slow and manage floodwaters. This can also provide additional ecological benefits, such as wildlife habitat and water filtration. Once established, riparian buffers require relatively low maintenance, especially if native vegetation is used.

Priority 22 - Increase Ditch and Culvert Capacities

Upgrading or expanding the capacity of existing drainage infrastructure to handle higher volumes of runoff during heavy precipitation, reducing the likelihood of localized flooding.

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Upgrading or expanding the capacity of existing drainage infrastructure to handle higher volumes of runoff during heavy precipitation, reducing the likelihood of localized flooding.

Priority 23 - Increase Storm Sewer Capacity

Increasing the size of pipes and stormwater drainage systems can accommodate higher volumes of water. This might involve upgrading storm sewer systems by installing larger pipes or additional storm drains in areas prone to flooding.

Priority 24 - Consider Alternative Roof Materials

Alternatives include installing lighter-colored shingles to reduce heat absorption, ensuring proper attic ventilation to prevent heat buildup, and using sheet metal or slate roofing as durable, weather-resistant options instead of asphalt shingles.

Priority 25 - Pavement Material Upgrades

Asphalt binder upgrade, increasing HMA layer thickness, or using modified HMA are some of the strategies many studies suggest reducing the risks of pavement structure failure because of degradation over time from increased temperature and precipitation. Further investigation is necessary to further examine the cost-effectiveness of these adaptation strategies.

Priority 27 - Upgrade Cooling Systems

Using more energy-efficient cooling systems or upgrading existing systems can help reduce the amount of energy needed to cool a building, thereby reducing the strain on the system during extreme heat.

Priority 28 - Improve Grid Resilience

Small-scale upgrades to existing infrastructure can help prevent overheating and failures in transformers and other equipment without requiring major overhauls. Protective equipment such as fuses or circuit breakers can be installed in critical areas to prevent overloads from high energy demand.

Priority 30 - Proper Installation and Maintenance of Roof Gutters and Downspouts

Design roofs with an appropriate slope to direct water toward gutters and downspouts are correctly sized, and well-maintained.

Priority 31 - Waterproofing Exterior Walls and Foundations

Waterproofing exterior walls with proper waterproofing sealants helps protect them from water damage. It reduces the risk of mold growth, decay, and weakening of building material.

3.1.2 Policy Adaptations

Priority 1 - Climate Awareness & Preparedness Campaign

The municipality recently signed on to Voyent Alert; a multi-purpose communication services and alerting app. In an initiative to further community resilience, this program could be coupled with an educational campaign based on preparing for and responding to various severe weather events. This can include information such as staying hydrated and recognizing symptoms of heat illness during heatwaves, where to access heating centers during cold spells, information on flooding and wildfire risks, evacuation plans, and fire safety practices.

Priority 2 - Incentivizing Green Retrofits

Encourage rural households to acquire green retrofits (e.g., home insulation, space heating) through incentives and rebates. This would also include educating community members on programs such as the ***Canada Greener Homes Initiative***; run by the Federal Government, which seeks to provide grants to households to be more climate resilient.

Priority 3- Localized Emergency Committees

Organize ward-based volunteer or neighborhood teams trained to assist in the evacuation of vulnerable individuals. These teams could be mobilized quickly in case of severe emergency events such as flooding or wildfire to ensure that at-risk people such as elderly, children, or those with mobility issues are assisted in evacuations.

Priority 4 - Integrate FireSmart Program into EMO Plan

By integrating the FireSmart Program into the EMO plan, communities can take a comprehensive, proactive approach to wildfire management, ensuring greater safety and resilience for residents and infrastructure.

Priority 5 - Access Homeowner Repair Programs

Funding programs such as the Repair and Renewal option of the Affordable Housing Fund, or the Government of New Brunswick's Homeowner Repair program can be proactive measure to prepare for wildfires is vital for enhancing the resilience of homes and communities. By retrofitting properties with flood-resistant materials, elevating structures, and improving drainage systems, homeowners can protect their homes from water intrusion and reduce the risk of structural damage.

These programs can also help homeowners implement fire-resistant improvements, such as installing fire-resistant roofing, creating defensible space around properties, and reinforcing windows and doors to prevent ember intrusion. These proactive measures not only safeguard the property but also reduce long-term financial and emotional stress during and after a flood event. Additionally, repairing and reinforcing homes before flooding occurs helps ensure quicker recovery, supports community resilience, and reduces the overall impact on local economies and resources.

Priority 7 - Water Conservation Campaign

Public education campaigns promoting water conservation practices, such as efficient irrigation systems, rainwater harvesting, and reduced water usage, to alleviate pressure on groundwater resources - especially during hot summers.

Priority 8 - Aquifer Assessment

Aquifer assessments help identify areas at risk of over-extraction, contamination, or depletion by analyzing groundwater levels, flow patterns, and quality. By understanding the vulnerabilities of local

aquifers, communities can implement sustainable water management practices, such as regulating extraction rates, protecting recharge zones, and preventing contamination from agricultural or industrial activities.

Priority 9 - Inflow and Infiltration Assessment

Conduct evaluations to identify and quantify excess water entering lift stations through inflow and infiltration and recommending remediation strategies. Municipality should seek funding from the Environmental Trust Fund to potentially complete this assessment.

Priority 10 - Maintenance and Renewal of Exterior Finishes for Municipal Building

Regularly inspect and seal cracks and gaps to mitigate water intrusion because of wind-directed rain. Sealing as needed can help maintain building performance and prevent minor issues from escalating to major repairs. This routine should also inspect existing heat mitigation elements, such as shade structures and reflective coatings. When renewing, opt for heat-resistant options like reflective or light-colored paints and coatings that can withstand prolonged sun exposure.

Priority 12 - Municipal Water System Feasibility Assessment

Such an assessment is a comprehensive evaluation to determine the viability of establishing, upgrading, or expanding a community's water supply and distribution system. This assessment can be an important action to investigate the feasibility of a centralized water system to ensure reliable, safe, and sustainable water access, especially in the face of climate change and growing demands.

Priority 13 - Stormwater Management Modelling

Modelling supports the evaluation of existing stormwater control systems and help develop strategies to mitigate overland flood risks in flood-prone areas through the identification of drainage system improvements.

Priority 14 - Community Fire Risk Assessment

Conducting a fire risk assessment involves systematically identifying fire hazards and evaluating risks in order to take appropriate actions to reduce or eliminate potential threats. One potential outcome could be the identification of activities of surrounding municipalities or private organizations in near vicinity of Nashwaak that could heighten wildfire risks and working with the right authorities to address them.

Priority 15 – Improved Floodplain Management (Establish or Enforce Zoning Regulations in Floodplains)

Implement zoning regulations that prevent development in high-risk flood zones identified through flood risk assessments, while promoting flood-resistant building practices. Consider enforcing compliance through a permitting process, regular inspections, and penalties for non-compliance. This

coupled with regularly updating zoning maps and engaging the community can support long-term resilience and adaptability to changing flood risks.

Priority 17 - Routine Roof Inspections for Heat Damage

Timely inspections can be done to ensure that minor issues are addressed appropriately before they escalate into major roofing problems. This can also assist in identifying potential problems to watch for in the future (e.g. cracking, shrinking, damage to flashing).

Priority 18 - Routine Inspection and Maintenance of Roads

Establish a routine inspection and maintenance schedule to regularly check for and address heat-related damage, extending the lifespan of the infrastructure.

Priority 21 - Acquire Land in High-Risk Flood Areas for Conservation

With support from watershed associations, purchasing and preserving land in high-risk flood areas for conservation can restore natural ecosystems, such as wetlands and floodplains, which act as natural buffers against flooding by absorbing and slowing floodwaters. Partnering with watershed associations and leveraging funding opportunities can make this strategy cost-effective and community-driven, ensuring a sustainable and environmentally conscious path toward flood mitigation and ecosystem restoration.

Priority 26 - Routine Inspection and Maintenance of Cooling Systems

Ensuring that cooling systems are well-maintained helps them run more efficiently and reduces the risk of breakdowns during periods of extreme heat. Regular maintenance can prevent service disruptions, extend the life of the system, and reduce the need for costly repairs or upgrades in the future.

Priority 29 - Routine Inspection and Maintenance of Windows

Regularly inspecting and maintaining window seals ensures early detection of any damage, which can prevent further deterioration. Reapply sealant or caulk around the window edges as necessary, especially after noticing any cracking or shrinkage from weather exposure.

Priority 32 - Well Maintenance Awareness Campaign

Public education campaigns can raise awareness about the importance of well maintenance and flood preparedness. This can include information on the importance of regular inspection and maintenance of private wells with proper casing and secure seals. In addition, it could also inform residents to consider elevating wellheads and installing backflow prevention devices to further reduce contamination risks.

Priority 33 - Routine Snow Removal

If snow accumulates significantly, timely inspection and removal of snow from the roof can reduce weight load that the roof must support.

Priority 34 - Planting Heat-Tolerant and Drought-Resilient Vegetation

Plant native and drought-tolerant species that can withstand both heat and wet conditions (e.g., Red Maple (Acer rubrum), Eastern White Cedar (Thuja occidentalis), and Switchgrass (Panicum virgatum).). These species are better adapted to regional conditions and can withstand temperature fluctuations and drought conditions.

4.0 Conclusion

In summary, the climate change vulnerability assessment completed for Nashwaak Rural Community identified **four (4) extreme, twelve (12) high, seventeen (17) medium, twenty (20) low risk interactions** from the vulnerability assessment. Medium, high, and extreme risks were prioritized and brought forward to the adaptation planning process. The high-level flood risk assessment found various segments of the community's road infrastructure and buildings to be vulnerable to the 2100 1-in-20 year and present day 1-in-100 year flood events. As the global climate grows unstable, the frequency and severity of inclement weather such as very hot days, heavy precipitation, or even drought-like conditions can also be anticipated to increase. More extreme multi-variable dependent events such as wildfire remain difficult to accurately predict but the significant impacts they can bring to a community necessitates a robust and comprehensive emergency management plan.

In total, thirty-four (34) unique adaptation options were identified to support climate resilience within the community. This Climate Change Adaptation Plan identifies a path forward for the Community to proactively prepare for the anticipated climate change impacts for the region. As time progresses, new climate information and modelling technologies will emerge and so this plan will require ongoing monitoring and review of the adaptation measures and implementation plan outlined in **Section 3.0** of this report.

4.1 Limitations

The climate change hazards used in this project were obtained from several sources, each using separate projection models with inherent limitations. Generally, the uncertainty found in climate projections can be divided into three main categories:

1. Natural climate variability (i.e., the natural fluctuations of the climate on timescales ranging from days to decades);
2. Models (i.e., different parameterizations in models can lead to somewhat different climate change signals or properties); and
3. Scenarios (i.e., future CO_2 emissions, representative concentration pathways).

Uncertainty categories 1 and 2 relate to the use of large ensembles of models. Using a large ensemble will ultimately help develop a measure of the natural climate variability, which is related to the spread of the simulations estimated by looking at the 10th, 25th, 75th and 90th percentiles for each climate indicator.

Uncertainty category 3 is covered by using the most realistic RCP scenarios (namely RCP 8.5) to align with the current progress of global GHG emission reductions. RCP 8.5 aligns with the current "business

as usual" trend of no significant reduction in global GHG emissions, and a possibility of continued growth in atmospheric loadings of global GHGs.

This report was prepared by Dillon Consulting Limited for the sole benefit of our Client for the purposes outlined in our approved scope of work. The material in it reflects Dillon's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Dillon accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

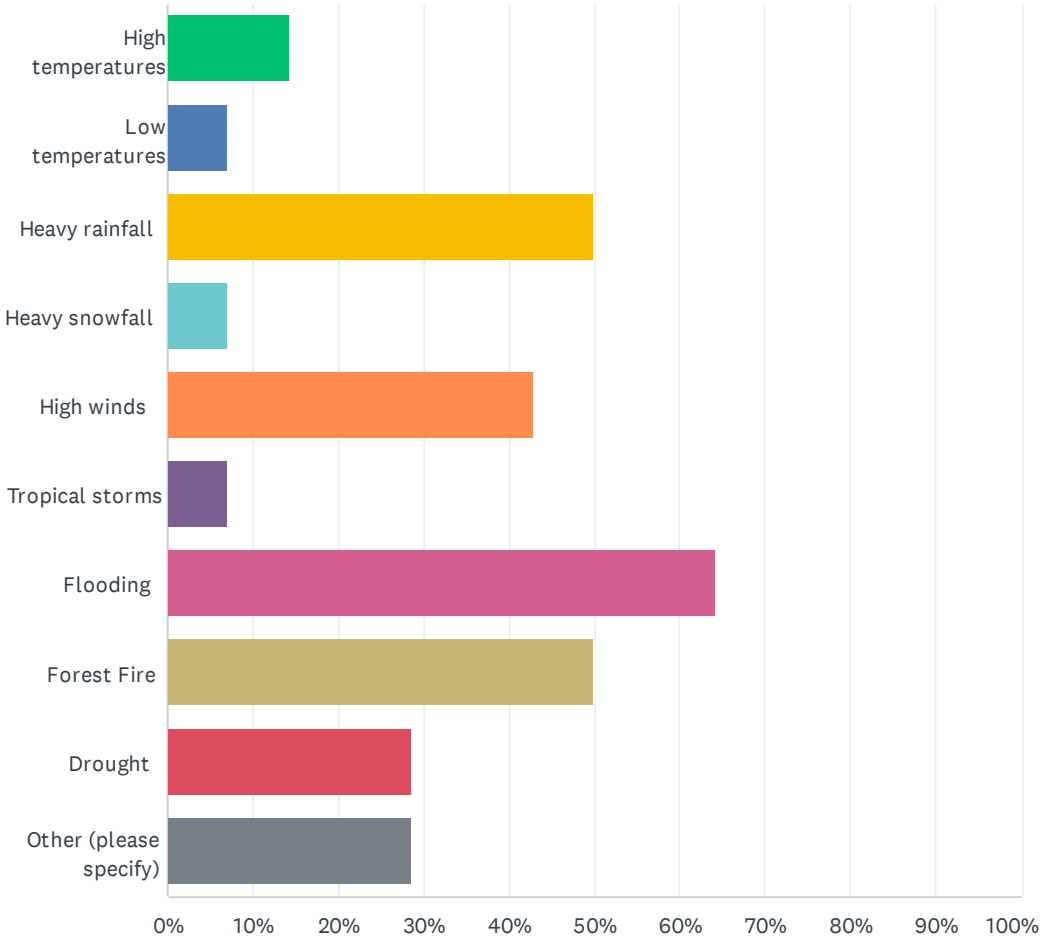
Appendix A

Engagement Survey Results

DILLON CONSULTING

Q1 What do you feel are climate impacts of concern for the Nashwaak Rural Community? Select top 3 climate concerns.

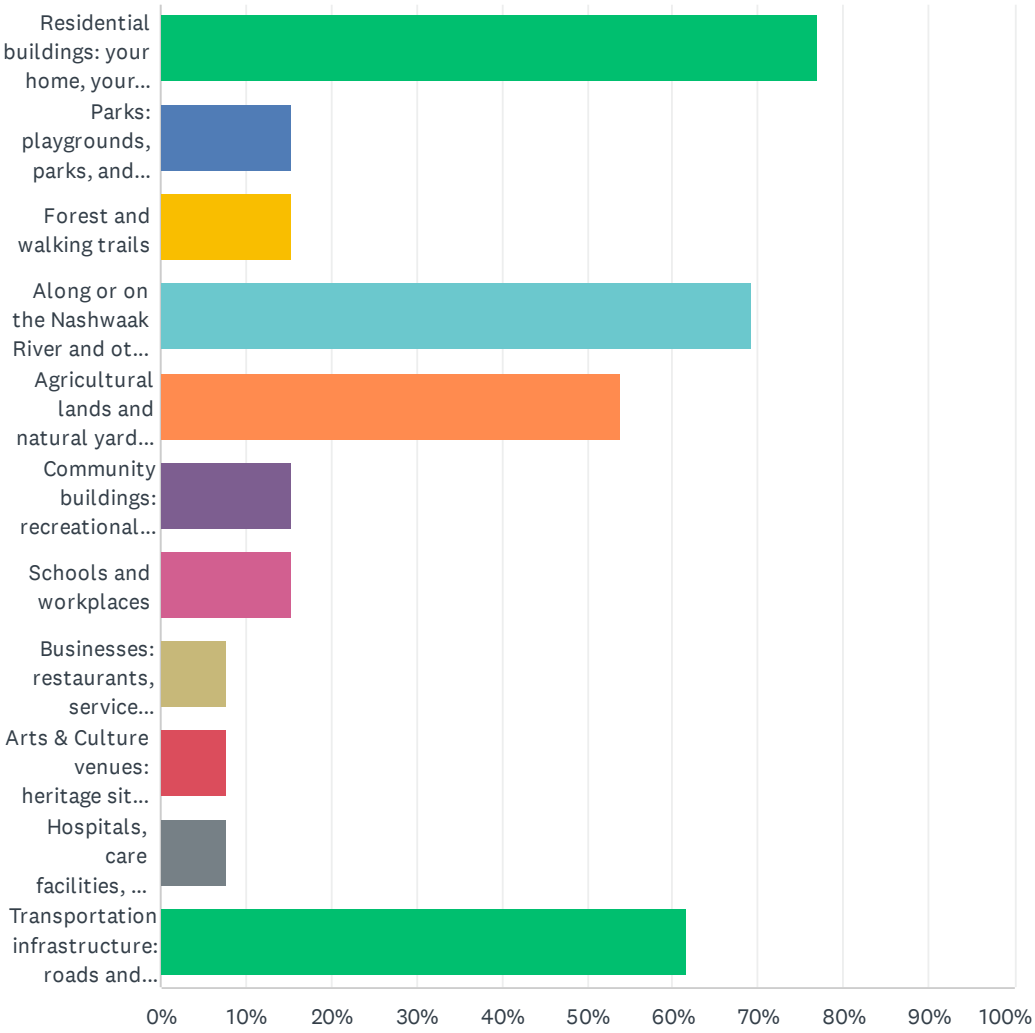
Answered: 14 Skipped: 0



ANSWER CHOICES	RESPONSES	
High temperatures	14.29%	2
Low temperatures	7.14%	1
Heavy rainfall	50.00%	7
Heavy snowfall	7.14%	1
High winds	42.86%	6
Tropical storms	7.14%	1
Flooding	64.29%	9
Forest Fire	50.00%	7
Drought	28.57%	4
Other (please specify)	28.57%	4
Total Respondents: 14		

Q2 Which places do you feel are at high risk of climate change impacts? Think of various social, economic, built, or natural spaces in the Nashwaak area. Select all that apply.

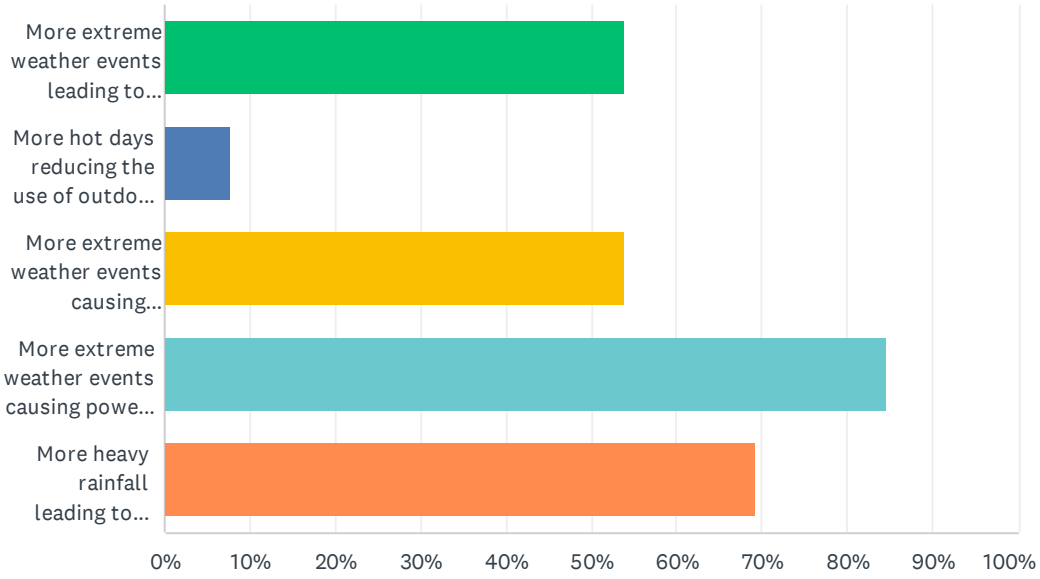
Answered: 13 Skipped: 1



ANSWER CHOICES	RESPONSES	
Residential buildings: your home, your neighbors' and loved ones' homes	76.92%	10
Parks: playgrounds, parks, and nature reserves	15.38%	2
Forest and walking trails	15.38%	2
Along or on the Nashwaak River and other waterways	69.23%	9
Agricultural lands and natural yard gardens	53.85%	7
Community buildings: recreational facilities, community resource centres, churches, etc.	15.38%	2
Schools and workplaces	15.38%	2
Businesses: restaurants, service providers, retail spaces, etc.	7.69%	1
Arts & Culture venues: heritage sites, community markets, etc.	7.69%	1
Hospitals, care facilities, and social services facilities	7.69%	1
Transportation infrastructure: roads and sidewalks	61.54%	8
Total Respondents: 13		

Q3 The following list of statements represent potential social risks posed by climate change. Select the 3 risks you are most concerned about in your community.

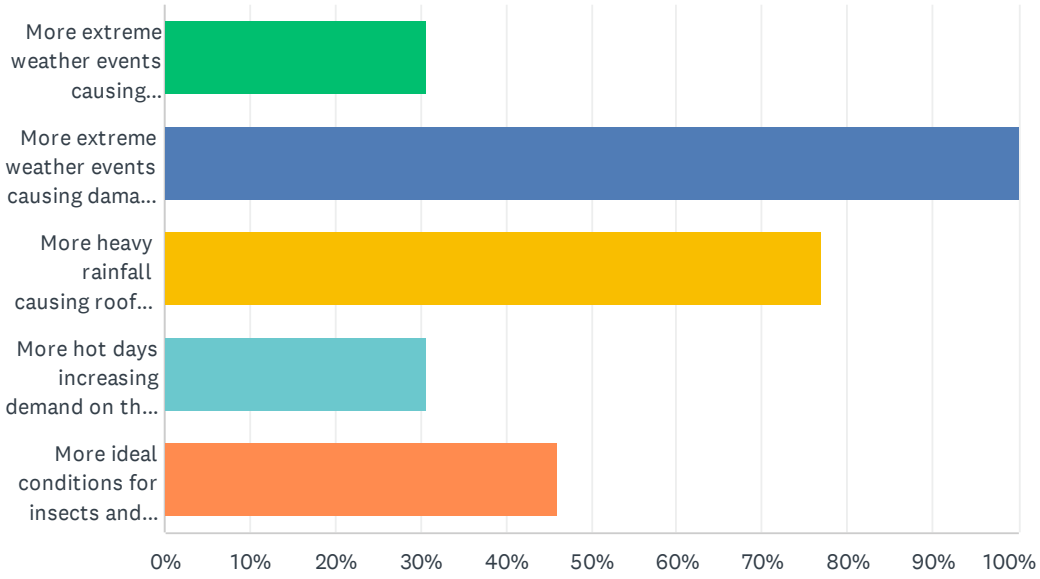
Answered: 13 Skipped: 1



ANSWER CHOICES	RESPONSES	
More extreme weather events leading to higher mental and physical health impacts	53.85%	7
More hot days reducing the use of outdoor spaces and disrupting community events	7.69%	1
More extreme weather events causing dangerous travel conditions	53.85%	7
More extreme weather events causing power outages impacting internet or other connectivity	84.62%	11
More heavy rainfall leading to flooding causing displacement as a result of damage to roadways and homes	69.23%	9
Total Respondents: 13		

Q4 The following list of statements represent potential economic or infrastructure risks posed by climate change. Select the 3 risks you are most concerned about in your community.

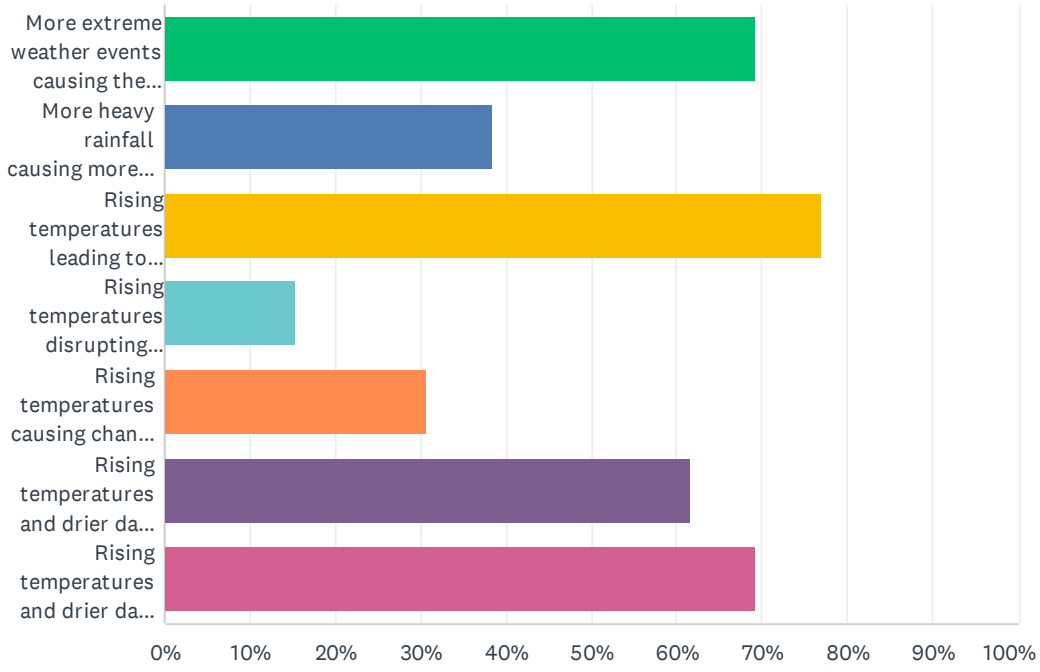
Answered: 13 Skipped: 1



ANSWER CHOICES	RESPONSES	
More extreme weather events causing dangerous travel conditions	30.77%	4
More extreme weather events causing damage to power lines and utility infrastructure that businesses rely on	100.00%	13
More heavy rainfall causing roof leaks, flooding, and damage to privately owned assets and infrastructure	76.92%	10
More hot days increasing demand on the power grid	30.77%	4
More ideal conditions for insects and pests, impacting agricultural crops	46.15%	6
Total Respondents: 13		

Q5 The following list of statements represent potential environmental risks posed by climate change. Select the 4 risks you are most concerned about in your community.

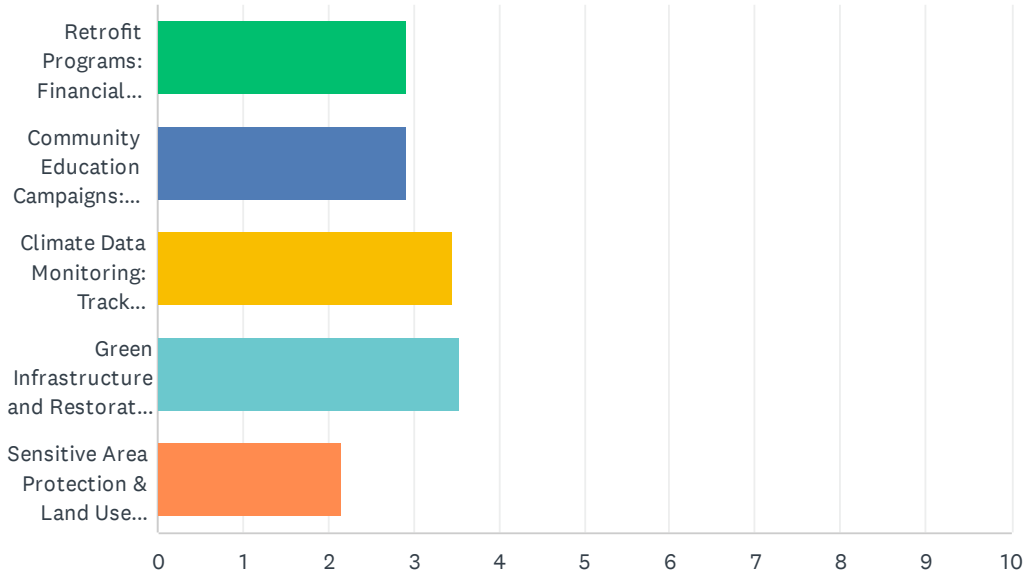
Answered: 13 Skipped: 1



ANSWER CHOICES	RESPONSES	
More extreme weather events causing the riverbank and steep slopes to erode, and the destruction of habitats in the floodplain	69.23%	9
More heavy rainfall causing more flooding and more surface runoff to carry contaminants into waterways and groundwater supplies	38.46%	5
Rising temperatures leading to higher risk of forest fires, heatwaves. and poor air quality	76.92%	10
Rising temperatures disrupting plant growth	15.38%	2
Rising temperatures causing changes in species distribution and stunted rare and common plant growth	30.77%	4
Rising temperatures and drier days leading to lower water levels in lakes and rivers	61.54%	8
Rising temperatures and drier days stressing forests, wetlands, and groundwater supplies	69.23%	9
Total Respondents: 13		

Q6 Rank each government-led action from very important to very unimportant

Answered: 13 Skipped: 1



	1	2	3	4	5	TOTAL	SCORE
Retrofit Programs: Financial incentives for homeowners to make energy-efficient upgrades and flood-proof their homes.	38.46% 5	0.00% 0	7.69% 1	23.08% 3	30.77% 4	13	2.92
Community Education Campaigns: Inform the public about climate risks specific to Nashwaak and how to prepare for them (e.g. FireSmart program that supports improvements in emergency planning, preparation and response to wildfire impacts).	23.08% 3	7.69% 1	30.77% 4	15.38% 2	23.08% 3	13	2.92
Climate Data Monitoring: Track climate-related data to inform future adaptation efforts and policy decisions, including the Northside Flood Resiliency Project and Water Quality Monitoring - Facilitating Environmental Stewardship organized by Petitcodiac Watershed Alliance.	7.69% 1	61.54% 8	7.69% 1	15.38% 2	7.69% 1	13	3.46
Green Infrastructure and Restoration Projects: Develop green infrastructure like wetlands, parks, and greenways to manage floodwaters and provide recreational spaces, including the Forested Wetlands Project or Nashwaak River Bank Stabilization Project organized by Nashwaak Watershed Association Inc.	23.08% 3	23.08% 3	38.46% 5	15.38% 2	0.00% 0	13	3.54
Sensitive Area Protection & Land Use Planning Reform: Regulate development on environmentally sensitive areas like rivers, streams, wetlands, steep slopes, organic soils, and groundwater recharge / discharge areas, including McLeod Hill and the Nashwaak River floodplain.	7.69% 1	7.69% 1	15.38% 2	30.77% 4	38.46% 5	13	2.15

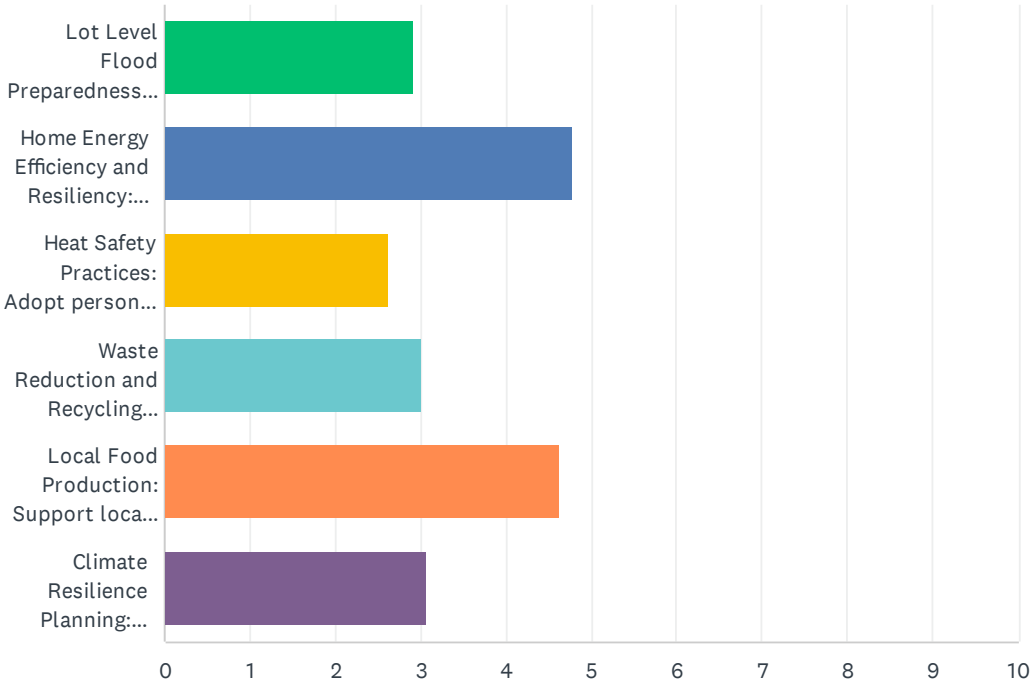
Q7 Do you have other Actions or Strategies that you would like to see the Government implement?

Answered: 3 Skipped: 11

Answers have been synthesized and included as **Section 3.0** of the report

Q8 Rank each community-led action from very important to very unimportant.

Answered: 13 Skipped: 1



	1	2	3	4	5	6	TOTAL	SCORE
Lot Level Flood Preparedness: Implement measures like Natural Yard Pledge & Wildlife Friendly Gardening and Rain Gardens to reduce flooding on personal properties.	7.69% 1	7.69% 1	30.77% 4	7.69% 1	15.38% 2	30.77% 4	13	2.92
Home Energy Efficiency and Resiliency: Upgrade insulation, windows, and heating/cooling systems to reduce energy consumption and improve comfort during extreme weather.	53.85% 7	7.69% 1	15.38% 2	15.38% 2	0.00% 0	7.69% 1	13	4.77
Heat Safety Practices: Adopt personal heat safety measures such as staying hydrated, using fans, and checking on vulnerable neighbors during heatwaves.	0.00% 0	15.38% 2	7.69% 1	15.38% 2	46.15% 6	15.38% 2	13	2.62
Waste Reduction and Recycling Initiatives: Encourage waste reduction through recycling programs, composting, and initiatives to reduce single-use plastics.	0.00% 0	15.38% 2	23.08% 3	23.08% 3	23.08% 3	15.38% 2	13	3.00
Local Food Production: Support local food production through farmers' markets and supporting local agriculture to reduce food miles and promote sustainable farming practices.	38.46% 5	23.08% 3	7.69% 1	23.08% 3	7.69% 1	0.00% 0	13	4.62
Climate Resilience Planning: Develop plans to enhance the community's resilience to climate impacts, including the Village of Stanley Emergency Action Plan and the Climate Adaptation Plan these efforts support.	0.00% 0	30.77% 4	15.38% 2	15.38% 2	7.69% 1	30.77% 4	13	3.08

Q9 Do you have other Actions or Strategies that you would like to see the Community of Nashwaak implement?

Answered: 2 Skipped: 12

Answers have been synthesized and included as **Section 3.0** of the report

Appendix B

Vulnerability Assessment Results

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Table B-1. Expanded Vulnerability and Risk Table

Code	Infrastructure	Hazard	Vulnerability	Historical Risk Score (1981 - 2010)	Projected Risk Score (2050s)	Projected Risk Score (2080s)
Building Infrastructure						
B1	Foundation/Structure	Heavy Precipitation	Heavy rain can impact building foundations by saturating the surrounding soil, leading to soil erosion, uneven settlement, and increased hydrostatic pressure against foundation walls. This can cause foundation cracks, misalignment, or even shifting and tilting of the structure.	4	4	4
B2	Foundation/Structure	Freeze-Thaw Cycles	When water enters cracks in the foundation and freezes in cold weather, it expands, putting pressure on the material. This can cause cracks, surface damage, and weaken the foundation over time. Repeated freezing and thawing can further weaken the structure.	5	5	4
B3	Roof	High Temperatures	Higher temperatures can cause materials such as asphalt, shingles, and metal to expand and contract, which can lead to cracking, warping, and weakening of exterior walls, reducing their lifespan.	4	8	10
B4	Roof	Heavy Precipitation	Heavy precipitation can cause ponding and poor roof drainage may lead to water infiltration and damage to other building components, disrupting service and requiring repairs	8	8	8
B5	Roof	Freeze-Thaw Cycles	Damage roof membrane over time due to expansion/contraction and possible ice build-up; Long-term wear and tear may increase maintenance cost and shorten asset life	5	5	4
B6	Roof	Snow Accumulation	As snow piles up on the roof, it adds weight to the structure, which can stress the roof and potentially lead to sagging or even collapse if the weight exceeds the roof's capacity.	12	12	12[1]
B7	Roof	High Wind Gusts	Damage from wind-blown debris is possible but is expected to have a small impact to building roof potentially requiring minor repairs	3	-	3
B8	Exterior Finishes	High Temperatures	Higher temperatures can cause materials such as wood, concrete, and brick to expand and contract, which can lead to cracking, warping, and weakening of exterior walls, reducing their lifespan.	4	8	10
B9	Exterior Finishes	Heavy Precipitation	Heavy precipitation can damage a building's exterior finishes by allowing water to infiltrate cracks and gaps, leading to water damage, mold growth, or weakening of materials.	8	8	8
B10	Windows & Doors	High Temperatures	More extreme temperature fluctuations can cause materials used in windows to expand and contract. This repeated movement can weaken seals, cause cracks in the glass, and degrade the window frame over time.	4	8	10
B11	Windows & Doors	Heavy Precipitation	Wind-directed rain can put pressure on the seals around windows. If the seals (weatherstripping or caulking) are compromised or degraded, rainwater can seep through gaps into the building. This can cause water damage to the window frame, the surrounding wall, and the interior of the building.	4	4	4
B12	Windows & Doors	Freeze-Thaw Cycles	Damage seals over time due to expansion/contraction; Long-term wear and tear may increase maintenance costs and shorten asset life	10	10	8
B13	Windows & Doors	High Wind Gusts	Wind loading; Risk of debris damaging windows - Wind damage is possible but is expected to have a small impact to building envelope requiring minor repairs	6	-	6
B14	Mechanical Systems	High Temperatures	Extreme hot temperatures could overwhelm the cooling system's capacity which may lead to increased energy demand, temporary service disruption, and expensive replacement costs to increase capacity for the future.	2	4	5
B15	Mechanical Systems	Heavy Precipitation	Wind-directed rain can penetrate rooftop HVAC systems and damage ducts	4	4	4
B16	Mechanical Systems	High Wind Gusts	In the case of roof mounted HVAC units, high winds can potentially remove grilles and filters, and bend ducts out of shape.	6	-	6
B17	Electrical Systems	High Temperatures	Higher average temperatures can strain electrical grids and equipment, leading to higher demand for cooling systems and potentially causing overheating or failures in transformers, switchgear, and other electrical components.	2	4	5
B18	Electrical Systems	High Wind Gusts	Temporary service disruptions may occur due to power outages	3	-	3
B19	Power Lines	High Wind Gusts	Wider temporary service disruptions may occur due to power outages	9	-	9
Transportation						
T1	Hardscaping (Asphalt & Concrete Surface)	High Temperatures	Under high temperatures, road surfaces are at higher risk of softening, cracking, rutting, leading to overall degradation of the road infrastructure	4	8	10
T2	Hardscaping (Asphalt & Concrete Surface)	Heavy Precipitation	Rain loading/flash flooding - May erode supporting soils but unlikely to have a direct impact on hard surfaces	4	4	4

[1] Risk score for **Roof – Snow Accumulation** was downgraded from a high to medium risk as roof design typically considers safety factors.

Code	Infrastructure	Hazard	Vulnerability	Historical Risk Score (1981 - 2010)	Projected Risk Score (2050s)	Projected Risk Score (2080s)
T3	Hardscaping (Asphalt & Concrete Surface)	Freeze-Thaw Cycles	Accelerated damage with more freeze-thaw cycles; Long-term wear and tear may increase maintenance costs and shorten asset life	5	5	4
T4	Walking Trails (Gravel or Natural)	Heavy Precipitation	Heavy rain can lead to the erosion of trail surfaces, particularly on dirt, gravel, or soil-based trails.	4	4	4
T5	Signage and Streetlights	High Wind Gusts	High winds can impact road signage and streetlights, causing damage or displacement.	3	-	3
Fleet						
F1	Fire Department Vehicles	High Temperatures	Increased ambient temperatures can reduce the ability for engine cooling. If overheated, it can lead to reduced performance, potential damage to engine components, and even engine failure.	2	4	5[2]
Water, Wastewater, and Stormwater						
W1	Wastewater Lagoon	Heavy Precipitation	Heavy rain can impact water levels in wastewater lagoon, potentially leading to overflow of untreated or partially treated wastewater. This can lead to the contamination of surrounding area.	12	12	12
W2	Lift Station	Heavy Precipitation	Lift station pumps may by impacted if significant inflow and infiltration is present, causing increased operational costs or potential discharge to the surrounding environment through emergency overflow.	12	12	12
W3	Culverts & Ditches	Heavy Precipitation	Heavy precipitation events can result in higher volumes of runoff entering ditches and culverts, exceeding their capacity and causing localized flooding.	8	8	8
W4	Culverts & Ditches	Snow Accumulation	Snow, if not cleared, can be packed down impacting flow from culverts and ditches, potentially leading to localized flooding during winter rain events.	6	6	6
W5	Culverts & Ditches	High Wind Gusts	Wind-swept debris can impact ditches and culverts, obstructing flow and potentially leading to localized flooding	6	-	6
W6	Groundwater Wells (Private)	Heavy Precipitation	Heavy precipitation causing localized flooding may result in potential contamination based on increased water run off. However, we assume most private wells have proper casing and are appropriately maintained.	8	8	8
W7	Groundwater Wells (Private)	Drought	Drought can lower groundwater well levels and degrade water quality.	8	8	12
W8	Stormsewers	Heavy Precipitation	Heavy precipitation events can result in higher volumes of runoff entering the piping system, exceeding their capacity and causing localized flooding.	8	8	8
W9	Stormsewers	Freeze-Thaw Cycles	Freeze-thaw cycles can lead to ground subsidence around pipes, potentially causing settlement and structural instability.	4	4	4
Natural Infrastructure						
N1	Green Infrastructure	High Temperatures	Increased watering costs and cost of transitioning to warmer climate landscaping; However extreme heat can cause more pronounced damage to green infrastructure, which has not been quantified as part of this risk due to unknowns.	2	4	5
N2	Green Infrastructure	Heavy Precipitation	Heavy precipitation can impact green infrastructure and surrounding soils.	4	4	4
N3	Green Infrastructure	Drought	Risk of damage to trees and landscaping, and other green infrastructure.	4	4	6
N4	River and Waterways	Drought	Low water levels can restrict use and reduce intake for firefighting capacity	4	4	6
N5	Riverbanks	Heavy Precipitation	Heavy precipitation can increase water levels and cause shoreline erosion lead which can lead to loss of land	12	12	12
People						
P1	Seniors	High Temperatures	Seniors can be more vulnerable to heat-related illnesses (e.g. heat exhaustion and heat stroke). Chronic health conditions such as respiratory issues and heart disease can worsen in the heat. Without relief, extreme cases can potentially lead to hospitalization or death.	10	20	25
P2	People with disabilities	High Temperatures	High temperatures can be especially harmful to people with disabilities, as certain conditions may affect their ability to regulate body temperature or respond to heat. Mobility impairments can limit access to cooling methods, while sensory or cognitive disabilities might make it harder to recognize or communicate the need for hydration or rest. Additionally, some medications used by people with disabilities may increase sensitivity to heat, raising the risk of heat exhaustion or heat stroke.	8	16	20
P3	People in core housing need	High Temperatures	People in core housing need are vulnerable to heat due to inadequate housing, lack of cooling, and overcrowded conditions. Financial constraints and limited access to healthcare increase the risk of heat-related illnesses.	8	16	20
P4	Low-Income Households	High Temperatures	Low-income households are at greater risk during heatwaves due to limited access to cooling, financial constraints, limited access to healthcare, and poor housing. This increases the likelihood of heat-related illnesses.	8	16	20

[2] Risk score for **Fire Department Vehicles – High Temperatures** was downgraded from a medium to low risk due to their robustness to high temperatures in their initial design.

Code	Infrastructure	Hazard	Vulnerability	Historical Risk Score (1981 - 2010)	Projected Risk Score (2050s)	Projected Risk Score (2080s)
P5	Seniors	Low Temperatures	Cold temperatures can impact elderly populations due to reduced circulation and a weakened ability to sense temperature changes. This increases the risk of hypothermia. Chronic conditions and limited mobility also make it harder for this population to stay warm, further heightening vulnerability to cold-related health issues.	16	12	8
P6	People with disabilities	Low Temperatures	Mobility impairments may make it difficult to access heating or seek shelter in warmer spaces, increasing the risk of prolonged exposure to the cold. Sensory disabilities, such as blindness or deafness, can prevent individuals from sensing the drop in temperature, while cognitive or developmental disabilities may affect their ability to recognize the symptoms of hypothermia or frostbite.	16	12	8
P7	People in core housing need	Low Temperatures	Without adequate warmth, these households face an increased risk of hypothermia, frostbite, and other cold-related health issues. Limited access to healthcare and resources further exacerbates the danger, making it harder for individuals to recover from cold exposure.	16	12	8
P8	Low-Income Households	Low Temperatures	Without adequate warmth, these households face an increased risk of hypothermia, frostbite, and other cold-related health issues. Limited access to healthcare and resources further exacerbates the danger, making it harder for individuals to manage from cold exposure.	16	12	8
P9	People in core housing need	High Wind Gusts	Wind-swept debris can cause serious injury or death, especially in areas with poorly constructed buildings or insufficient wind protection which is often the case with households in core housing need.	9	-	9
P10	Low-Income Households	High Wind Gusts	Wind swept debris can cause serious injury or death, especially in areas with poorly constructed buildings or insufficient wind protection.	9	-	9

Appendix C

Flood Maps

DILLON CONSULTING

Flood Risk Assessment Process

Dillon analyzed the flood limits within key regions of higher population centers within NRC. This being the former Village of Stanley, Village of Nashwaak, Penniac, and Penniac-East. The present day and 2100 flood maps are publicly accessible through the "***New Brunswick Flood Hazard Maps***" published by Service New Brunswick. The following scenarios were assessed:

1. The present day 1-in-100 year flood event; and
2. The present day and 2100 1-in-20 year flood event (with climate change).

A "1-in-100 year flood" means that there is a 1% chance of this level of flooding occurring in a given year at a specific location. While a 1-in-100 year flood represents a relatively rare event, it's crucial to be prepared for such occurrences, as they can cause significant damage and pose risks to life and property. In practice, regions and municipalities often use this concept to establish zoning regulations ad insurance requirements in flood-prone areas. This approach is part of a broader strategy to consider and mitigate the impacts of flooding and protect public safety.

Note: New Brunswick Flood Hazard Maps did not feature complete data for the future 2100 1-in-100 year flood event. For this reason, only the present day variant was assessed. Production of a future 2100 1-in-100 year flood map (with climate change) may be an action to be undertaken following the publishing of this CCAP.

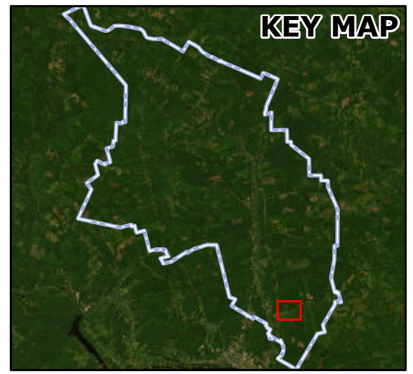
NASHWAAK CLIMATE ADAPTATION PLAN

VULNERABILITY ASSESSMENT

1 IN 100 YEAR FLOOD MAP

PENNIAC EAST

- Present Day - 1 in 100 year
- Building
- Watercourse
- Parcel
- Wetland
- Waterbody
- Municipal Boundary



SCALE 1:10,000

0 0.13 0.25 0.5 km

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MAP DRAWING INFORMATION:
DATA PROVIDED BY DILLON, GEONB

MAP CREATED BY: DS
MAP CHECKED BY: JM
MAP PROJECTION: NAD 1983 CSRS New Brunswick Stereographic

DILLON CONSULTING

PROJECT: 24-9222

STATUS: DRAFT

DATE: 2025-01-20

FILE LOCATION: K:\2024\249222\Product\Client\Flood Mapping\Flood Mapping.aprx

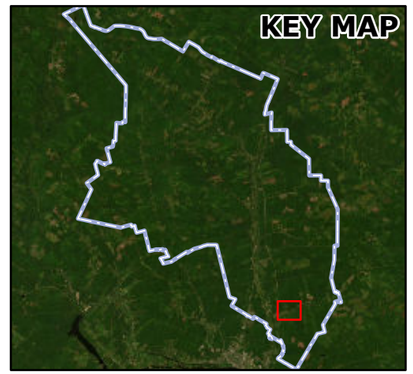
NASHWAAK CLIMATE ADAPTATION PLAN

VULNERABILITY ASSESSMENT

1 IN 20 YEAR FLOOD MAP

PENNIAC EAST

- Building
- Present Day - 1 in 20 year
- 2100 Flood with Climate Change - 1 in 20 year
- Watercourse
- Parcel
- Wetland
- Municipal Boundary



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MAP DRAWING INFORMATION:
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DATE: 2025-02-25

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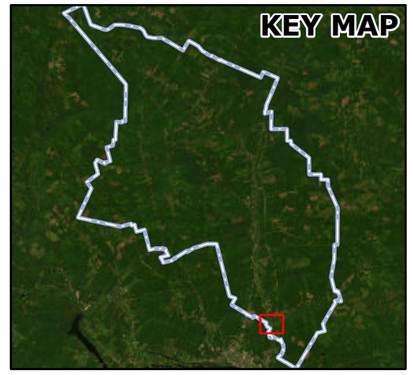
NASHWAAK CLIMATE ADAPTATION PLAN

VULNERABILITY ASSESSMENT

1 IN 100 YEAR FLOOD MAP

PENNIAC

- Present Day - 1 in 100 year
- Building
- Watercourse
- Parcel
- Wetland
- Waterbody
- Municipal Boundary



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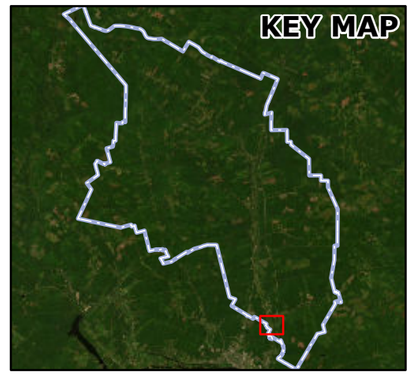
NASHWAAK CLIMATE ADAPTATION PLAN

VULNERABILITY ASSESSMENT

1 IN 20 YEAR FLOOD MAP

PENNIAC

- Building
- Present Day - 1 in 20 year
- 2100 Flood with Climate Change - 1 in 20 year
- Watercourse
- Parcel
- Wetland
- Municipal Boundary



SCALE 1:10,000

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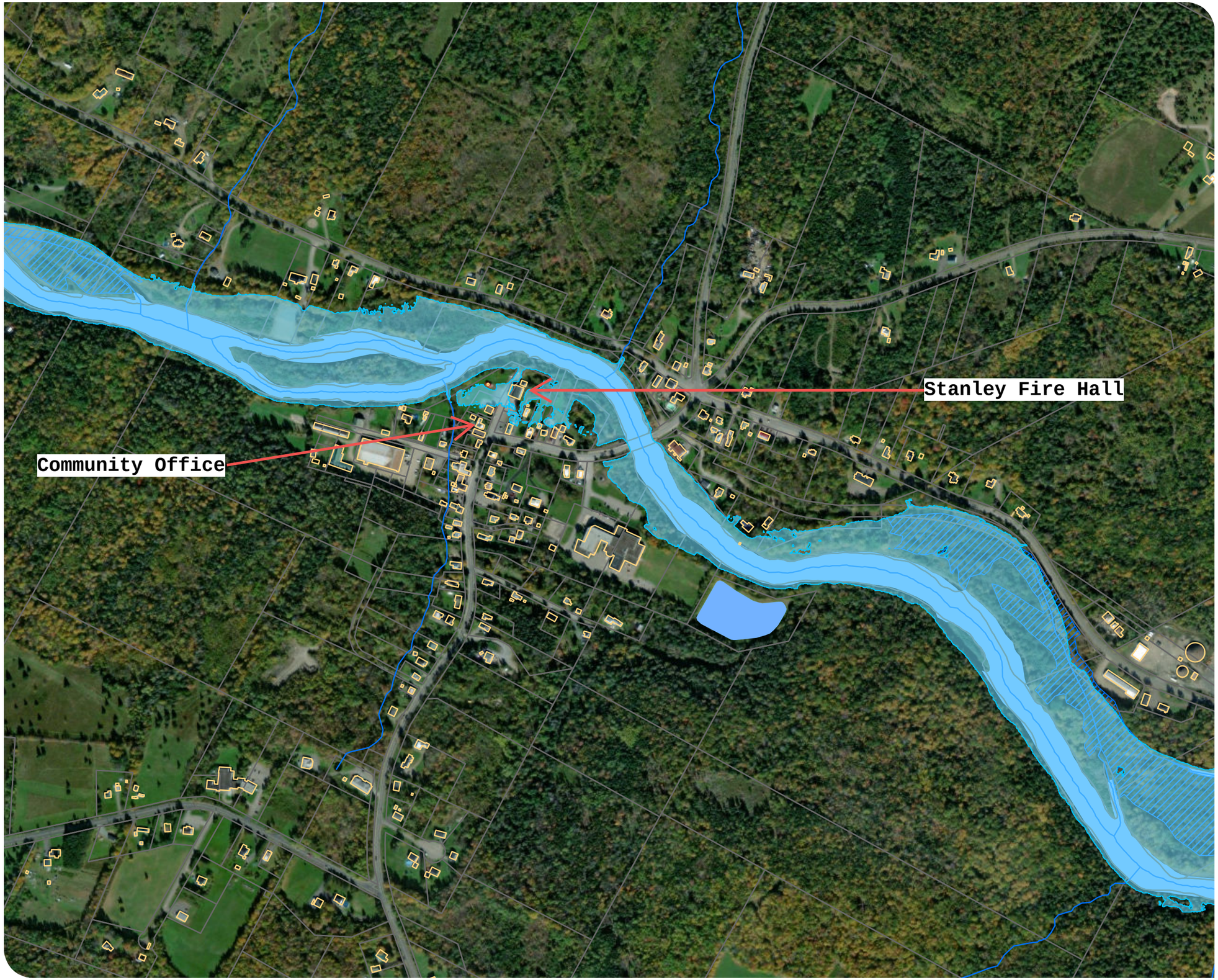


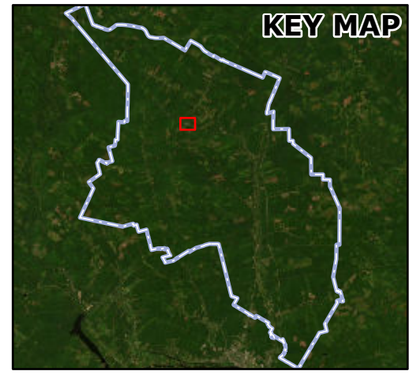
NASHWAAK CLIMATE ADAPTATION PLAN

VULNERABILITY ASSESSMENT

1 IN 100 YEAR FLOOD MAP

FORMER VILLAGE OF STANLEY

- Present Day - 1 in 100 year
- Building
- Watercourse
- Parcel
- Wetland
- Waterbody
- Municipal Boundary



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MAP DRAWING INFORMATION:
DATA PROVIDED BY DILLON, GEONB

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MAP CHECKED BY: JM
MAP PROJECTION: NAD 1983 CSRS New Brunswick Stereographic

DILLON CONSULTING

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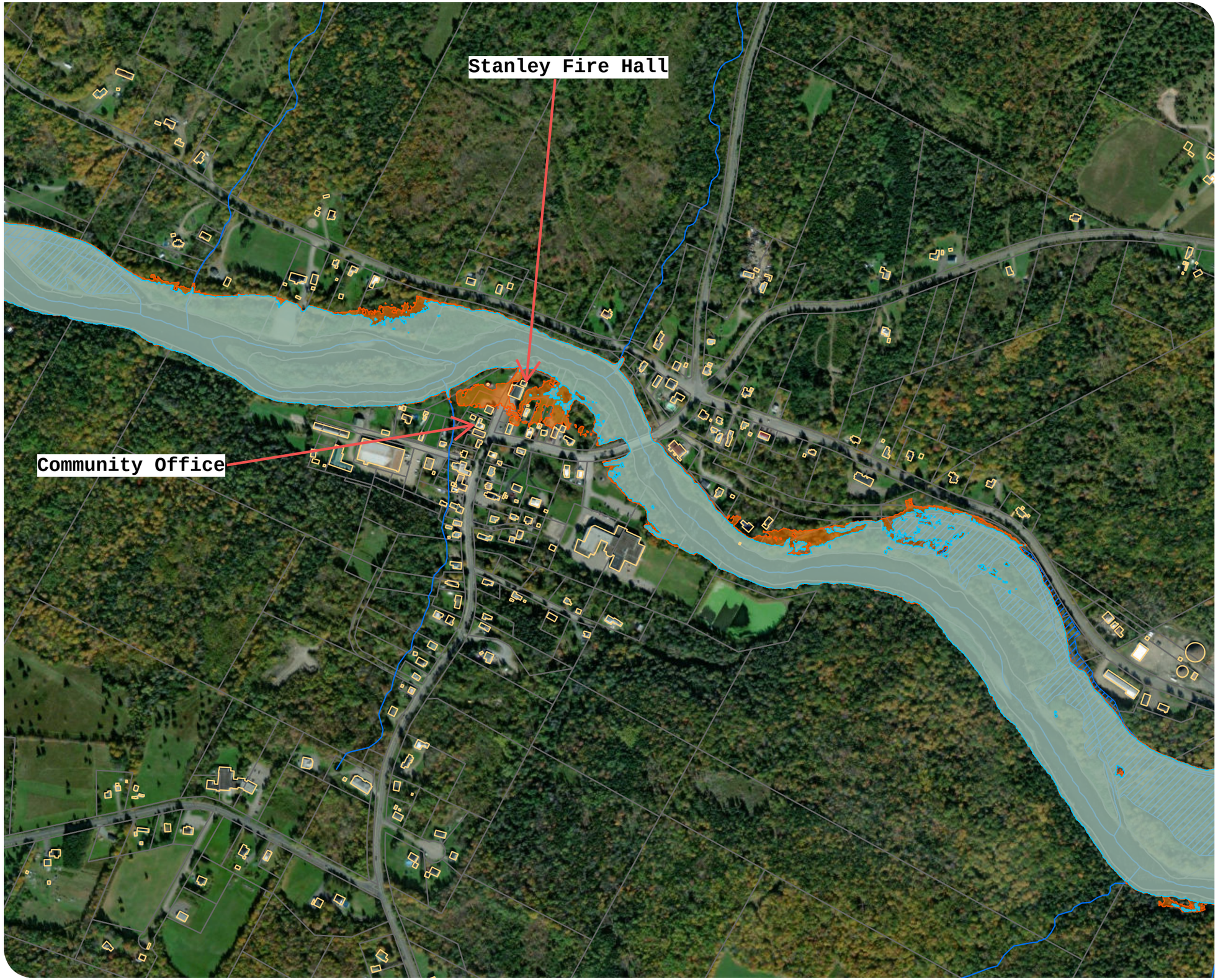


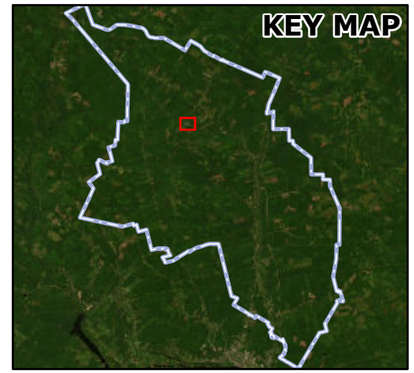
NASHWAAK CLIMATE ADAPTATION PLAN

VULNERABILITY ASSESSMENT

1 IN 20 YEAR FLOOD MAP

FORMER VILLAGE OF STANLEY

- Building
- Present Day - 1 in 20 year
- 2100 Flood with Climate Change - 1 in 20 year
- Watercourse
- Parcel
- Wetland
- Municipal Boundary



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N W E S

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DILLON CONSULTING

PROJECT: 24-9222
STATUS: DRAFT
DATE: 2025-02-25

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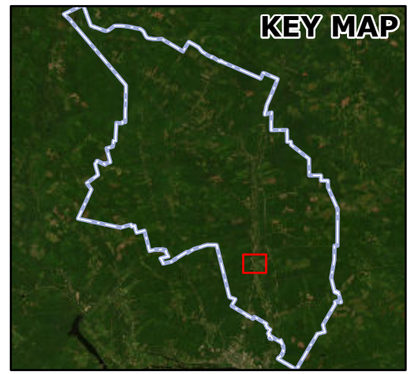
NASHWAAK CLIMATE ADAPTATION PLAN

VULNERABILITY ASSESSMENT

1 IN 100 YEAR FLOOD MAP

VILLAGE OF NASHWAAK

- Present Day - 1 in 100 year
- Building
- Watercourse
- Parcel
- Wetland
- Waterbody
- Municipal Boundary



SCALE 1:10,000

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N W E S

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STATUS: DRAFT

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FILE LOCATION: K:\2024\249222\Product\Client\Flood Mapping\Flood Mapping.aprx

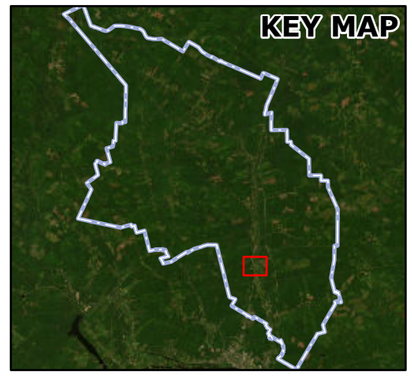
NASHWAAK CLIMATE ADAPTATION PLAN

VULNERABILITY ASSESSMENT

1 IN 20 YEAR FLOOD MAP

VILLAGE OF NASHWAAK

- Building
- Present Day - 1 in 20 year
- 2100 Flood with Climate Change - 1 in 20 year
- Watercourse
- Parcel
- Wetland
- Municipal Boundary



SCALE 1:10,000

0 0.13 0.25 0.5 km

N
W E
S

MAP DRAWING INFORMATION:
DATA PROVIDED BY DILLON, GEONB

MAP CREATED BY: DS
MAP CHECKED BY: JM
MAP PROJECTION: NAD 1983 CSRS New Brunswick Stereographic

DILLON CONSULTING

PROJECT: 24-9222
STATUS: DRAFT
DATE: 2025-02-25

FILE LOCATION: K:\2024\249222\Product\Client\Flood Mapping\Flood Mapping.aprx

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