Municipality **of** the District of Argyle

Municipal Climate Change Action Plan

November 8, 2013

ENDORSEMENT BY COUNCIL

Municipal Climate Change Action Plan Approval

This document was approved by Municipal Council for the Municipality of the District of Argyle at the Regular Council Meeting on November 12, 2013 through the following motion:

It is moved by Richard Donaldson and seconded by Roderick Murphy Jr. to approve the Municipal Climate Change Action Plan as presented.
Motion Carried *(9 in favour, 0 against)*

November 12, 2013
Date

_____
Warden Aldric d'Entremont

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PART ONE
INTRODUCTION

PURPOSE

The purpose of the Municipal Climate Change Action Plan (MCCAP) is to primarily meet Municipal obligations described in the 2010-2014 Municipal Funding Agreement. As a requirement in the 2010-2014 Gas Tax Agreement and the Municipal Funding Agreements (MFAs), the Municipality has prepared and is submitting to Service Nova Scotia and Municipal Relations (SNSMR) this plan for consideration. "The Gas Tax Funds promotes the economic, social, environmental and cultural sustainability of Nova Scotia municipalities" and "will enable municipalities to continue to invest in environmentally sustainable infrastructure projects that contribute to reduce greenhouse gas emissions, cleaner water and/or air" (Service Nova Scotia and Municipal Relations, 2011).

The MCCAP will be an amendment to the Municipality of the District of Argyle's approved Integrated Community Sustainability Plan (ICSP). The MCCAP is intended to focus on both climate change adaptation and mitigation and will define how the municipality plans to respond to climate change.

LOCAL CONTEXT

The Municipality of Argyle is one of three municipal units within Yarmouth County and is bounded by the Municipalities of; Barrington and Shelburne to the east, Yarmouth to the west and Clare and Digby to the north. The Tusket Islands, as well as the Islands located in Lobster Bay, form the unique southern boundary of the municipality.

The Municipality of the District of Argyle is located on the southwestern shore of Nova Scotia and as a rural setting it has a total land area of 1,527.10 km² and a population of 8,252 residents. (Statistics Canada, 2013). A large portion of the interior of the municipality is crown land owned by the Province of Nova Scotia and managed by the Department of Natural Resources (DNR). Portions of the provincially designated Tobeatic Wilderness Area and Wildlife Management Area are located in the northern part of the municipality.

The municipality is multicultural in nature with an Acadian, First Nation and European heritage. Most of the municipality's residents live in coastal communities with a few smaller villages located inland on the Tusket River System. There are three main nodes of commercial development and residential settlement within the unit and all rely on the ocean for their existence. Some of the earliest European settlements go back to the 1600's, with further settlement by the return of the expelled "Acadiens" and later by the Loyalists from the American colonies. A significant percentage of the population is of Acadian descent and their mother tongue is French.

GAS TAX FUND

The MMCAP was prepared to comply with federal and provincial requirements for continued receipt of monies from the Gas Tax Fund. This fund is provided by the federal government and administered provincially by Service Nova Scotia and Municipal Relations (SNSMR). Gas tax funds are to be invested in environmentally sustainable municipal infrastructure. Eligible project categories include public transit, community energy systems, water, wastewater management, solid waste management, roads and bridges, where it can be demonstrated that they will enhance environmental sustainability outcomes. Funding can also be used by municipalities to help them develop long-term plans for improving local quality of life. The required outcomes defined by the federal government are cleaner air, cleaner water and reduced greenhouse gas emissions.

Finding is distributed to municipalities by the Province of Nova Scotia. The distribution is based on a formula proposed by the Union of Nova Scotia Municipalities (UNSM) and the distribution formula includes population, the number of dwellings in a municipality and municipal expenditure. Municipalities must enter into an agreement with the Province (Municipal Funding Agreement) and submit a capital budget identifying eligible project expenditures as well as meet reporting requirements (of which the ICSP was one) before funds are released (Service Nova Scotia and Municipal Relations, 2013).

The Municipality is required to submit a Capital Investment Plan (CIP) annually, which provides to the Canada-Nova Scotia Infrastructure Secretariat a detailed understanding of anticipated investments into tangible capital assets, including basic facilities, services and installations needed for the functioning of the community such as bridges, roads, water systems and wastewater treatment and collection facilities.

The table below shows the amount of Gas Tax funding received and spent so far by the Municipality of the District of Argyle.

Fiscal Year	Income	Expenditures*
2006-07	112,406 (received)	112,406
2007-08	150,513 (received)	150,513
2008-09	189,848 (received)	189,848
2009-10	380,360 (received)	380,360
2010-11	367,821 (received)	367,821
2011-12	365,211 (received)	228,138
2012-13	357,008 (received)	195,556
TOTAL	1,923,167	1,624,642

**Note: reported expenditures do not include accrued interest.*

CLIMATE CHANGE

Climate change refers to both the warming of the earth's atmosphere and oceans, along with an increase in the natural variability of the climate. Municipalities cannot rely on the assumption that the prevailing climate will be more or less the same as it was over the past 50 to 100 years. The future climate is expected to have different rainfall patterns, warmer temperatures, more frequent storms, and severe weather events. The changes in climate will affect future infrastructure location and design, where and how land is zoned and subdivided for development, how water and wastewater treatment plants, or local roads and other municipal assets are maintained, renewed and managed (Service Nova Scotia and Municipal Relations, 2011).

The two main methods for tackling the issues related to climate change are: adaptation and mitigation; and are addressed in Parts two and three of the MCCAP.

1) **Adaptation:** Involves undertaking actions and activities that are designed to reduce and minimize the harmful consequences of climate change. Successful adaptation does not mean that negative impacts from climate change will not occur, but they will be less severe than would be experienced had no adaptation occurred (Service Nova Scotia and Municipal Relations, 2011).

2) **Mitigation:** Involves undertaking actions and activities that are designed to reduce the sources of greenhouse gases (GHG) or expanding forests and other "sinks" to remove greater amounts of carbon dioxide form the atmosphere. Actions and activities completed over the long-term will reduce GHG levels in the atmosphere, which in turn will help to reduce the heating trends that are believed to be behind many of the climate changes that are currently being experienced (Service Nova Scotia and Municipal Relations, 2011).

Climate scenarios are not predictions of future climate, but are used to assess impacts of climate change, address vulnerability to change and to develop adaptation strategies or actions. The following tables are found in the report *Scenarios and Guidance for Adaptation to Climate Change and Sea Level Rise – NS and PEI Municipalities* by William Richards and Réal Daigle. The report was created to provide information to assist municipalities in the Provinces of Nova Scotia and Prince Edward Island to develop Climate Change Action Plans. Table 1: Climate Indices and Definitions, shows a list of the climate and sea level indices and their definitions (Richards & Daigle, 2011).

Table 1: Climate Indices and Definitions (Richards & Daigle, 2011)

Climate Index	Definition
Heating Degree Days	Base temperatures are +18ºC for heating degree days
Cooling Degree Days	Base temperatures are +18ºC for cooling degree days
Hot Days	Days when the maximum daily temperature exceeds 30ºC
Very Hot Days	Days when the maximum daily temperature exceeds 35ºC
Cold Days	Days when the maximum daily temperature is less than -10ºC
Very Cold Days	Days when the maximum daily temperature is less than -20ºC
Growing Degree Days > 5	Base temperatures are +5C for growing degree days > 5
Growing Degree Days > 10	Base temperatures are +10ºC for growing degree days > 10.
Growing Season Length	The number of days between the dates when the mean daily temperature exceeds 5ºC
Corn Heat Units	An index similar to growing degree days but tuned to corn growth as defined by (Brown, 1979)
Corn Heat Unit Season Length	The number of days between the start (mean daily temperature >12.8°C for 3 consecutive days during the period May 11 to July 31) and end (first occurrence when minimum daily temperature is < -2°C during the period August 1 to October 15) of the corn growing season
Freeze Free Season	The number of days during the year when the daily mean temperature is greater than 0°C
Days With Rain	The number of days of rain on a monthly basis, with the values averaged over the 30-year period
Days With Snow	The number of days of snow on a monthly basis, with the values averaged over the 30-year period
Freeze-Thaw Cycles	Freeze-thaw cycles represent the average number of days per period indicated when the daily maximum temperature equals or exceeds 0°C AND the daily minimum temperature is less than 0°C. The freeze-thaw cycle and its associated effects on water/ice formation can have significant effects on built environment deterioration
Water Surplus	The excess moisture remaining after the evaporation needs of the soil have been met (i.e. when actual evapotranspiration equals potential

	evapotranspiration) and soil storage has been returned to the water holding capacity level
Water Deficit	The amount by which the available moisture fails to meet the demand for water and is computed by subtracting the potential evapotranspiration from the actual evapotranspiration for the period in question
Change in High Intensity Short Period Rainfall	Percentage change in the 20 year return value of the 24 hour precipitation currently used in building design
Net Sea-Level Change	Estimated Rise in Sea Level
Change in Extreme High Coastal Water Levels	Estimated extreme high water elevation for 10, 25, 50 and 100 year return period.

Table 2: Climate and Sea Level Scenario Data for Yarmouth, uses data from the climate station identified as Yarmouth A (id: 8206500) @ 43.83N 66.09W, CHS site Yarmouth. All temperature values are in °C and all precipitation values are in millimeters (mm). Sea level values like Sea Level Rise and Extreme Total Sea Level (TSL) are in metres and the TSL values are referred to Chart Datum. The temperature and precipitation categories of the scenarios show the present values and future scenarios for average temperature and precipitation. All values refer to a 30 year period with the label referring to the middle decade. The seasons are broken down as follows: Winter (December, January, February), Spring (March, April, May), Summer (June, July, August) and Autumn (September, October, November) (Richards & Daigle, 2011).

Table 2: Climate and Sea Level Scenario Data for Yarmouth (Richards & Daigle, 2011).

Parameter	1980s	2020s		2050s		2080s	
	Value	**Value**	**SD**	**Value**	**SD**	**Value**	**SD**
Temperature - Annual	6.9	8.1	0.4	9.3	0.6	10.6	1.0
Winter	-2.1	-0.8	0.6	0.7	0.8	2.1	1.1
Spring	5.0	6.0	0.4	7.1	0.7	8.3	1.1
Summer	15.7	16.7	0.4	17.9	0.7	19.1	1.0
Autumn	9.3	10.4	0.4	11.5	0.6	12.8	0.9
Precipitation - Annual	1275.1	1310.1	31.3	1320.9	36.3	1360.1	47.4
Winter	370.5	388.5	14.7	397.8	19.0	419.5	24.3
Spring	310.9	321.2	13.2	325.8	17.6	338.6	23.2
Summer	255.9	260.2	15.2	259.4	20.1	259.7	33.3
Autumn	337.8	341.9	15.4	341.5	16.2	349.1	25.1

	1980s	2020s	2050s	2080s
Heating Degree Days	4038.7	3663.0	3267.4	2892.9
Cooling Degree Days	21.0	49.8	106.0	189.4
Hot Days (Tmax > 30)	0.0	0.1	0.2	0.9
Very Hot Days (Tmax > 35)	0.0	0.0	0.0	0.0
Cold Days (Tmax < -10)	1.5	0.6	0.1	0.1
Very Cold Days (Tmax < -20)	0.0	0.0	0.0	0.0
Growing Degree Days > 5	1619.5	1858.6	2146.7	2466.8
Growing Degree Days > 10	707.2	869.6	1070.2	1294.2
Growing Season Length (days)	201.0	219.4	235.1	250.9
Corn Heat Units (CHU)	2329.3	2725.8	3144.8	3586.4
Corn Season Length (days)	153.9	169.7	183.6	196.4
Freeze Free Season (days)	234.6	255.9	276.5	294.4
Days With Rain	129.3	141.0	145.4	149.2
Days With Snow	50.3	50.3	41.8	34.3
Freeze-Thaw Cycles - Annual	88.7	78.9	65.5	53.5
Winter	45.7	45.3	41.9	38.3
Spring	29.0	23.2	17.1	11.6
Summer	0.0	0.0	0.0	0.0
Autumn	14.0	10.5	6.6	3.6
Water Surplus (mm)	846.9	770.9	739.0	718.6
Water Deficit (mm)	36.3	40.0	47.8	56.0
Δ Intensity Short Period Rainfall (%)	0	5	9	16

	2000	2025	2055	2085	2100
Total Sea Level Rise (m)		0.15 ± 0.03	0.43 ± 0.15	0.83 ± 0.36	1.06 ± 0.48
Extreme TSL - 10 Yr Ret Period	5.84 ± 0.10	5.99 ± 0.13	6.27 ± 0.25	6.67 ± 0.46	6.90 ± 0.58
Extreme TSL - 25 Yr Ret Period	5.91 ± 0.10	6.06 ± 0.13	6.34 ± 0.25	6.74 ± 0.46	6.97 ± 0.58
Extreme TSL - 50 Yr Ret Period	5.96 ± 0.10	6.12 ± 0.13	6.40 ± 0.25	6.80 ± 0.46	7.03 ± 0.58
Extreme TSL - 100 Yr Ret Period	6.02 ± 0.10	6.18 ± 0.13	6.46 ± 0.25	6.86 ± 0.46	7.09 ± 0.58

PART TWO
CLIMATE CHANGE ADAPTATION

SECTION ONE: ADAPTATION COMMITTEE

This section outlines the terms of reference that the Municipal Climate Change Action Plan (MCCAP) Committee will operate. Committee members are listed along with their role within the organization.

TERMS OF REFERENCE

To amend the Municipality of the District of Argyle's Integrated Community Sustainability Plan (ICSP) with recommended course of actions as required by the gas tax agreement respecting adaptation measures for climate change in our community. A draft document shall be completed for Council's Consideration by August 31, 2013 and the final to be completed by November 30, 2013.

MEMBERS

The members of the Municipal Climate Change Action Plan (MCCAP) Committee are:

- Alain Muise, CA, Chief Administrative Officer
- John Sullivan, Director of Property Inspection and Public Works
- Tayler Harris, GIS Technician/Development Officer
- Chris Frotten, Executive Assistant/Deputy Clerk
- Brad Fulton, Senior Planner
- Janine Doucette, EMO Coordinator
- Danny Muise, Councillor

POTENTIAL STAKEHOLDERS

Potential stakeholders to be consulted during preparation of the plan are:

- Senior Safety Officer (Peggy Boudreau)
- Tourism & Culture (Roger d'Entremont)
- Department of Environment
- Fire Services (Steve Jacquard)
- Police Services (Michel Lacroix)
- Recreation (Recreation Director)
- Department of Transportation and Infrastructure Renewal
- Solid Waste (Waste Check)
- Port & Harbour Authorities Representative
- Department of Fisheries and Oceans
- Department of Natural Resources

OBJECTIVES

Objectives of the Argyle MCCAP Committee are:

a) To Identify significant climate change issues and hazards affecting Argyle
b) To Identify areas of Argyle that are subject to climate change issues
c) To Identify and describing how existing (and proposed) Municipally owned and operated facilities and infrastructure are vulnerable to climate change
d) To Identify whom within the Municipality might be most adversely affected by climate change issues
e) To Identify potential economic impacts of climate change
f) To Identify potential environmental issues which could result from climate change impacts
g) To Identify priorities for adaptive action

DELIVERABLES

Deliverables of the Argyle MCCAP Committee are:

a) Completion of the Municipal Climate Change Action Plan report.
b) Production of various maps which illustrate where climate change hazards have occurred in the past and where they are most likely to occur in the future.
c) Production of various maps with a focus on areas that will be affected by storm surges and rising sea levels.
d) Production of mapping showing which Municipal and Community assets/infrastructure are located in vulnerable or at-risk areas.
e) Completion of Climate Change Hazard Impact matrix and other related tables.

SCOPE OF WORK

The MCCAP Committee shall consider the following when preparing the plan:

a) The effects of climate change on resource industries with a focus on the fishery
b) The effects of climate change on the residents of Argyle
c) The effects of climate change on business operating in Argyle

PROCESS FOR ACCOUNTABILITY

The MCCAP Committee will prepare the MCCAP in accordance with the MCCAP Guidebook and will report to Municipal Council quarterly. The Committee will meet each month and will include stakeholders when necessary to provide information needed for the completion of the MCCAP report.

TIME FRAME

See Table 3: Municipal Climate Change Action Plan (MCCAP) Time Frame.

MCCAP TERMS OF REFERENCE APPROVAL

The MCCAP Terms of Reference was approved by Council on January 29, 2013 at the Committee of the Whole Meeting. See Appendix A.

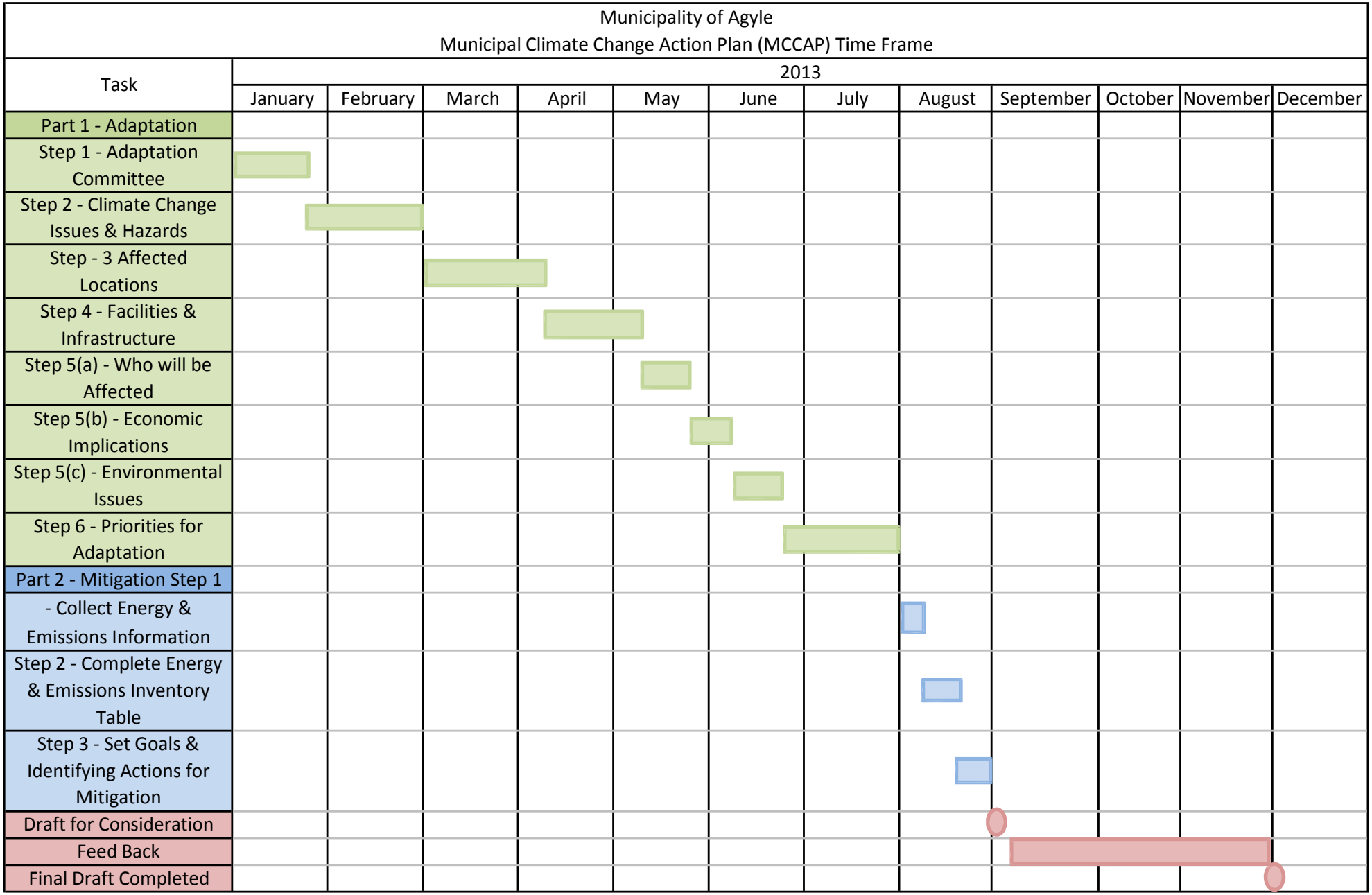


Table 3: Municipal Climate Change Action Plan (MCCAP) Time Frame.

MCCAP COMMITTEE MEMBER INFORMATION

Danny Muise, Councillor/Committee Chair:
Danny was born April 5th, 1949, married, has a son and 3 step-daughters and 5 grandchildren. Danny is retired after working 30 years with the Provincial Department of Transportation, first as an Engineering Survey Technician and the final 7 years of his career as an Operations Supervisor

Since retirement, Danny has been employed in various term positions. Danny worked with Statistics Canada as Field Operations Supervisor during the 2006 and 2011 census. In 2001, Danny was appointed as Returning Officer for Elections Nova Scotia, a position that he still presently holds. Danny has also worked on several construction projects as field inspector. In 2012, Danny was elected as Councillor for District 1, Municipality of Argyle.

Danny has volunteered with a number of organizations including church council with Ste. Anne Parish, Board member as well as various committees with Ste. Anne's Credit Union (now Coastal Financial Credit Union), past president of Argyle Historical Society and Board member with NS Government Employees Union. Danny currently serves on various municipal committees.

Alain Muise, CA, Chief Administrative Officer:
Alain is the current Chief Administrative Officer for the Municipality of Argyle, and has been since 2006. Alain obtained his CA designation in 1998 with Saxton Comeau, Chartered Accountants in Yarmouth, and delivered accounting, tax and audit services to a wide range of clients including Municipal Government for 13 years prior to joining the Municipality.

Alain studied at Dalhousie University prior to his CA designation and obtained a Bachelor of Commerce degree with a concentration in accounting. Alain is bilingual, of Acadian descent, and was born and raised in the small community of Sainte-Anne-du-Ruisseau, and currently resides in Sluice Point.

Alain chose the path of municipal government to further his passion to make his community a better place to live. His interests, other than work, include travel, reading and running.

John Sullivan, Director of Property Inspection and Public Works:
Working for the Municipality, John oversees the day to day operations of the public works department, including the sewer and wastewater treatment plants and municipal infrastructure. As well this department controls and administers land use issues adopted by council.

Tayler Harris, GIS Technician/Development Officer:
Tayler has been working for the Municipality of Argyle since May 2011 as a GIS Technician/Development Officer. Tayler attended the Centre of Geographic Sciences (COGS) where she completed the Survey Technician Certificate program in 2010 and the Geomatics Engineering Technology program in 2011. Tayler's work consists of creating maps and asset mapping, along with other GIS work and I also work with the Land Use By-law and Municipal

Planning Strategy. For the Municipal Climate Change Action Plan (MMCAP) Tayler will be creating maps and pulling the document together.

Chris Frotten, Executive Assistant/Deputy Clerk:
Chris is originally from Amirault's Hill in the Municipality of Argyle. He has been working with the Municipality as Executive Assistant/Deputy Clerk since September 2012 and before that as Coordinator of the 33e Finale des Jeux de l'Acadie since March 2011. He is currently in his final stages of his Bachelor of Science/Bachelor of Education.

Brad Fulton, Senior Planner:
Employed as Senior Planner with the Yarmouth Argyle Barrington District Planning Commission since May 2008. Responsible for overseeing and managing the planning department staff of the Commission. Responsible for research, reporting and recommendations to Councils and Planning Committees on matters of planning including adoption and amendment of municipal planning documents, municipal planning studies and provincial regulations and legislation. Prepares development agreements in consultation with the Municipal Solicitors on behalf of Councils. Oversees development and maintenance of the GIS system for the Municipal units. Assists and works closely with the Development Officers in each municipality in their administration work. Designs and conducts public meetings to facilitate public input into the planning processes in the respective municipalities. Represents the Commission to member units as well as Provincial or Federal Agencies. Appears in Court as required to represent the interests of Councils or the Municipal Solicitor in matters of planning and/or development, and appears before the NS utility and Review Board on behalf of the Councils.

Past employment experience includes working in the roles of: Municipal Development Officer, Certified Building Inspector, Fire Inspector and By-law Enforcement Officer for the Municipality of the District of Yarmouth (27 years).

Member of the Canadian Institute of Planners, Atlantic Planners Institute and Licensed Professional Planners Association of Nova Scotia and Nova Scotia Planning Directors Association.

Undergraduate Degree from Acadia University in Anthropology (1976).

Janine Doucette, Emergency Management Coordinator for Municipality of Argyle:
Janine has been serving as EMO Coordinator for the Municipality of Argyle since May of 2012 when she was appointed to this position by Municipal Council. Janine is responsible for emergency planning and coordination for the Municipality and working very closely with other agencies. Janine is presently retired from the Department of Community Services and when she retired in 2010, she was Coordinator for Emergency Social Services for the Western Region for

which she had received the Minister's Award for work in this field. Janine is also a volunteer with the Canadian Red Cross serving on the local Disaster Response Team, a trainer for the Red Cross as well as a member of the Provincial Council.

SECTION TWO: IMPACTS & HAZARDS

This section provides information on climate change issues and hazards affecting the Municipality of Argyle. Locations where climate change hazards are likely to occur and where they have occurred in the past are identified.

TYPES OF HAZARDS AND ISSUES

The different issues that the Municipality of Argyle has experienced due to climate change are:

1. Drinking water contamination
2. Public safety concern
3. Damage to structures, property and infrastructure
4. Interruptions in power supply
5. Road closures
6. Erosion

The hazards that caused these issues are:

- Flooding
- Hurricanes
- Winter Storms
- Storm Surge/Sea Level Rise

See Appendix B for descriptions of the weather events that caused the above hazards and issues.

LEVEL OF PREPAREDNESS

There is an emergency plan for the Municipality of Argyle created by the Emergency Management Organization (EMO). The aim of the *Municipality of Argyle Emergency* Plan is to lay down a general plan of action for the deployment of all municipal services, agencies and volunteer organizations, in order that the following be assured:

a. Minimize the effects of an emergency or disaster on the Municipality of Argyle and its inhabitants;
b. the earliest possible coordinated response;
c. the protection and preservation of private property;
d. the protection and preservation of health;
e. the provision of social services;
f. the release of all factual official information; and
g. the restoration of normal services.

See Appendix C for the *Municipality of Argyle Emergency Plan*.

There is an Emergency Plan for flooding in Quinan, which was created after the community experienced flooding in November 2010. This plan is called *Contingency Plan, EMO Quinan Flooding* and can be seen in Appendix D.

DESCRIPTION OF CLIMATE RELATED HAZARDS OR ISSUES

Table 4: Climate Change Hazard Impact Matrix was created to assign a relative degree of impact to the climate change hazards affecting the municipality.

Hazard	Severity			Frequency			Area		
	Severe	Moderate	Minor	Often	Sometimes	Rarely	Large	Medium	Small
Sea Level Rise		**X**			**NA**		**X**		
Erosion			**X**			**X**			**X**
Flooding	**X**				**X**			**X**	
Landslides			**X**			**X**			**X**
Storm Surge	**X**				**X**		**X**		
Hurricanes & Wind	**X**					**X**	**X**		
Forest Fires	**X**				**X**			**X**	
Drought	**X**				**X**		**X**		

Table 4: Climate Change Hazard Impact Matrix

The climate related hazards that could cause problems in the future are flooding and storm surge. The municipality is experiencing an increase in flooding and potential storm surge threats. These hazards will require future action on the part of the municipality. Table 5: Hazard Analysis for the Municipality of Argyle (Emergency Plan), was created from a table completed by EMO for the Emergency Plan. The table identifies the potential long term impacts that may be experienced and cause problems.

Potential Hazard	Risk Ranking*	Immediate Impact	Immediate Solution	Long Term Impact	Long Term Solution	Prevention/ Planning
Flooding	1	Evacuation of low lying areas, road closures	Social Services	Road erosion, infrastructure damage, property damage, well water	ID trouble areas	Homeowner awareness Development planning
Freezing rain	1	Hazardous driving conditions, associated risks	NA	Blackout, infrastructure damage	Advance warning to population	Liaise with NS Power for tree cutting
Windstorm/ Hurricane	2	Tidal surge, can lead to a blackout	NA	Blackout, infrastructure damage, property damage	Advance warning to population	Liaise with NSP
Storm Surge	2	Flooding, damage to fleet, road closures	NA	Road erosion, infrastructure damage, property damage	Advance warning to population	DOT NS, Investigate breakwater construction
Hailstorm	3	Damage to property, can lead to Blackout	NA	Infrastructure damage	Advance warning to population	NA
Blizzard	3	Hazardous driving conditions, associated risks, can lead to blackout	Public service warning	Structural damage	Advance warning to population	Homeowner awareness
Forest Fire	4	Threat to property	As per DNR's NS Forest Fire Directive	Smoke related health issues, damage to infrastructure	As per DNR's Forest Fire Directive	Public awareness and education

Table 5: Hazard Analysis for the Municipality of Argyle (Emergency Plan)

*The risk ranking for each potential hazard was determined at an EMO exercise and uses the Hazard Risk Vulnerability Assessment (HRVA) Model.

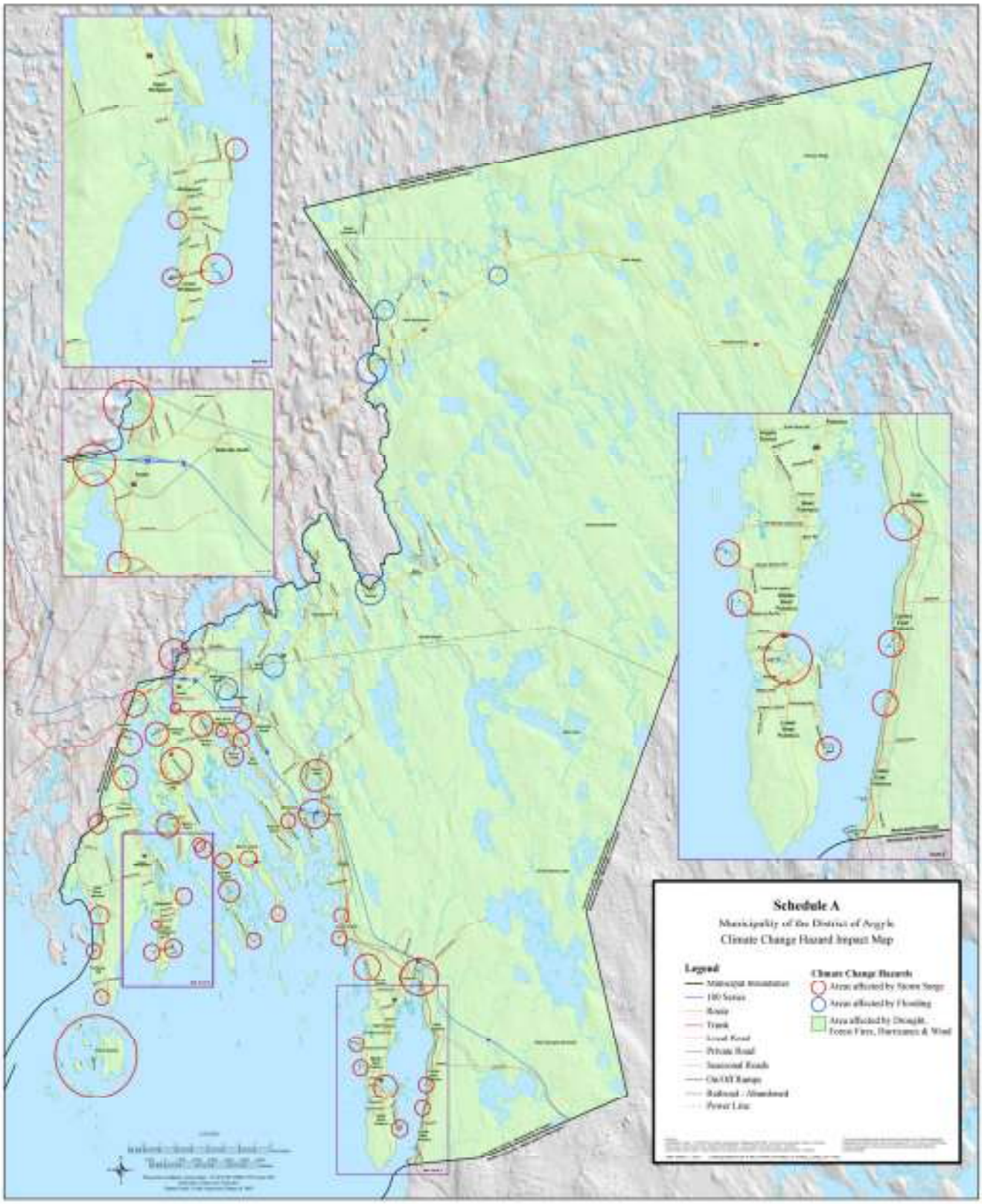
POTENTIAL CLIMATE BENEFITS

The South West Nova Scotia (SWNS) Temperature and Solar Radiation Study that is currently in progress is showing potential climate change benefits to agricultural crops such as grapes, berries and stone fruits. This could potentially become an economic opportunity for the municipality as a result of the changing climate.

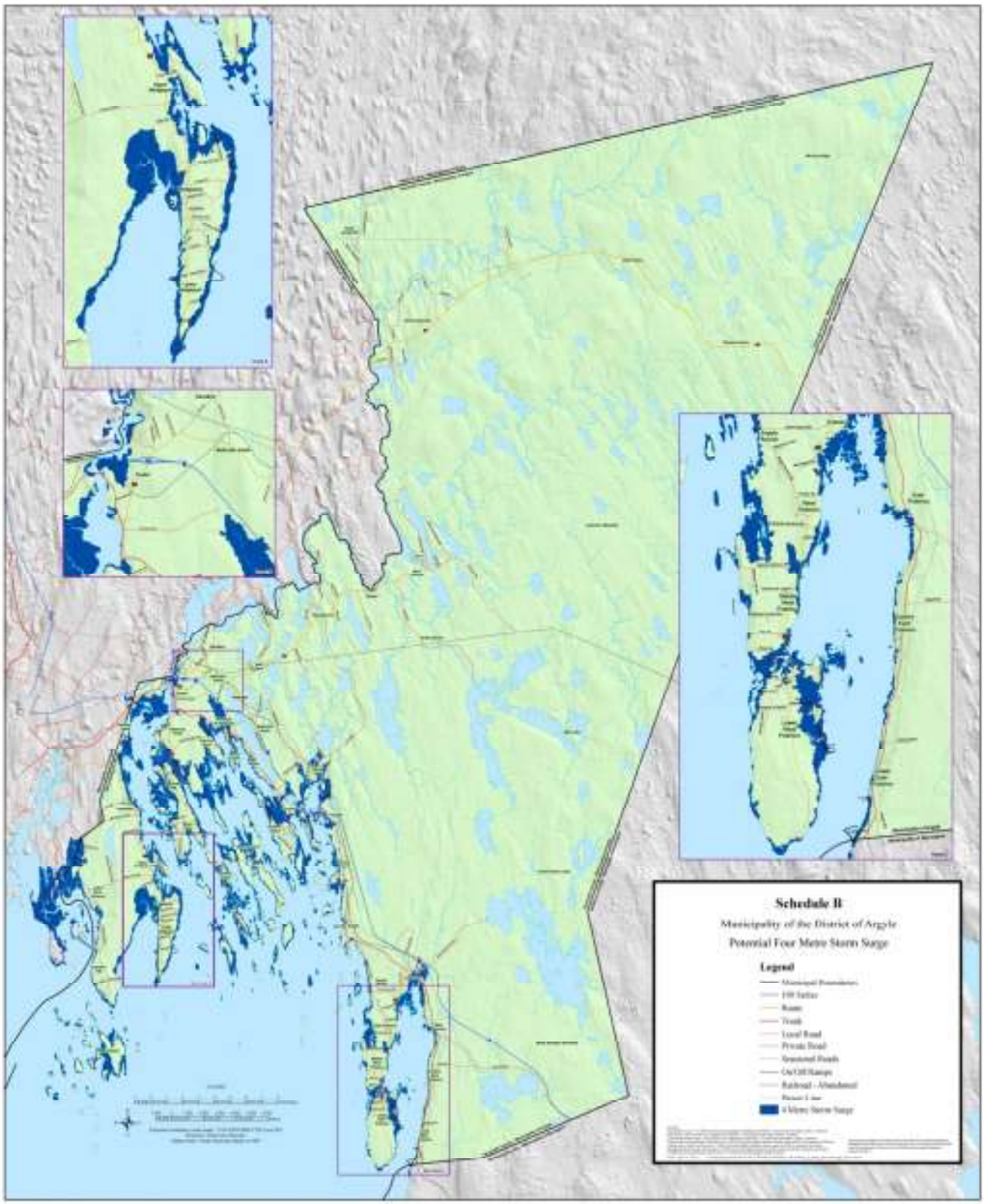
Potential for people to move to the area to enjoy one of the most temperate climates in Canada and to escape the warming temperatures in the south.

MAPPING

The following two maps geographically illustrate where climate change hazards are likely to occur and where they have occurred in the past. Schedule A: Climate Change Hazard Impact Map identifies locations where climate change hazards have occurred in the past and where they are likely to occur in the future. Schedule B: Potential Four Metre Storm Surge illustrates an approximate four (4) metre storm surge, which was originally created for an EMO exercise called Hurricane Purple completed in September 2008. The four (4) metre storm surge model was derived from the 1:2,000 Provincial Digital Elevation Model and the 1:10,000 Provincial Elevation Model using ArcGIS 3D Analyst and ArcScene.



Schedule A can be seen at full scale in the list of schedules.



Schedule B can be seen at full scale in the list of schedules.

SECTION THREE: AFFECTED LOCATIONS

This section provides information that describes parts of the municipality that the committee identified as being subject to climate change hazards identified in section two.

HAZARD RISK VULNERABILITY ASSESSMENT (HRVA) MODEL

The Hazard Risk Vulnerability Assessment (HRVA) Model is a standard model used by Emergency Management Organization (EMO) for assessing risks and hazards. When completing a hazard analysis, the HRVA Model helps to determine the known and potential impacts a hazard may create. Once the impacts have been assessed, priorities for planning are identified. The MCCAP Committee used the HRVA Model to describe the parts of the municipality that were identified as being subject to climate change issues. The locations that the committee completed the HRVA Model on was determined by identifying locations that have experienced climate hazards in the past and areas that are becoming more vulnerable to the changing climate.

LOCATION ONE

Hazard Risk Vulnerability Assessment (HRVA) Model (Revised)

HAZARD

Background Information

Analysis completed for: **Quinan, East Kemptville and North Kemptville**

See Appendix E for the complete HRVA Model document, which includes all tables used to complete the assessment.

Category of Hazard

X	Natural
	Technological
	Industrial
	Human-Induced

Definition of Specific Hazard

Inland Flooding

Related Notes or Hazard Triggers (i.e. what causes Municipal Emergency Management Organization involvement)

Fatalities; injuries; displacement; isolation; water contamination; community lifeline (bridge) damage; landslides/erosion; transportation disruption; food & fuel shortages; property damage.

PROBABILITY

Historical Events

Date (most recent first)	Changes made since	Comments
November 2010	Specific plan created by EMO to cover this area. Municipality purchased water pumps for the fire department and a "rescue" boat. An alerting system put in place for residents.	200 + mm of rain fell over a 72 hour period
February 2008		89 + mm of rain fell
April 2003		100 + mm of rain fell

IMPACTS

Identify most likely Impact Area (i.e. geographical; map reference)

Where the Quinan River meets the Tusket River in the community of Quinan (Schedule C) and areas in North/East Kemptville (Schedule D) that are affected by the Tusket River flooding its banks.

Identify Population number in Impact Area

Quinan: An approximate population of 35-40 (23 homes) located in the flood area and approximately 350+ residents isolated due to road closures.
North/East Kemptville: An approximate population of 148 residents affected by road closures.

Identify Susceptible Persons in Impact Area

Groups
Elderly
Isolated or confined individuals
Farm owners
Families of responders
First Responders

Identify critical Infrastructure in Impact Area

Sites	Identify Owner			
	Private	Municipal	Provincial	Federal
Bridges			X	
Roads			X	

Identify Severity of Impacts and Resources Required

Typical Impacts (Table 1)	Estimated # Affected (People/Structures)	Resources to respond				Municipal Cost Recover/Rebuild/Repair			Comments
		Pri	Mun	Prov	Fed	High	Medium	Low	
Bridges Impassable	300+	X	X	X				X	Both communities
Road Closures	300+	X	X	X				X	Both communities
Homes Flooded	25	X	X	X				X	Quinan Only

HAZARD RISK VULNERABILITY RATING

Probability Score

(Considering historical and predicted probability rate the likelihood of occurrence in years)

X	1	Highly Probable: once every 5 years or less
	2	Likely to occur once every 10 years
	3	Might occur once every 20-30 years
	4	Not expected; could occur once every 50 years
	5	Rare chance of occurrence; once every 100 or more years

Overall Impact Score

(Considering each of the impacts identified and the guidelines below, select an overall impact score for the hazard)

	1	**Catastrophic**, over 100 people impacted; multiple fatalities; injuries, long term health effects, prolonged displacement (over 72 hours); long term effects to environment; destruction of critical infrastructure; loss of socially valued infrastructure; external resources required for immediate response; community unable to function without outside (provincial/federal) support: Municipal EOC activated for 24 hours or longer.
X	**2**	**Significant**; 51-100 people impacted; no immediate fatalities; multiple serious injuries; long-term hospitalization required; displacement (24-72 hours); significant impact to environment-medium term effects; critical infrastructure, socially valued & property damage repairable within emergency budgets; external resources required to support/supplement community services/responders; some community services unavailable for less than 72 hours; Municipal EOC activated for less than 24 hours.
	3	**Moderate**; 11-50 people impacted; no fatalities, minor injuries; short-term hospitalization and treatment required; displacement (6-24) hours; no long term environmental, infrastructure or property damage; localized damage rectified by routine arrangements and mutual aid agreement resources; minor localized disruption to community services (non-critical) for less than 6 hours, Municipal EOC activated for less than 8 hours.
	4	**Minor**; less than 10 people impacted; no fatalities, minor injuries requiring first aid/out-patient treatment only; displacement (less than 6 hours); no sustained damage to infrastructure or property; normal community functioning with some inconvenience; no external resources required; Municipal emergency officials notified but no EOC activation.
	5	**Insignificant**; less than 10 people impacted; no fatalities, injuries or impact on health and property beyond first responder “everyday” capacity; no displacement; no damage to properties or environment; no disruption to community services or infrastructure; no resources gaps; no Municipal emergency official notification or activation required.

(Probability score) 1 x (Overall Impact score) 2 = Number assigned to this Hazard 2 (1-25)

RISK TOLERANCE

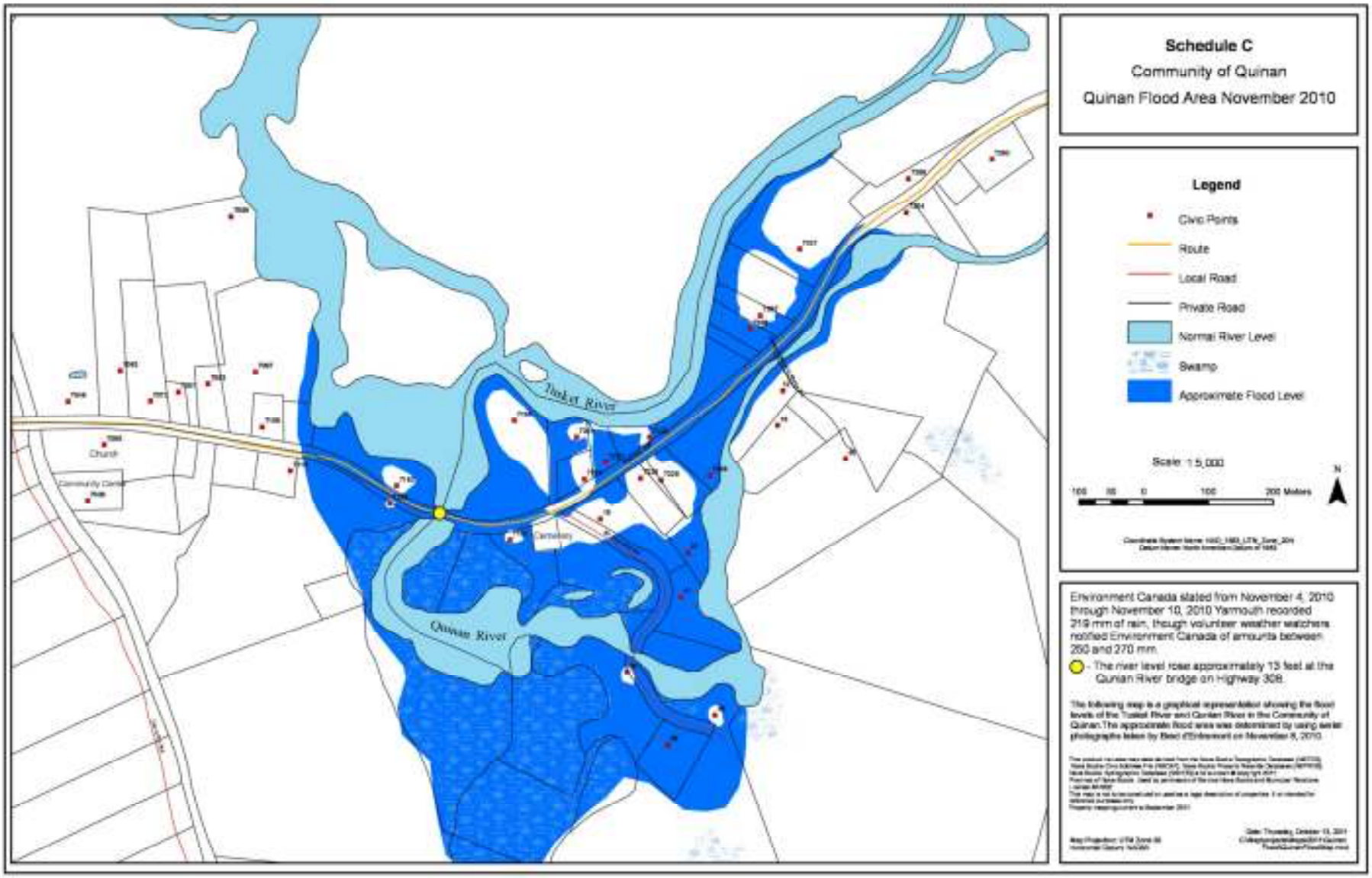
Final Hazard Assignment, in consideration of Risk Tolerance for Priority Planning

X	1-5	Low
	6-10	Medium
	11-25	High
		Requires further analysis/planning due to Risk Tolerance rating

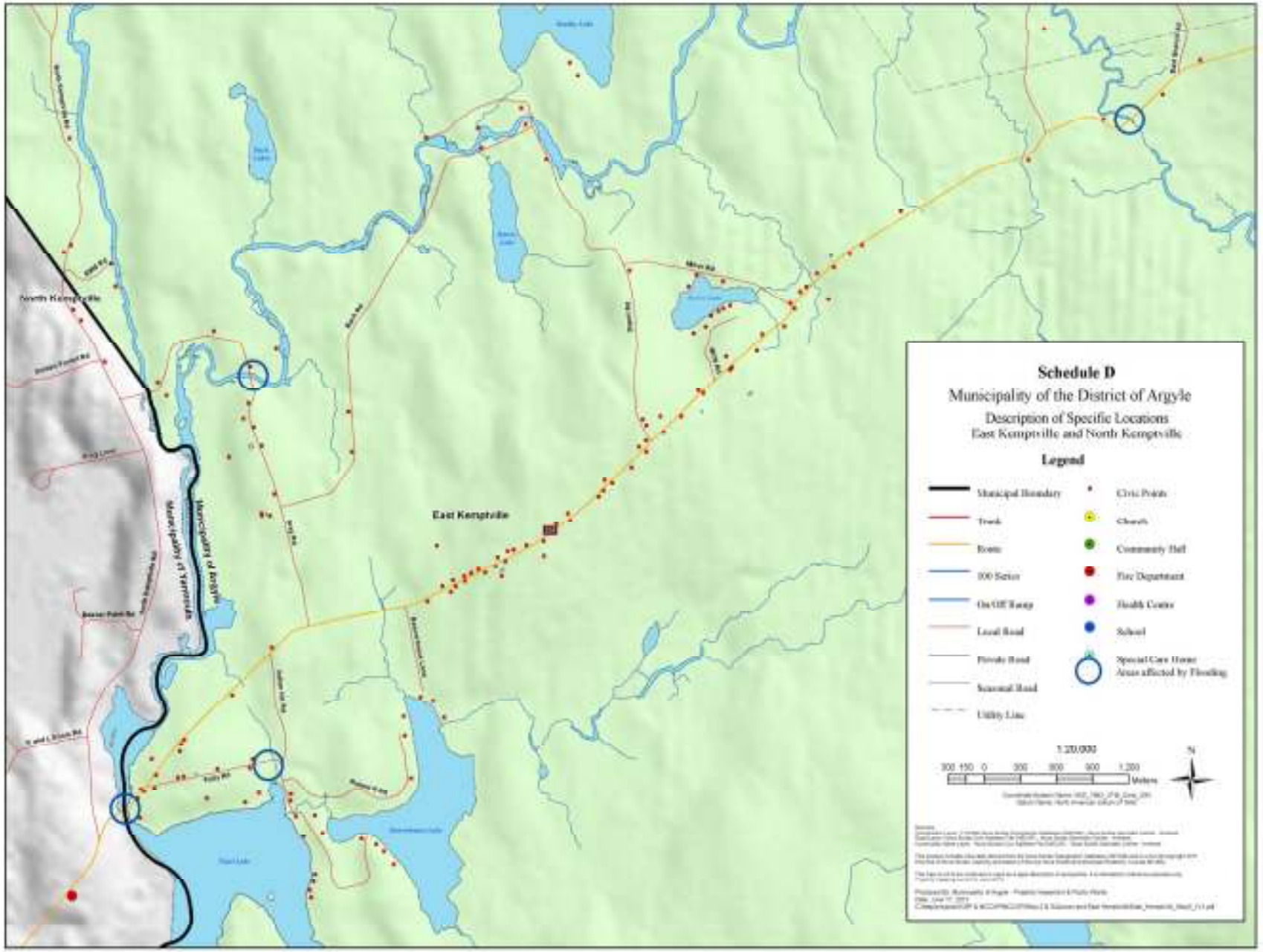
Low Tolerance – unable to accept hazard; public disorder; requires special planning.

Medium Tolerance – may question authorities if impact is different than anticipated/predicted; media pressure may increase over time; requires consideration in planning.

High Tolerance – able to accept hazards; doesn't require special planning.



Schedule C can be seen at full scale in the list of schedules.



Schedule D can be seen at full scale in the list of schedules.

LOCATION TWO

Hazard Risk Vulnerability Model (Revised)

HAZARD

Background Information

Analysis completed for: **Communities of Pleasant Lake, Plymouth, Upper Wedgeport, Wedgeport, Lower Wedgeport, Little River Harbour and Comeaus Hill.**

See Appendix E for the complete HRVA Model Document, which includes all tables used to complete the assessment.

Category of Hazard

X	Natural
	Technological
	Industrial
	Human-Induced

Definition of Specific Hazard

Hurricane with Coastal Flooding/Sea Level Rise/Storm Surge based on an approximate four (4) meter storm surge. The four (4) metre storm surge model was derived from the 1:2000 Provincial Digital Elevation Model and the 1:10,000 Provincial Elevation Model using ArcGIS 3D Analyst and ArcScene. This was originally created for an EMO exercise called Hurricane Purple back in September 2008.

Related Notes or Hazard Triggers (i.e. what causes Municipal Emergency Management Organization involvement)

Flooding of populated area, possible evacuation of people, impact on infrastructure, roads, bridges, wharves; no schools, churches or fire halls are affected.

PROBABILITY

Historical Events

Date (most recent first)	Changes made since	Comments
February 2, 1976 Groundhog Day Storm	No changes made	

IMPACTS

Identify most likely Impact Area (i.e. geographical; map reference)

Any low-lying coastal areas affected by storm surge or sea level rise, see Schedule E.

Identify Population number in Impact Area

Approximately 2000+ residents.

Identify Susceptible Persons in Impact Area

Groups
Children
Day cares
Electricity dependent
Elderly
Families of first responders
First responders
Families of health care
People with disabilities
Low Rental Housing Units
Senior Low Rental Housing Complex

Identify critical Infrastructure in Impact Area

Sites	Identify Owner			
	Private	Municipal	Provincial	Federal
Roads/culverts/bridges			X	
Wharves	X			X
Fish Plants	X			
Wedgeport & District Fire Department		X		

Identify Socially Valued (non-critical) Infrastructure in Impact Area

Sites	Identify Owner			
	Private	Municipal	Provincial	Federal
Wedgeport Columbus Club	X			
Royal Canadian Legion Branch 155	X			
École Wedgeport		X		
Plymouth School		X		
St. Michael's Catholic Church	X			
St. Gabriel Catholic Church	X			
Harbour Hills Community Centre	X			

Identify Severity of Impacts and Resources Required

Typical Impacts (Table 1)	Estimated # Affected (People/Structures)	Resources to respond				Municipal Cost Recover/Rebuild/Repair			Comments
		Pri	Mun	Prov	Fed	High	Medium	Low	
Road Closures	900+	X	X	X	X		X		
Evacuation	100+	X	X	X	X			X	
Wharf/Boat Damage	4 wharves	X	X	X	X			X	
Damage to property, i.e. homes, cottages, etc.		X	X	X	X			X	

HAZARD RISK VULNERABILITY RATING

Probability Score

(Considering historical and predicted probability rate the likelihood of occurrence in years)

	1	Highly Probable: once every 5 years or less
	2	Likely to occur once every 10 years
X	3	Might occur once every 20-30 years
	4	Not expected; could occur once every 50 years
	5	Rare chance of occurrence; once every 100 or more years

Overall Impact Score

(Considering each of the impacts identified and the guidelines below, select an overall impact score for the hazard)

	1	**Catastrophic**, over 100 people impacted; multiple fatalities; injuries, long term health effects, prolonged displacement (over 72 hours); long term effects to environment; destruction of critical infrastructure; loss of socially valued infrastructure; external resources required for immediate response; community unable to function without outside (provincial/federal) support: Municipal EOC activated for 24 hours or longer.
X	**2**	**Significant**; 51-100 people impacted; no immediate fatalities; multiple serious injuries; long-term hospitalization required; displacement (24-72 hours); significant impact to environment-medium term effects; critical infrastructure, socially valued & property damage repairable within emergency budgets; external resources required to support/supplement community services/responders; some community services unavailable for less than 72 hours; Municipal EOC activated for less than 24 hours.
	3	**Moderate**; 11-50 people impacted; no fatalities, minor injuries; short-term hospitalization and treatment required; displacement (6-24) hours; no long term environmental, infrastructure or property damage; localized damage rectified by routine arrangements and mutual aid agreement resources; minor localized disruption to community services (non-critical) for less than 6 hours, Municipal EOC activated for less than 8 hours.
	4	**Minor**; less than 10 people impacted; no fatalities, minor injuries requiring first aid/out-patient treatment only; displacement (less than 6 hours); no sustained damage to infrastructure or property; normal community functioning with some inconvenience; no external resources required; Municipal emergency officials notified but no EOC activation.
	5	**Insignificant**; less than 10 people impacted; no fatalities, injuries or impact on health and property beyond first responder “everyday” capacity; no displacement; no damage to properties or environment; no disruption to community services or infrastructure; no resources gaps; no Municipal emergency official notification or activation required.

(Probability score) 3 x (Overall Impact score) 2 = Number assigned to this Hazard 6 (1-25)

RISK TOLERANCE

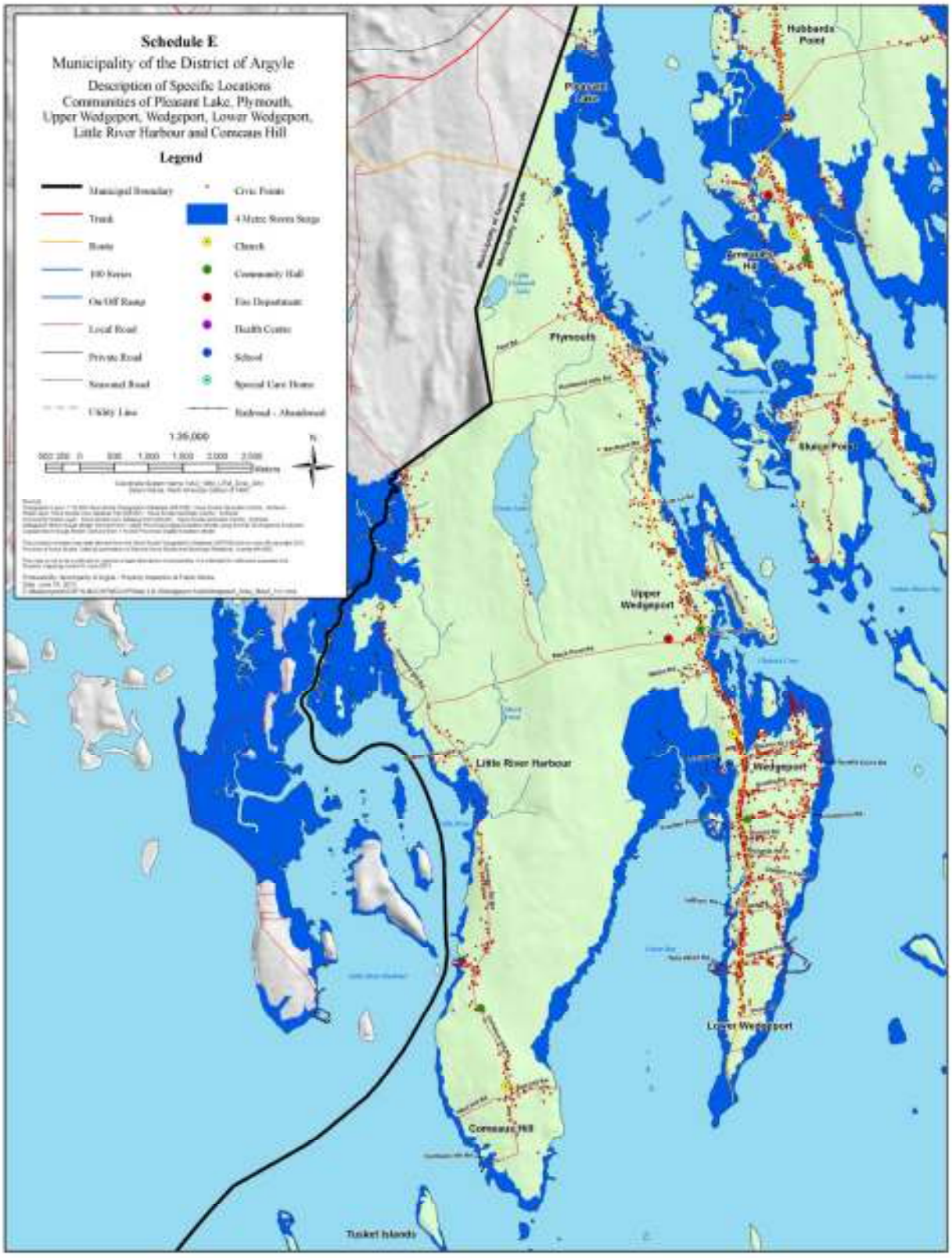
Final Hazard Assignment, in consideration of Risk Tolerance for Priority Planning

	1-5	Low
X	6-10	Medium
	11-25	High
		Requires further analysis/planning due to Risk Tolerance rating

Low Tolerance – unable to accept hazard; public disorder; requires special planning.

Medium Tolerance – may question authorities if impact is different than anticipated/predicted; media pressure may increase over time; requires consideration in planning.

High Tolerance – able to accept hazards; doesn't require special planning.



Schedule E can be seen at full scale in the list of schedules.

LOCATION THREE

Hazard Risk Vulnerability Model (Revised)

HAZARD

Background Information

Analysis completed for: **Shoreline areas of the villages of Tusket, Hubbards Point, Amiraults Hill, Sluice Point, Surettes Island, Morris Island, Ste. Anne du Ruisseau, Abram's River, Rocco Point and Eel Brook**

See Appendix E for the complete HRVA Model document, which includes the tables used to complete the assessment.

Category of Hazard

X	Natural
	Technological
	Industrial
	Human-Induced

Definition of Specific Hazard

Hurricane with Coastal Flooding/Sea Level Rise/Storm Surge based on an approximate four (4) meter storm surge. The four (4) metre storm surge model was derived from the 1:2000 Provincial Digital Elevation Model and the 1:10,000 Provincial Elevation Model using ArcGIS 3D Analyst and ArcScene. This was originally created for an EMO exercise called Hurricane Purple back in September 2008.

Related Notes or Hazard Triggers (i.e. what causes Municipal Emergency Management Organization involvement)

Flooding of populated area, possible evacuation of people, impact on infrastructure, roads, bridges, wharves; no schools, churches or fire halls are affected.

PROBABILITY

Historical Events

Date (most recent first)	Changes made since	Comments
February 2, 1976 Groundhog Day Storm	No changes made	

IMPACTS

Identify most likely Impact Area (i.e. geographical; map reference)

Any low-lying coastal areas affected by storm surge or sea level rise, see Schedule F.

Identify Population number in Impact Area

Approximately 1900 residents.

Identify Susceptible Persons in Impact Area

Groups
Children
Day cares (1 located in Tusket)
Electricity dependent
Elderly
Families of first responders
First responders
Families of health care
People with disabilities
Low Rental Housing Units
Senior Boarding House

Identify critical Infrastructure in Impact Area

Sites	Identify Owner			
	Private	Municipal	Provincial	Federal
Roads/culverts/bridges			X	
Wharves	X			X
Fish Plants	X			
Municipal Wastewater System (Tusket)		X		
Amiraults Hill & Hubbard's Point Fire Department		X		
Island & District Fire Department		X		
Eel Brook Fire Department		X		
Municipal Administration Building		X		

Identify Socially Valued (non-critical) Infrastructure in Impact Area

Sites	Identify Owner			
	Private	Municipal	Provincial	Federal
École secondaire de Par-en-Bas			X	
Twin Village Social Club	X			
Ste. Famille Catholic Church	X			
Club Social des Îles	X			
St. Joseph Catholic Church	X			
Club Acadien	X			
Église Saint-Anne Church	X			
Carl's Store	X			
Argyle Township Court House Archives	X			
Argyle Township Court House		X		

Identify Severity of Impacts and Resources Required

Typical Impacts (Table 1)	Estimated # Affected (People/Structures)	Resources to respond				Municipal Cost Recover/Rebuild/Repair			Comments
		Pri	Mun	Prov	Fed	High	Medium	Low	
Road Closures	900+	X	X	X	X		X		
Evacuation	100+	X	X	X	X			X	
Wharf/Boat Damage	4 wharves	X	X	X	X			X	
Waste Water System Damage (Tusket)			X	X				X	
Damage to property			X	X				X	i.e. homes, cottages

HAZARD RISK VULNERABILITY RATING

Probability Score

(Considering historical and predicted probability rate the likelihood of occurrence in years)

	1	Highly Probable: once every 5 years or less
	2	Likely to occur once every 10 years
X	**3**	Might occur once every 20-30 years
	4	Not expected; could occur once every 50 years
	5	Rare chance of occurrence; once every 100 or more years

Overall Impact Score

(Considering each of the impacts identified and the guidelines below, select an overall impact score for the hazard)

	1	**Catastrophic**, over 100 people impacted; multiple fatalities; injuries, long term health effects, prolonged displacement (over 72 hours); long term effects to environment; destruction of critical infrastructure; loss of socially valued infrastructure; external resources required for immediate response; community unable to function without outside (provincial/federal) support: Municipal EOC activated for 24 hours or longer.
X	**2**	**Significant**; 51-100 people impacted; no immediate fatalities; multiple serious injuries; long-term hospitalization required; displacement (24-72 hours); significant impact to environment-medium term effects; critical infrastructure, socially valued & property damage repairable within emergency budgets; external resources required to support/supplement community services/responders; some community services unavailable for less than 72 hours; Municipal EOC activated for less than 24 hours.

	3	**Moderate**; 11-50 people impacted; no fatalities, minor injuries; short-term hospitalization and treatment required; displacement (6-24) hours; no long term environmental, infrastructure or property damage; localized damage rectified by routine arrangements and mutual aid agreement resources; minor localized disruption to community services (non-critical) for less than 6 hours, Municipal EOC activated for less than 8 hours.
	4	**Minor**; less than 10 people impacted; no fatalities, minor injuries requiring first aid/out-patient treatment only; displacement (less than 6 hours); no sustained damage to infrastructure or property; normal community functioning with some inconvenience; no external resources required; Municipal emergency officials notified but no EOC activation.
	5	**Insignificant**; less than 10 people impacted; no fatalities, injuries or impact on health and property beyond first responder "everyday" capacity; no displacement; no damage to properties or environment; no disruption to community services or infrastructure; no resources gaps; no Municipal emergency official notification or activation required.

(Probability score) 3 x (Overall Impact score) 2 = Number assigned to this Hazard 6 (1-25)

RISK TOLERANCE

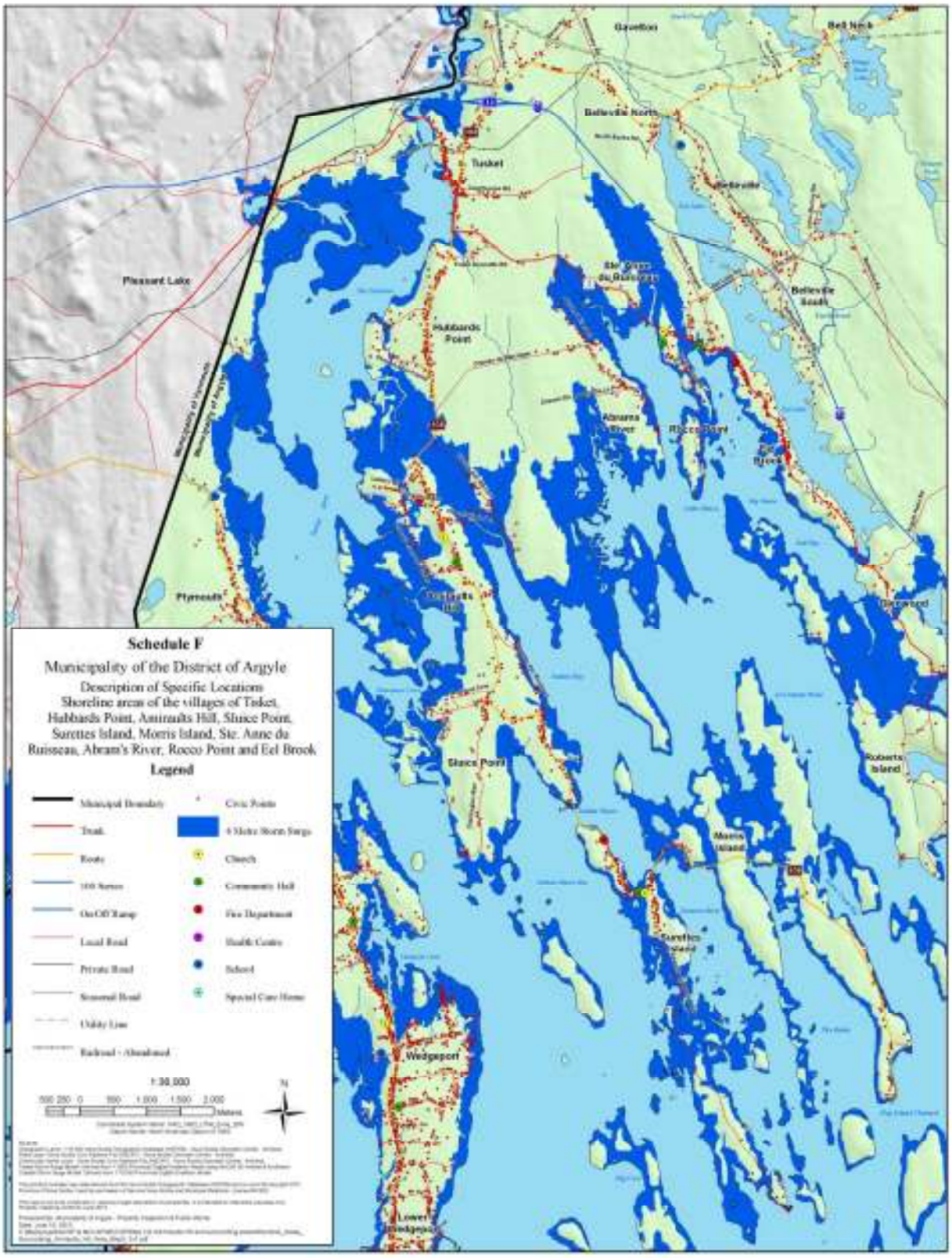
Final Hazard Assignment, in consideration of Risk Tolerance for Priority Planning

	1-5	Low
X	6-10	Medium
	11-25	High
		Requires further analysis/planning due to Risk Tolerance rating

Low Tolerance – unable to accept hazard; public disorder; requires special planning.

Medium Tolerance – may question authorities if impact is different than anticipated/predicted; media pressure may increase over time; requires consideration in planning.

High Tolerance – able to accept hazards; doesn't require special planning.



Schedule F can be seen at full scale in the list of schedules.

LOCATION FOUR

Hazard Risk Vulnerability Model (Revised)

HAZARD

Background Information

Analysis completed for: **Communities of Roberts Island, Glenwood, Argyle Head, Argyle, Central Argyle and Lower Argyle.**

See Appendix E for the complete HRVA Model document, which includes all tables used to complete the assessment.

Category of Hazard

X	Natural
	Technological
	Industrial
	Human-Induced

Definition of Specific Hazard

Hurricane with Coastal Flooding/Sea Level Rise/Storm Surge based on an approximate four (4) meter storm surge. The four (4) metre storm surge model was derived from the 1:2000 Provincial Digital Elevation Model and the 1:10,000 Provincial Elevation Model using ArcGIS 3D Analyst and ArcScene. This was originally created for an EMO exercise called Hurricane Purple back in September 2008.

Related Notes or Hazard Triggers (i.e. what causes Municipal Emergency Management Organization involvement)

Flooding of populated area, possible evacuation of people, impact on infrastructure, roads, bridges, wharves; no schools, churches or fire halls are affected.

PROBABILITY

Historical Events

Date (most recent first)	Changes made since	Comments
February 2, 1976 Groundhog Day Storm	No changes made	

IMPACTS

Identify most likely Impact Area (i.e. geographical; map reference)

Any low-lying coastal areas affected by storm surge or sea level rise, see Schedule G.

Identify Population number in Impact Area

Approximately 900+ residents.

Identify Susceptible Persons in Impact Area

Groups
Children
Day cares
Electricity dependent
Elderly
Families of first responders
First responders
Families of health care workers
People with disabilities
Special care home
Farm Owners

Identify critical Infrastructure in Impact Area

Sites	Identify Owner			
	Private	Municipal	Provincial	Federal
Roads/culverts/bridges			X	
Wharves	X			X

Identify Socially Valued (non-critical) Infrastructure in Impact Area

Sites	Identify Owner			
	Private	Municipal	Provincial	Federal
Drumlin Heights Consolidated School			X	
Argyle Historic Church	X			
Nakile Home for Special Care		X		
Argyle-Glenwood Community Hall	X			

Identify Severity of Impacts and Resources Required

Typical Impacts (Table 1)	Estimated # Affected (People/Structures)	Resources to respond				Municipal Cost Recover/Rebuild/Repair			Comments
		Pri	Mun	Prov	Fed	High	Medium	Low	
Road Closures	500+	X	X	X	X		X		
Evacuation	50-100+	X	X	X	X			X	
Wharf/Boat Damage	2 wharves	X	X	X	X			X	
Damage to property, i.e. homes, cottages, etc.			X	X				X	

HAZARD RISK VULNERABILITY RATING

Probability Score

(Considering historical and predicted probability rate the likelihood of occurrence in years)

	1	Highly Probable: once every 5 years or less
	2	Likely to occur once every 10 years
X	3	Might occur once every 20-30 years
	4	Not expected; could occur once every 50 years
	5	Rare chance of occurrence; once every 100 or more years

Overall Impact Score

(Considering each of the impacts identified and the guidelines below, select an overall impact score for the hazard)

	1	**Catastrophic**, over 100 people impacted; multiple fatalities; injuries, long term health effects, prolonged displacement (over 72 hours); long term effects to environment; destruction of critical infrastructure; loss of socially valued infrastructure; external resources required for immediate response; community unable to function without outside (provincial/federal) support: Municipal EOC activated for 24 hours or longer.
X	**2**	**Significant**; 51-100 people impacted; no immediate fatalities; multiple serious injuries; long-term hospitalization required; displacement (24-72 hours); significant impact to environment-medium term effects; critical infrastructure, socially valued & property damage repairable within emergency budgets; external resources required to support/supplement community services/responders; some community services unavailable for less than 72 hours; Municipal EOC activated for less than 24 hours.
	3	**Moderate**; 11-50 people impacted; no fatalities, minor injuries; short-term hospitalization and treatment required; displacement (6-24) hours; no long term environmental, infrastructure or property damage; localized damage rectified by routine arrangements and mutual aid agreement resources; minor localized disruption to community services (non-critical) for less than 6 hours, Municipal EOC activated for less than 8 hours.
	4	**Minor**; less than 10 people impacted; no fatalities, minor injuries requiring first aid/out-patient treatment only; displacement (less than 6 hours); no sustained damage to infrastructure or property; normal community functioning with some inconvenience; no external resources required; Municipal emergency officials notified but no EOC activation.
	5	**Insignificant**; less than 10 people impacted; no fatalities, injuries or impact on health and property beyond first responder "everyday" capacity; no displacement; no damage to properties or environment; no disruption to community services or infrastructure; no resources gaps; no Municipal emergency official notification or activation required.

(Probability score) 3 x (Overall Impact score) 2 = Number assigned to this Hazard 6 (1-25)

RISK TOLERANCE

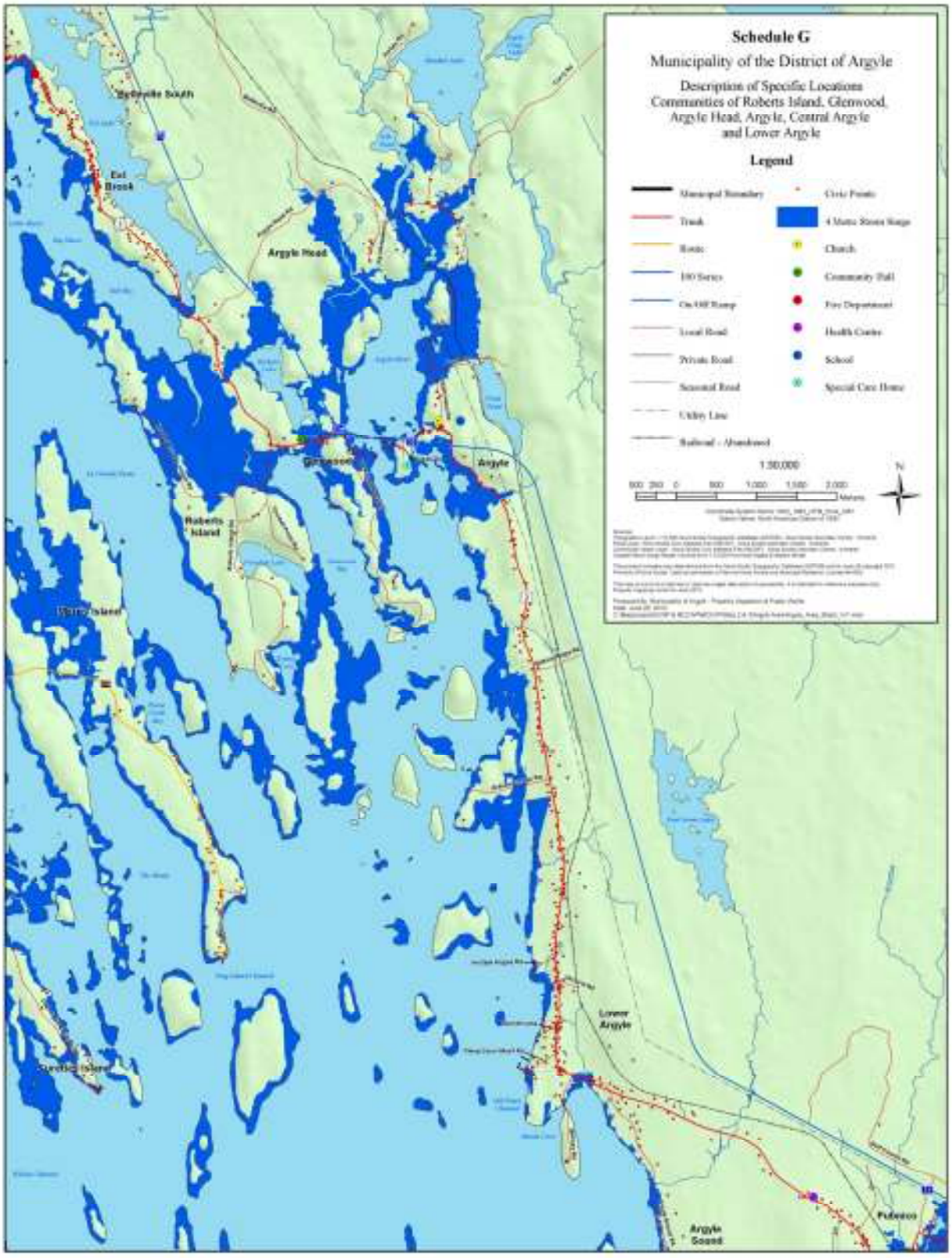
Final Hazard Assignment, in consideration of Risk Tolerance for Priority Planning

	1-5	Low
X	6-10	Medium
	11-25	High
		Requires further analysis/planning due to Risk Tolerance rating

Low Tolerance – unable to accept hazard; public disorder; requires special planning.

Medium Tolerance – may question authorities if impact is different than anticipated/predicted; media pressure may increase over time; requires consideration in planning.

High Tolerance – able to accept hazards; doesn't require special planning.



Schedule G can be seen at full scale in the list of schedules.

LOCATION FIVE

Hazard Risk Vulnerability Model (Revised)

HAZARD

Background Information

Analysis completed for: **The Pubnicos Coastal Area**

See Appendix E for the complete HRVA document, which includes all tables used to complete the assessment.

Category of Hazard

X	Natural
	Technological
	Industrial
	Human-Induced

Definition of Specific Hazard

Hurricane with Coastal Flooding/Sea Level Rise/Storm Surge based on an approximate four (4) meter storm surge. The four (4) metre storm surge model was derived from the 1:2000 Provincial Digital Elevation Model and the 1:10,000 Provincial Elevation Model using ArcGIS 3D Analyst and ArcScene. This was originally created for an EMO exercise called Hurricane Purple back in September 2008.

Related Notes or Hazard Triggers (i.e. what causes Municipal Emergency Management Organization involvement)

Flooding of populated area, possible evacuation of people, impact on infrastructure, roads, bridges, wharves; no schools, churches or fire halls are affected. Note that there are 17 wind turbine generators at the Pubnico Point Wind Farm.

PROBABILITY

Historical Events

Date (most recent first)	Changes made since	Comments
February 2, 1976 Groundhog Day Storm	No changes made	

IMPACTS

Identify most likely Impact Area (i.e. geographical; map reference)

Any low-lying coastal areas affected by storm surge or sea level rise, see Schedule H.

Identify Population number in Impact Area

Approximately 2600 residents.

Identify Susceptible Persons in Impact Area

Groups
Children
Day cares
Electricity dependent
Elderly
Families of first responders
First responders
Families of health care workers
People with disabilities
Special care home

Identify critical Infrastructure in Impact Area

Sites	Identify Owner			
	Private	Municipal	Provincial	Federal
Roads/culverts/bridges			X	
Wharves	X			X
Fish Plants	X			
Municipal Wastewater System		X		
Wind Turbine Generators (Wind Farm)	X			
East Pubnico Fire Department	X			
West Pubnico Fire Department	X			
Centre de Santé A.M. Clark Health Centre		X		
EHS Paramedic Base	X			
East Pubnico Water Utility		X		
Pont du Marais Boarding Home	X			

Identify Socially Valued (non-critical) Infrastructure in Impact Area

Sites	Identify Owner			
	Private	Municipal	Provincial	Federal
East Pubnico Community Centre	X			
Immaculate Conception Catholic Church	X			
Église Saint Pierre Church	X			
Royal Canadian Legion Branch 66	X			
École Pubnico-Ouest		X		
Le Village Historique Acadien	X			

Identify Severity of Impacts and Resources Required

Typical Impacts (Table 1)	Estimated # Affected (People/Structures)	Resources to respond				Municipal Cost Recover/Rebuild/Repair			Comments
		Pri	Mun	Prov	Fed	High	Medium	Low	
Road Closures	900+	X	X	X	X		X		
Evacuation	50-100+	X	X	X	X			X	
Wharf/Boat Damage	7 wharves	X	X	X	X			X	
Waste Water System Damage			X	X			X		
Damage to property, i.e. homes, cottages, etc.			X	X				X	

HAZARD RISK VULNERABILITY RATING

Probability Score

(Considering historical and predicted probability rate the likelihood of occurrence in years)

	1	Highly Probable: once every 5 years or less
	2	Likely to occur once every 10 years
X	**3**	Might occur once every 20-30 years
	4	Not expected; could occur once every 50 years
	5	Rare chance of occurrence; once every 100 or more years

Overall Impact Score

(Considering each of the impacts identified and the guidelines below, select an overall impact score for the hazard)

	1	**Catastrophic**, over 100 people impacted; multiple fatalities; injuries, long term health effects, prolonged displacement (over 72 hours); long term effects to environment; destruction of critical infrastructure; loss of socially valued infrastructure; external resources required for immediate response; community unable to function without outside (provincial/federal) support: Municipal EOC activated for 24 hours or longer.
X	**2**	**Significant**; 51-100 people impacted; no immediate fatalities; multiple serious injuries; long-term hospitalization required; displacement (24-72 hours); significant impact to environment-medium term effects; critical infrastructure, socially valued & property damage repairable within emergency budgets; external resources required to support/supplement community services/responders; some community services unavailable for less than 72 hours; Municipal EOC activated for less than 24 hours.
	3	**Moderate**; 11-50 people impacted; no fatalities, minor injuries; short-term hospitalization and treatment required; displacement (6-24) hours; no long term environmental, infrastructure or property damage; localized damage rectified by routine arrangements and mutual aid agreement resources; minor localized disruption to community services (non-critical) for less than 6 hours, Municipal EOC activated for less than 8 hours.
	4	**Minor**; less than 10 people impacted; no fatalities, minor injuries requiring first aid/out-patient treatment only; displacement (less than 6 hours); no sustained damage to infrastructure or property; normal community functioning with some inconvenience; no external resources required; Municipal emergency officials notified but no EOC activation.
	5	**Insignificant**; less than 10 people impacted; no fatalities, injuries or impact on health and property beyond first responder "everyday" capacity; no displacement; no damage to properties or environment; no disruption to community services or infrastructure; no resources gaps; no Municipal emergency official notification or activation required.

(Probability score) 3 x (Overall Impact score) 2 = Number assigned to this Hazard 6 (1-25)

RISK TOLERANCE

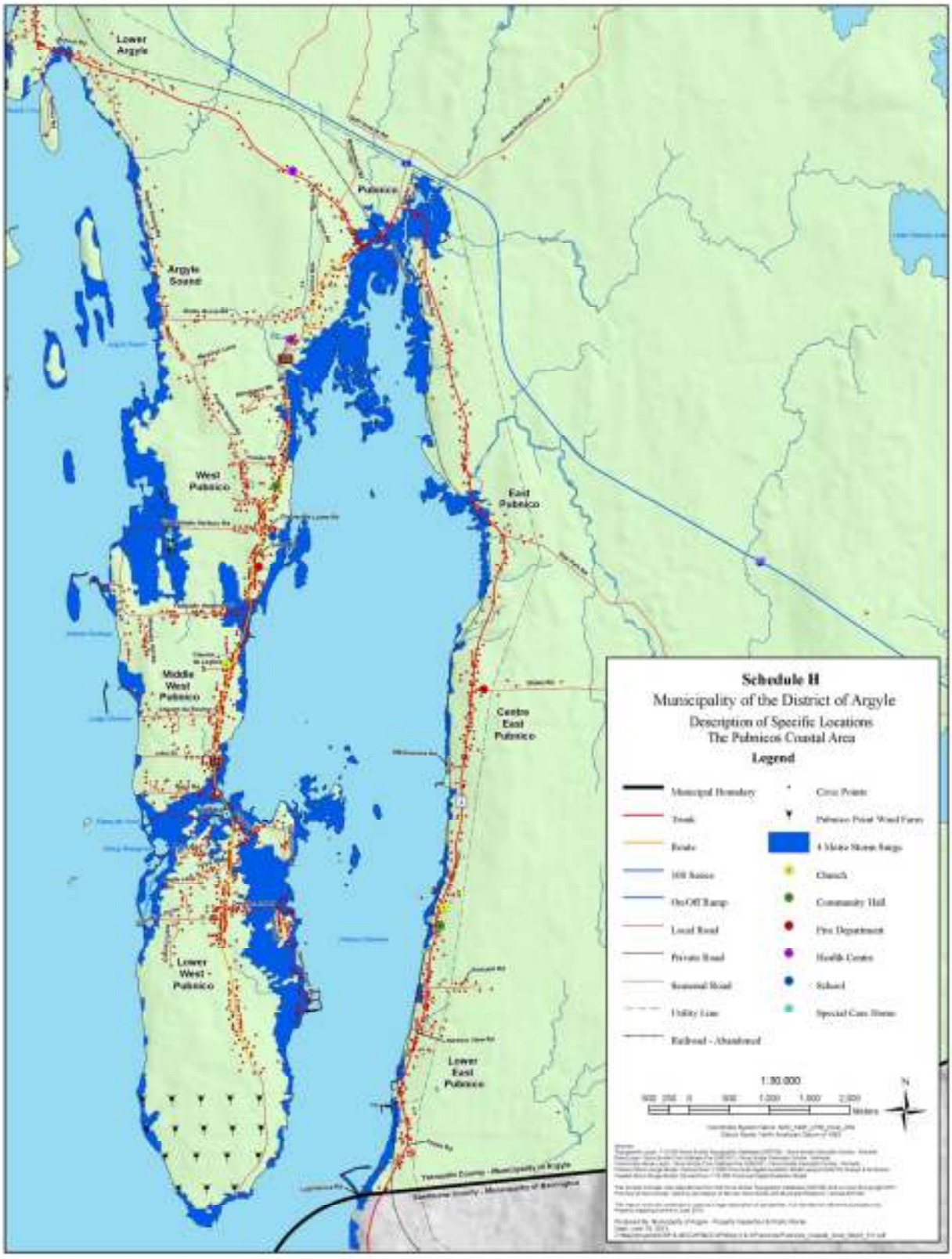
Final Hazard Assignment, in consideration of Risk Tolerance for Priority Planning

	1-5	Low
X	6-10	Medium
	11-25	High
		Requires further analysis/planning due to Risk Tolerance rating

Low Tolerance – unable to accept hazard; public disorder; requires special planning.

Medium Tolerance – may question authorities if impact is different than anticipated/predicted; media pressure may increase over time; requires consideration in planning.

High Tolerance – able to accept hazards; doesn't require special planning.



Schedule H can be seen at full scale in the list of schedules.

LOCATION SIX

Hazard Risk Vulnerability Model (Revised)

HAZARD

Background Information

Analysis completed for: **Municipality of Argyle**

See Appendix E for the complete HRVA Model document, which includes all tables used to complete the assessment.

Category of Hazard

X	Natural
	Technological
	Industrial
	Human-Induced

Definition of Specific Hazard

Drought causing increase in forest fire/wildfire

Related Notes or Hazard Triggers (i.e. what causes Municipal Emergency Management Organization involvement)

Need for evacuation of residents, impact on infrastructure and homes, transportation disruption and air pollution.

PROBABILITY

Historical Events

Wildfires in Yarmouth County		
Year	**Number of Fires**	**Total Area Burned (HA)**
2006	21	715.2
2007	35	127.8
2008	29	66.12
2009	8	9.80
2010	21	12.92
2011	21	N/A
2012	20	N/A

(Natural Resources, 2013)

IMPACTS

Identify most likely Impact Area (i.e. geographical; map reference)

Localized areas in the municipality, for example: Quinan and East Kemptville.

Identify Population number in Impact Area

Population in impact area depends on the location of the forest fire. On average it could potentially impact up to 200 people.

Identify Susceptible Persons in Impact Area

Groups
Children
Elderly
Families of first responders
First responders
Families of health care workers
Farm Owners
Home Owners
Pet Owners

Identify critical Infrastructure in Impact Area

Sites	Identify Owner			
	Private	Municipal	Provincial	Federal
Roads			X	
Bridges			X	
Fire Departments		X		
Depending on the location there could be other infrastructure such as schools, medical centers, low rental housing, etc.	X	X	X	X

Identify Socially Valued (non-critical) Infrastructure in Impact Area

Sites	Identify Owner			
	Private	Municipal	Provincial	Federal
Churches	X			
Community Halls	X			
Schools		X		

Identify Severity of Impacts and Resources Required

Typical Impacts (Table 1)	Estimated # Affected (People/Structures)	Resources to respond				Municipal Cost Recover/Rebuild/Repair			Comments
		Pri	Mun	Prov	Fed	High	Medium	Low	
Road Closures	200+	X	X	X	X			X	
Evacuation	100+	X	X	X	X			X	
Loss of home and other structures	Depends on location	X	X	X	X		X		
Medical issues due to smoke inhalation	Depends on location	X	X	X	X			X	
Wildlife		X	X	X	X			X	

HAZARD RISK VULNERABILITY RATING

Probability Score

(Considering historical and predicted probability rate the likelihood of occurrence in years)

	1	Highly Probable: once every 5 years or less
X	**2**	Likely to occur once every 10 years
	3	Might occur once every 20-30 years
	4	Not expected; could occur once every 50 years
	5	Rare chance of occurrence; once every 100 or more years

Overall Impact Score

(Considering each of the impacts identified and the guidelines below, select an overall impact score for the hazard)

	1	**Catastrophic**, over 100 people impacted; multiple fatalities; injuries, long term health effects, prolonged displacement (over 72 hours); long term effects to environment; destruction of critical infrastructure; loss of socially valued infrastructure; external resources required for immediate response; community unable to function without outside (provincial/federal) support: Municipal EOC activated for 24 hours or longer.
	2	**Significant**; 51-100 people impacted; no immediate fatalities; multiple serious injuries; long-term hospitalization required; displacement (24-72 hours); significant impact to environment-medium term effects; critical infrastructure, socially valued & property damage repairable within emergency budgets; external resources required to support/supplement community services/responders; some community services unavailable for less than 72 hours; Municipal EOC activated for less than 24 hours.
X	**3**	**Moderate**; 11-50 people impacted; no fatalities, minor injuries; short-term hospitalization and treatment required; displacement (6-24) hours; no long term environmental, infrastructure or property damage; localized damage rectified by routine arrangements and mutual aid agreement resources; minor localized disruption to community services (non-critical) for less than 6 hours, Municipal EOC activated for less than 8 hours.
	4	**Minor**; less than 10 people impacted; no fatalities, minor injuries requiring first aid/out-patient treatment only; displacement (less than 6 hours); no sustained damage to infrastructure or property; normal community functioning with some inconvenience; no external resources required; Municipal emergency officials notified but no EOC activation.
	5	**Insignificant**; less than 10 people impacted; no fatalities, injuries or impact on health and property beyond first responder "everyday" capacity; no displacement; no damage to properties or environment; no disruption to community services or infrastructure; no resources gaps; no Municipal emergency official notification or activation required.

(Probability score) 3 x (Overall Impact score) 2 = Number assigned to this Hazard 6 (1-25)

RISK TOLERANCE

Final Hazard Assignment, in consideration of Risk Tolerance for Priority Planning

	1-5	Low
X	6-10	Medium
	1-25	High
		Requires further analysis/planning due to Risk Tolerance rating

Low Tolerance – unable to accept hazard; public disorder; requires special planning.

Medium Tolerance – may question authorities if impact is different than anticipated/predicted; media pressure may increase over time; requires consideration in planning.

High Tolerance – able to accept hazards; doesn't require special planning.

FUTURE CLIMATE HAZARDS

With more frequent storm events and increasing storm intensity the municipality will experience more climate hazards in the future. These climate hazards are likely to occur in locations that are now experiencing climate hazards and new locations will experience climate hazards due to increasing storm intensity. The following will identify where the following climate hazards are likely to occur in the future:

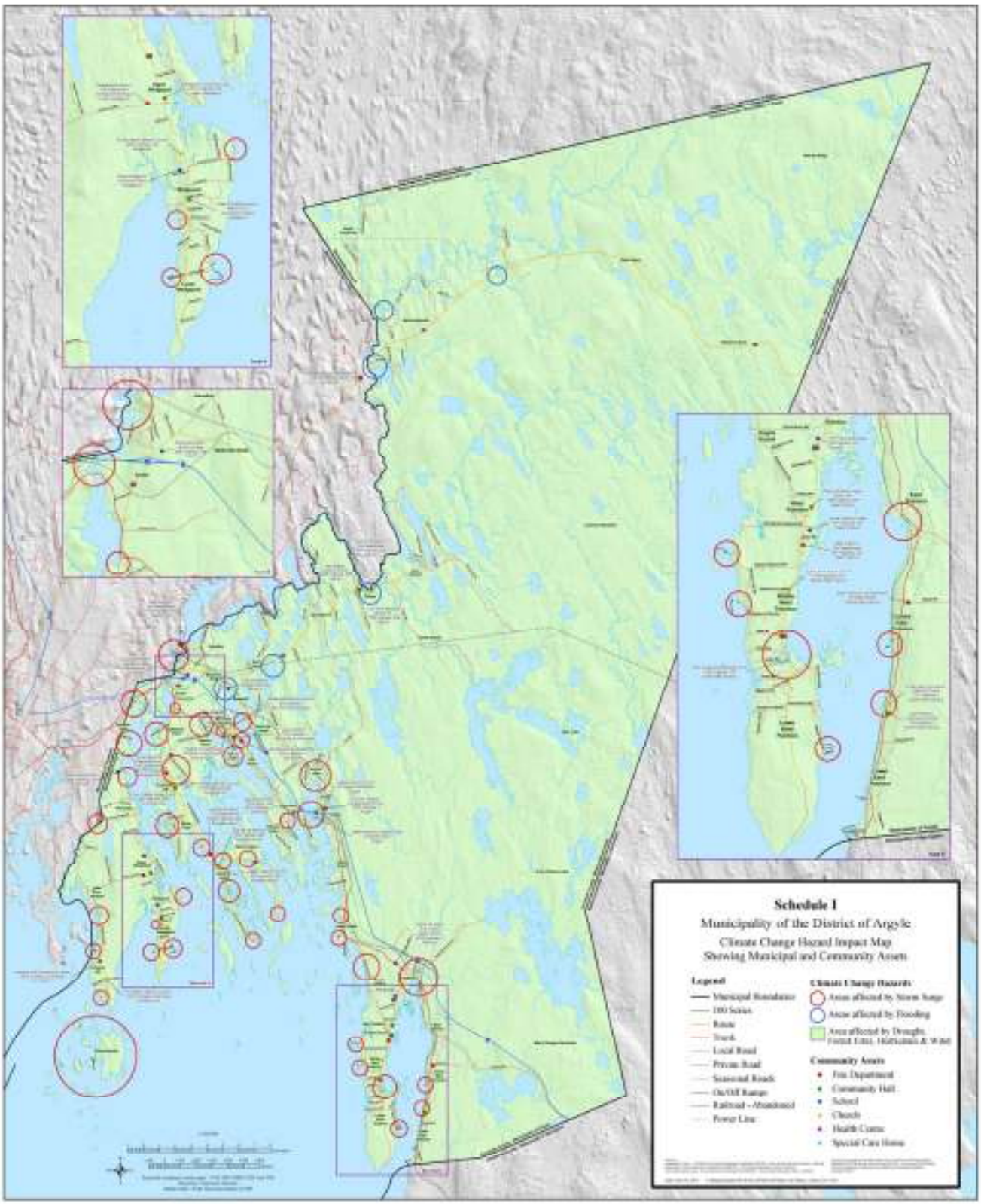
- **Flooding** – Flooding will continue to occur in the communities of Quinan, East Kemptville, North Kemptville and other locations along the Tusket River and Quinan River after heavy rainfall events. More locations are expected to be affected by flooding as precipitation amounts increase and rivers are unable to handle the extra flow of water causing them to flood their banks.

- **Storm Surge** – Future storm surge hazards are likely to occur in low lying coastal areas. As storm intensity increases, storm surge levels are expected and more areas will experience the effects of storm surge.

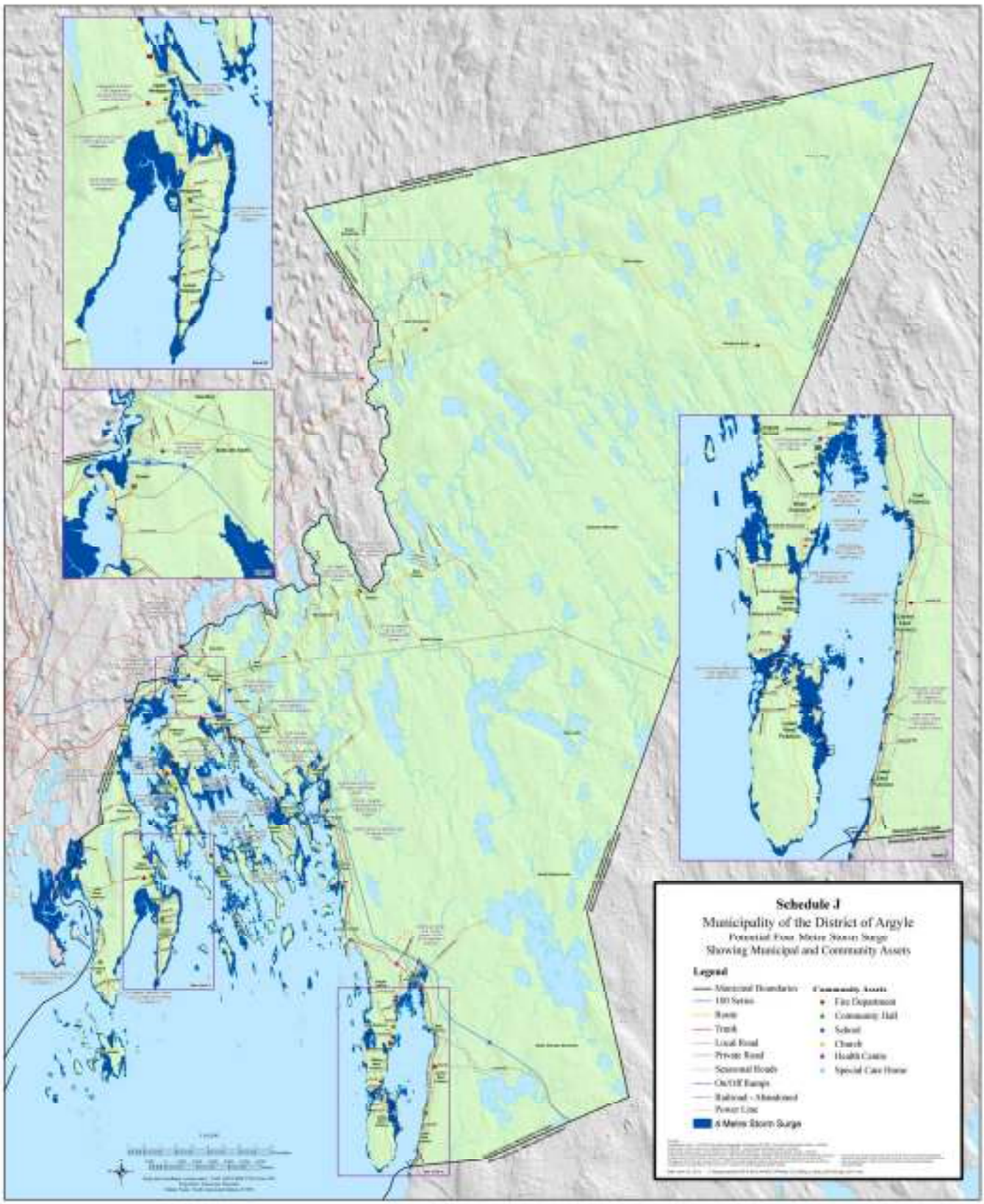
- **Sea Level Rise** – Sea level rise is likely to cause hazards along the coast in low lying areas. Areas affected by sea level rise are expected to increase in the future.

- **Hurricanes and Wind** – Future climate hazards caused by hurricanes and high wind storms are likely to occur in the coastal communities. Depending on the intensity of the storm climate hazards could also be experienced farther inland.

The following two maps show municipal and community assets located on vulnerable or at-risk areas in the municipality. Schedule I: Climate Change Hazard Impact Map Showing Municipal and Community Assets identifies the locations of municipal and community assets and indicates whether or not these assets fall into areas identified in Section Three as being at risk due to their location within the municipality. The areas identified as being at risk include areas where climate change hazards have occurred in the past and where they are likely to occur in the future. Schedule J: Potential Four Metre Storm Surge Showing Municipal and Community Assets identifies the locations of municipal and community assets and indicates whether or not these assets fall into the potential four metre storm surge area indicated. The four metre storm surge model was derived from the 1:2,000 Provincial Digital Elevation Model and the 1:10,000 Provincial Elevation Model using ArcGIS 3D Analyst and ArcScene, which was originally created for an EMO exercise called Hurricane Purple completed in September 2008.



Schedule I can be seen at full scale in the list of schedules.



Schedule J can be seen at full scale in the list of schedules.

SECTION FOUR: FACILITIES AND INFRASTRUCTURE

This section identifies and describes how existing municipally-owned and operated facilities and infrastructure are vulnerable to climate change.

MUNICIPAL FACILITIES AND INFRASTRUCTURE

The following are existing municipality-owned and operated facilities and infrastructure within the Municipality of the District of Argyle.

West Pubnico Wastewater System – The Municipality of the District of Argyle owns and operates a sanitary sewage collection and treatment system in the community of West Pubnico, Nova Scotia. The system was originally constructed in 1978, and since that time has undergone a number of upgrades and extensions. The collection system currently consists of approximately 14,300 metres (m) of 200 millimetre (mm) diameter gravity sewer and 150 m of 250 mm diameter gravity sewer. The system also contains twelve (12) duplex Flygt submersible pumping stations, complete with approximately 5,100 m of sewage forcemain. All gravity sewers and forcemains in the system are constructed of PVC plastic piping, and all manholes are built from pre-cast concrete. West Pubnico's sewage treatment plant originally consisted of two (2) cell aerated lagoon, which was constructed in 1979. Construction began on May 17, 2010 to upgrade the sewage treatment plant and the facility began treating wastewater on May 27, 2011. The system provides central sanitary sewage collection service to approximately 500 residential and commercial connections, which equates to an approximate serviced population of 1,700 people.

The following two maps indicate whether or not the West Pubnico Wastewater System falls into areas identified in Section Three as being at risk. Schedule K: Climate Hazard Impact Map Showing Municipally-Owned and Operated Facilities and Infrastructure West Pubnico identifies the location of the West Pubnico Wastewater System and indicates whether or not this infrastructure falls into areas identified in Section Three as being at risk. Schedule L: Potential Four Metre Storm Surge Showing Municipally-Owned and Operated Facilities and Infrastructure West Pubnico identifies the location of the West Pubnico Wastewater System and indicates whether or not this infrastructure falls into the potential four metre storm surge area.

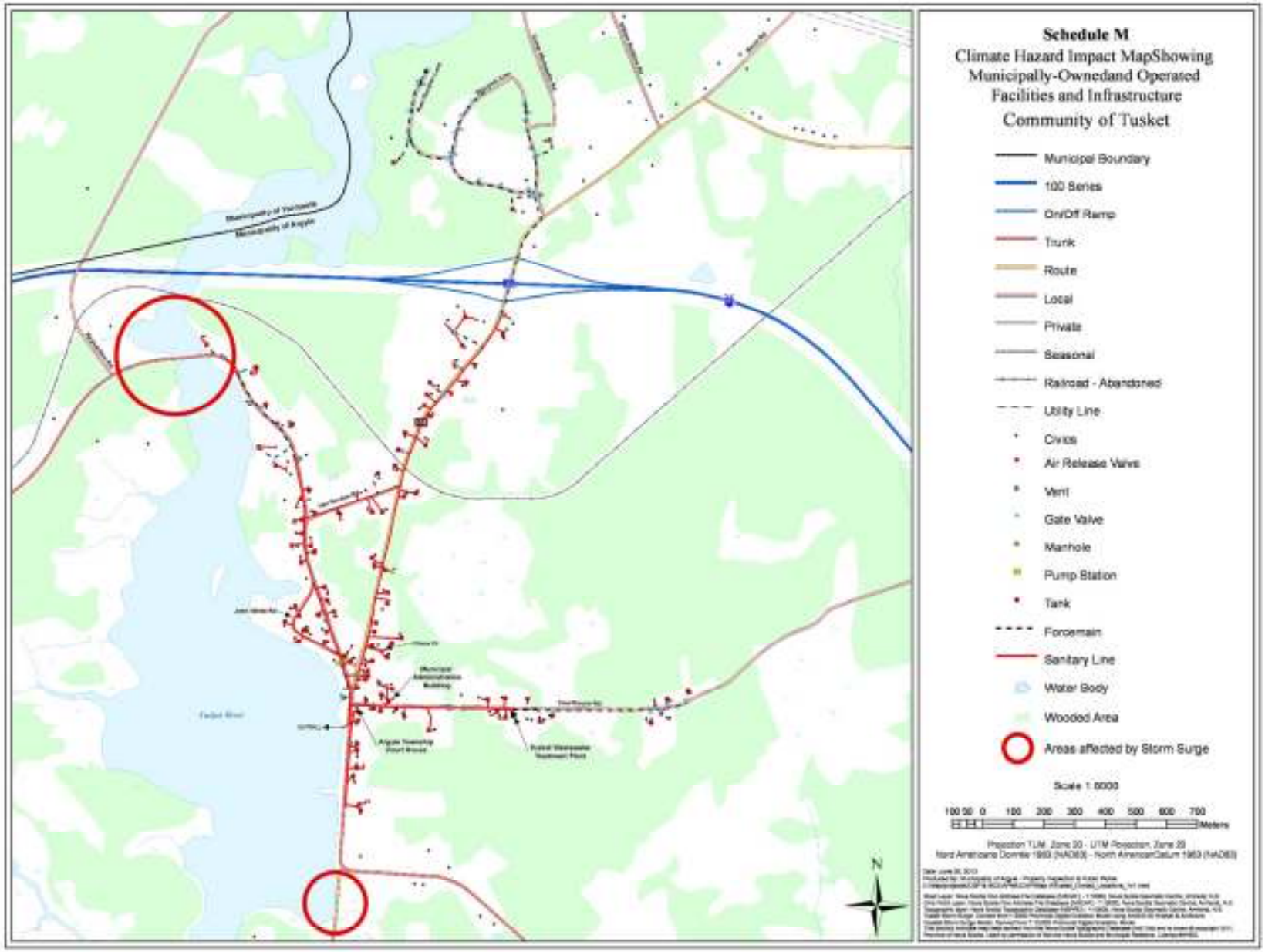
Schedules K and L can be seen at full scale in the list of schedules.

Tusket Wastewater System – The Municipality of the District of Argyle owns and operates a wastewater collection system in the community of Tusket, Nova Scotia. The system was constructed in 2005 and since then has undergone a few extensions. Wastewater is collected on individual properties in septic tanks, which provide primary treatment and settling of solids. Filtered effluent from the septic tanks flows by gravity, or is pumped, to the small diameter sewer main located in the street. The sewer main coveys the septic tank effluent to a central duplex pumping station, which in turn, pumps the effluent to the re-circulation tank located at the treatment site on Courthouse Road. A biologically active re-circulating sand filter (RSF) treatment system provides tertiary level treatment of the septic tank effluent. The treated effluent from the RSF is disinfected by the UV system prior to being discharged into the Tusket River. The system has 131.26 connections for both residential and commercial properties.

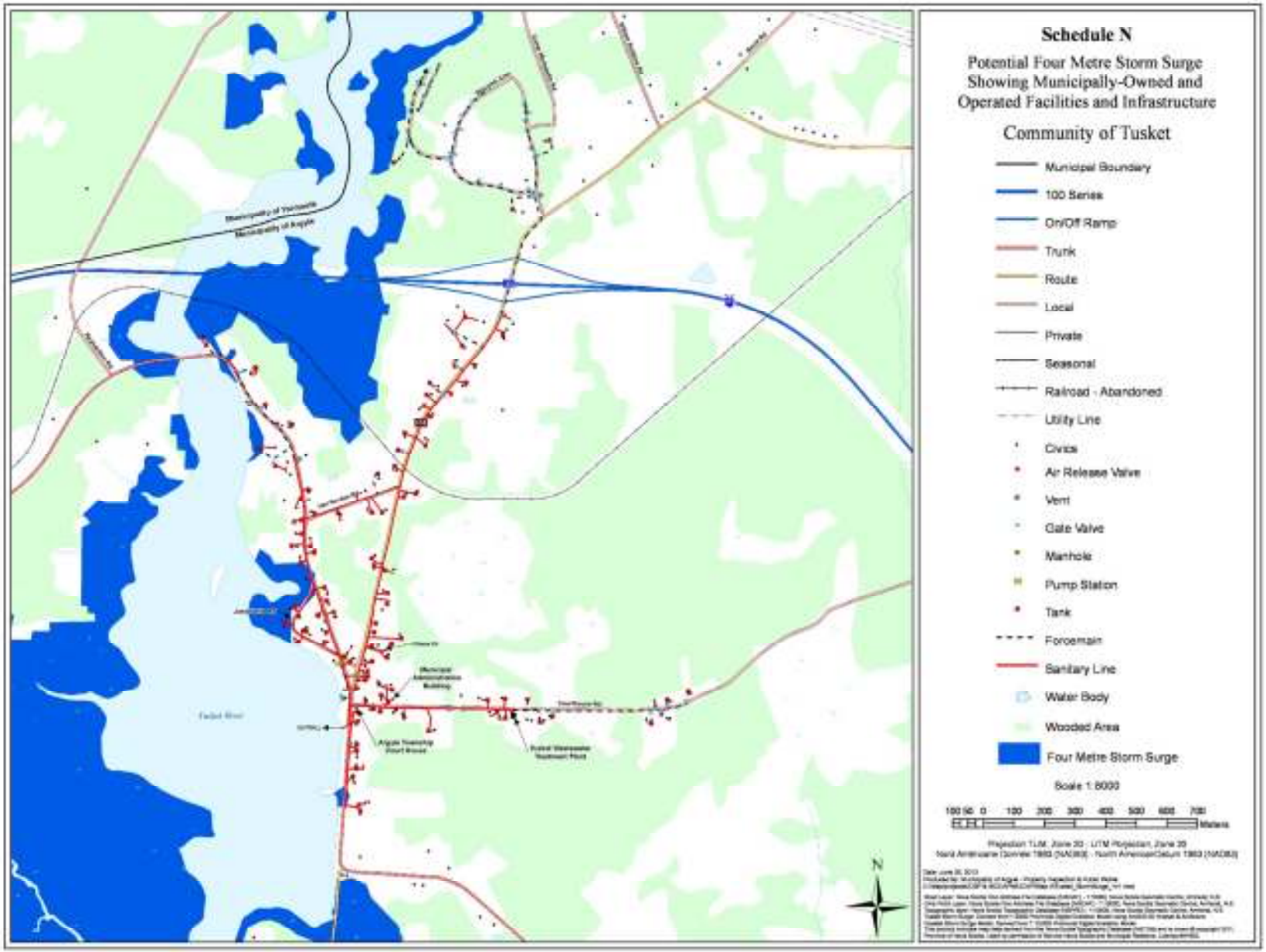
Municipal Administration Building – The 60 year old Municipal Administration Building is located in Tusket, Nova Scotia, and is the office building for the Municipality of the District of Argyle. The building was converted to an office building from an elementary school in 1976. The top floor houses primarily office spaces for Property Inspection & Public Works, Tax Office and the Municipal Council Chambers. The basement floor is occupied by the Recreation Department, Emergency Management Office and the Planning Commission.

Argyle Township Court House – The 204 year old Tusket Court House is located in Tusket, Nova Scotia, and is a museum and National Historic Site. The building served as the Municipal Offices from 1945 until 1976 and partially restored in 1982. The ground floor comprises an office and gift shop, the Gaol (jail) and the Jailer's quarters. The top floor houses the courtroom, the judge's chambers and the Grand Jury Room.

The following two maps indicate whether or not the Tusket Wastewater System, Municipal Administration Building and Argyle Township Court House falls into areas identified in Section Three as being at risk. Schedule M: Climate Hazard Impact Map Showing Municipally-Owned and Operated Facilities and Infrastructure Tusket identifies the location of the Tusket Wastewater System, Municipal Administration Building and Argyle Township Courthouse and indicates whether or not these facilities and infrastructure fall into areas identified in Section Three as being at risk. Schedule N: Potential Four Metre Storm Surge Showing Municipally-Owned and Operated Facilities and Infrastructure Tusket identifies the location of the Tusket Wastewater System, Municipal Administration Building and Argyle Township Courthouse and indicates whether or not these facilities and infrastructure fall into the potential four metre storm surge area.



Schedule M can be seen at full scale in the list of schedules.



Schedule N can be seen at full scale in the list of schedules.

Middle East Pubnico Water Utility – The Middle East Pubnico Water Utility (MEPWU) was initially constructed in 1969 to supply water from French Lake to the local fishing and forestry industries. The system was owned and operated by the Province of Nova Scotia Department of Environment (NSE), but was turned over to Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) in 2000. The Municipality of the District of Argyle took over ownership of the MEPWU in 2012. Due to unacceptable bacterial counts in the raw water supply from French Lake obtained by the Federal Department of Fisheries in 1976 this source was abandoned. Four (4) test wells were drilled in this area in 1977 to determine if adequate ground water supply was available to support the local industrial demands. Subsequently, the system was converted to the existing ground water supply system which includes two (2) wells, one (1) 500,000 imp gallon reservoir tank with Floatinode cathodic protection, a control chamber with pump controls, three (3) fire hydrants and approximately 205 kilometers of 14 inch diameter asbestos cement water main with cast iron fittings. This system supplies untreated, metered water to two (2) industrial facilities and the East Pubnico Fire Department. Currently, there is no requirement from NSE to treat or disinfect the industrial water supply to these facilities. The two (2) well provide approximately 50 imp gal/min to the end users who require fresh water for processing and rinsing fish, factory clean up and was down, fire protection, ice production, and washroom facilities for over 100 employees during peak production.

Lower East Pubnico Water Utility – The Lower East Pubnico Water Utility (LEPWU) was initially constructed in 1965 to supply water from Allen's Brook man made reservoir to the local fisheries. This utility was also turned over to NSTIR by NSE in 2000. The Municipality of the District of Argyle took over ownership of the LEPWU in 2012. A section of this system is located in the Municipality of the District of Barrington. This system supplies untreated, metered water to two (2) industrial facilities. Currently, there is no requirement from NSE to treat or disinfect the industrial water supply to these facilities. High bacterial counts in the water supply necessitated a search for alternate sources of supply. Five test wells were drilled to determine ground water availability. The best yielding well was selected and developed for supply. The current system includes a heated masonry block well house (11' x 11') located on Pope Road, heated masonry block control building (15' x 28') on Pope Road, one (1) fire hydrant on the former Provincial Highway #609, one (1) 100,000 imp gallon reservoir tank, and approximately 2.8 kilometers of 6" cast iron water main with two (2) special manholes and eight (8) gate valves. The ground water well provides approximately 80 imp gal/min to the end users who require fresh water for processing and rinsing fish, factory clean up and wash down, and washroom facilities for approximately 45 employees.

The following two maps indicate whether or not the Middle East Pubnico Water Utility and Lower East Pubnico Water Utility fall into areas identified in Section Three as being at risk. Schedule O: Climate Hazard Impact Map Showing Municipally-Owned and Operated Facilities and Infrastructure East Pubnico identifies the location of the MEPWU and LEPWU and indicates

whether or not these facilities and infrastructure fall into areas identified in Section Three as being at risk. Schedule P: Potential Four Metre Storm Surge Showing Municipally-Owned and Operated Facilities and Infrastructure East Pubnico identifies the location of the MEPWU and LEPWU and indicates whether or not these facilities and infrastructure fall into the potential four metre storm surge area.

Schedules O and P can be seen at full scale in the list of schedules.

ISSUES AFFECTING MUNICIPAL FACILITIES AND INFRASTRUCTURE

The following are issues that will affect municipally-owned and operated facilities and infrastructure:

- **West Pubnico Wastewater System** – Salt water could enter the West Pubnico Wastewater System in the event of a storm surge through pump stations and manholes causing potential issues in the treatment of the wastewater. An extreme rain event can overload the wastewater system causing overflow and backups because of infiltration through manholes, pump stations and sump pumps that are connected to the system that should not be.

- **Tusket Wastewater System** – There is a potential for salt water to enter the Tusket Wastewater System in the event of an extreme storm surge through the tanks causing potential issues in the treatment of the wastewater. An extreme rain event can overload the wastewater system causing overflow at the treatment plant because of infiltration through the sand filters at the treatment plant and sump pumps which are connected to the system that should not be.

- **Middle East Pubnico Water Utility** – An extreme rain event could potentially flood the wells that supply the water for the system causing operation issues.

- **Lower East Pubnico Water Utility** – An extreme rain event could potentially flood the well and pump house that supplies the water for the system causing operation issues.

- **Fire Departments –** All the fire department facilities will not be directly impacted by potential flooding or storm surge, but the operation of these facilities could be impacted, such as power outages and access restrictions due to road closures.

IMPORTANT MUNICIPAL FACILITIES DURING AN EMERGENCY

The following are the municipality facilities considered to be important during an emergency:

1. The Municipal Administration Building is considered to be an important municipally-owned facility during an emergency. The newly built headquarters of the E.M.O. for the Municipality of Argyle is located in the basement of the Municipal Administration Building in Tusket, which is also known as the Command Post where modern telecommunication equipment is available from telephones to portable radios including faxes and Internet linked computers. In addition to normal power, an emergency electrical generator is on standby, available as required. This command post can be run either with electricity or by generator, it has lights and heat. It is also set up with a conference area.

2. Fire department facilities are considered to be an important facility during an emergency. Some fire departments can be set up as comfort stations in an event of an emergency. Fire departments have emergency equipment available to respond to issues that occur during emergencies.

EXISTING INFRASTRUCTURE RISK EVALUATION

The following infrastructure risk evaluation on existing municipally-owned infrastructure was a mandatory part of the Municipal Climate Change Action Plan (MCCAP). For each of the municipal asset types an appropriate risk ranking from a drop down box was selected, depending on the vulnerability of the asset type to each of the climactic events listed. Once each table was completed for a municipal asset class the information was transferred to a new table showing only the high risk factors. There were no high risk factors transferred to the other tables because all of the municipal assets received a low risk ranking.

Municipal Asset	Sea Level Rise		Precipitation (extreme event)				Extreme Wind		Flooding		Temperature				Erosion		Earthquake		Total	Risk
			Snow		Rain						High		Low							
Water System																				
Water Source (Wells, Surface Water, Other)	N	0	N	0	L	1	N	0	L	1	N	0	N	0	N	0	N	0	**2**	**L**
Water Treatment Plant																				
Water Storage Facilities	N	0	N	0	N	0	L	1	N	0	N	0	N	0	N	0	N	0	**1**	**L**
Water Pumping Facilities	N	0	N	0	L	1	L	1	L	1	N	0	N	0	N	0	N	0	**3**	**L**
Water Distribution System	N	0	N	0	L	1	N	0	L	1	N	0	N	0	N	0	N	0	**2**	**L**
Individual Water Service Lines	N	0	N	0	L	1	N	0	N	0	N	0	N	0	N	0	N	0	**1**	**L**
Total																				
Sanitary Sewer System																				
Wastewater Treatment Plant	N	0	N	0	L	1	L	1	N	0	N	0	N	0	N	0	N	0	**2**	**L**
Buildings	N	0	N	0	N	0	L	1	N	0	N	0	N	0	N	0	N	0	**1**	**L**
Wastewater Gravity Sewer	L	1	L	1	M	2	N	0	L	1	N	0	N	0	N	0	N	0	**5**	**L**
Wastewater Pressure Sewer (Forcemain)	L	1	L	1	M	2	N	0	L	1	N	0	N	0	N	0	N	0	**5**	**L**
Pumping Stations	M	2	L	1	L	1	L	1	L	1	N	0	N	0	N	0	N	0	**6**	**L**
Total	**4**		**3**		**6**		**3**		**3**		**0**		**0**		**0**		**0**		**1**	

Municipal Asset	Sea Level Rise		Precipitation (extreme event)				Extreme Wind		Flooding		Temperature				Erosion		Earthquake		Total	Risk
			Snow		Rain						High		Low							
Municipal Buildings																				
Buildings	N	0	L	1	N	0	L	1	N	0	N	0	N	0	N	0	N	0	**2**	**L**
Total	**0**		**1**		**0**		**1**		**0**		**0**		**0**		**0**		**0**		**2**	
Roads																				
Bridges																				
Traffic Signals																				
Street Lighting	N	0	L	1	N	0	L	1	L	1	N	0	N	0	N	0	N	0	**3**	**L**
Signs	N	0	N	0	N	0	L	1	N	0	N	0	N	0	N	0	N	0	**1**	**L**
Culverts	N	0	N	0	L	1	L	1	L	1	N	0	N	0	N	0	N	0	**3**	**L**
Sidewalks	N	0	L	1	L	1	L	1	N	0	N	0	N	0	N	0	N	0	**3**	**L**
Local Roads	N	0	L	1	L	1	L	1	L	1	N	0	N	0	N	0	N	0	**4**	**L**
Collectors																				
Total																				

STAKEHOLDER INVOLVEMENT

The Department of Transportation and Infrastructure Renewal (TIR) owns and maintains the road infrastructure which runs through the municipality. The committee agreed that TIR would be contacted for input as a stakeholder. The committee met with Greg Newell, Area Manager to discuss the Municipal Climate Change Action Plan (MCCAP). TIR has temporary bridges province wide that can be assembled when bridges are damaged and need repair or replacement. New and upgraded infrastructure is being designed to meet higher standards and designed for higher intensity storms. TIR has the authority to close roads and bridges temporary if they are a safety hazard, also first responders have the right to do temporary road closures.

SECTION FIVE (a): SOCIAL CONSIDERATIONS

This section provides information about who within the municipality might be most adversely affected by climate change issues.

WHO WILL BE AFFECTED

Some residents living in the municipality may be more vulnerable than others in the event of climate-related emergencies. Those that will be most affected by climate related emergency events are:

- Seniors
- Special needs
- Disabled
- Low income
- Those living in isolated locations
- Those living along the coast
- Communities which have been identified through site specific contingency planning, such as Quinan and Surettes Island
- The population affected by raising water levels of the Tusket and Quinan Rivers

BARRIERS FOR AT-RISK PEOPLE

The two main barriers for at-risk people to receive adequate help during an emergency in the municipality are:

1. **Transportation** – long travelling distances between communities and there is no public transportation such as bus routes within the municipality.

2. **Isolation** – delays in emergency responders responding to individuals living in isolated areas.

EMERGENCY PLAN

The Municipality of Argyle has an emergency plan, which is currently and continuously being update, called the Municipality of Argyle Emergency Plan, which can be seen in Appendix C. The emergency plan does address barriers for at-risk people. The plan does take into

consideration the needs of at-risk people and works their needs into the plan for setting up shelters. The Nakile Home for Special Care has an emergency plan, which addresses the resident's needs. Contingency plans for Quinan Flooding and the Indian Sluice Bridge created by EMO address the needs of the at-risk individuals living in those communities.

HEALTH AND SAFETY OF RESIDENTS

There are a number of different issues caused by climate related hazards that have the potential to affect the quality of life, health and safety of residents. Depending on the severity of the climate hazard, the following are possible issues that could affect residents:

- **Storm Surge** – A storm surge that destroys the fishing infrastructure, such as wharves, fishing vessels and fish processing plants, would affect the quality of life of the fishing communities that rely on the infrastructure for their livelihood. A storm surge that damages road and bridge infrastructure could delay emergency first responders and put the safety of residents at risk.

- **Flooding** – Flooding will cause health and safety issues for residents, such as contaminated drinking water, road closures and property damage.

- **Forest Fires** – Forest fires caused by drought near communities cause health and safety issues for residents, such as smoke inhalation, potential loss of homes and residents would have to be evacuated to safe locations.

WHO CAN HELP

The following is a list of organizations, agencies and groups that may be able to help in the event of a weather-related emergency:

- Fire Department
- Emergency Management Organization (EMO)
- RCMP
- Red Cross
- Salvation Army
- Local church groups
- Provincial and Federal agencies

STAKEHOLDER INVOLVEMENT

For Section Five (a): Social Considerations, Janine Doucette and Tayler Harris met with Peggy Boudreau, Senior Safety Coordinator for the Municipality of Argyle to determine which residents would be most affected by climate related emergency events. Peggy's knowledge of the communities through her role as Senior Safety Coordinator and her involvement with EMO was an asset when determining who would be most affected by climate related emergency events.

SECTION FIVE (b): ECONOMIC CONSIDERATIONS

This section provides information on the potential economic implications of climate change on the municipality, at both the local and regional levels.

IMPORTANT INDUSTRIES IN THE MUNICIPALITY

The important economic industries located in the Municipality of Argyle are:

1. **Fishery** – The fishing industry is one of the most important industries in the municipality. Fish processing plants, lobster holding facilities, wharves and fishing vessels form the fishery and are located in the fishing communities along the coast and tend to be low lying areas, which are particularly vulnerable to storm surge and sea level rise.

2. **Service Industry** – The service industry is an important industry in the municipality. The majority of the service industries are located in the rural centers of Tusket, West Pubnico and Wedgeport. The municipality relies on other municipal units for some services, such as hospital, police, etc.

3. **Forestry** – The forestry industry use to be an important industry in the municipality, but activity has been on the decline over the past years. The forestry industry is located inland away from the coastal communities and tends to be isolated areas.

4. **Tourism** – The tourism industry is an important industry for the municipality, but tourism activity has been on the decline over the previous years. The majority of the tourism locations are located along the coast.

5. **Agriculture** – The agriculture industry is an important industry in the municipality. Currently there are five mink farms located in the communities of Argyle Head, Roberts Island and East Kemptville, along with a fox farm located in Quinan.

INDUSTRIES IMPACTED BY CLIMATE CHANGE

Climate change could potentially have a negative impact on the important economic industries in the municipality. The following is how each industry could potentially be affected by the climate hazards previously identified.

1. **Fishery** – A major storm surge could potentially damage and/or destroy the infrastructure that is located along the coast that the fishing industry relies on. The wharves and fishing vessels are the most vulnerable to major storm surge and high winds. If the wharves and fishing vessels are damaged and/or destroyed, this would have a major impact on the local economy. The fish processing plants and lobster holding facilities are located around the wharves and seem to be located in low lying areas, which put the facilities at risk of being damaged and/or destroyed by a major storm surge and high winds. If the facilities are damage and/or destroyed, this would have a major impact on the local economy and a potential impact regionally. It is not believed that any of the climate issues identified so far could result in the loss of the fishing industry, but they could have a major impact on the industry and the fishing communities.

2. **Service Industry** – Major storms such as hurricanes and high winds could impact the service industry by damaging and/or destroying the facilities these services rely on. The extent of the damage would determine whether or not the local economy would be impacted; the greater the damage, the greater the impact would be to the local economy. There could potentially be an impact felt on the economy regionally. It is not believed that any of the climate issues identified so far could result in the loss of the service industry.

3. **Forestry** – Drought and forest fires could have an impact on the forestry by destroying the wood lots that this industry relies on for logging. It is being predicted that our summers will be warmer and dryer due to the changing climate, which increases the risk of droughts. With the risk of forest fires increasing due to experiencing droughts more frequently, this puts wood lots at risk of being destroyed by fire. Due to the climate changing, the insect populations are growing and different species are being introduced to our forest, which can have a negative effect on the trees and vegetation. If a vast area of wood lots are destroyed this could potentially have an impact on the local economy. It is not believed that any of the climate issues identified so far could result in the loss of the forestry industry, but they could potentially have a major impact on the industry depending on the area of wood lots destroyed.

4. **Tourism** - Major storms such as hurricanes and high winds could impact the tourism industry by damaging and/or destroying the infrastructure such as museums and historical sites that attract the tourist. The extent of the damage would determine whether or not the local economy would be impacted; the greater the damage, the greater the impact would be to the local economy. There could potentially be an impact felt on the economy regionally. It is not believed that any of the climate issues identified so far could result in the loss of the tourism industry.

5. **Agriculture** - Major storms such as hurricanes and high winds could impact the agriculture industry by damaging and/or destroying the farm buildings. Forest fires could damage and/or destroy the farms. Also, with the climate changing there is a greater chance for the spread of diseases through pests and other factors.. The extent of the damage would determine whether or not the local economy would be impacted; the greater the damage, the greater the impact would be to the local economy. There could potentially be an impact felt on the economy regionally. It is not believed that any of the climate issues identified so far could result in the loss of the agriculture industry.

DEALING WITH POTENTIAL THREATS TO THE LOCAL ECONOMY

The following is a list of ideas and/or options for dealing with potential threats to the local economy:

1. Have emergency funds available.

2. Promote higher building standards which take into account climate change.

3. Impliment increased setbacks to coastal shorelines.

4. Have set plans in place to deal with climate hazards.

5. Continue to use each other to deal with climate related emergencies, i.e. families depend on one another at time of emergencies.

POTENTIAL ECONOMIC OPPORTUNITIES

The South West Nova Scotia (SWNS) Temperature and Solar Radiation Study that is currently in progress is showing potential climate change benefits to agricultural crops such as grapes, berries and stone fruits. This could potentially become an economic opportunity for the municipality as a result of the changing climate.

The tourism industry could experience potential economic benefits due to climate change. The municipality could have tourist travelling to the area to escape hotter temperatures in the south during the summer months, which would be a benefit to the local economy.

SECTION FIVE (c): ENVIRONMENTAL CONSIDERATIONS

This section provides information about environmental problems experienced as a result of climate related hazards. Information on protected areas and endangered species within the municipality is provided.

ENVIRONMENTAL PROBLEMS

The following are environmental problems that the municipality has experienced as a result of weather or climate related issues in the past.

1. Flooding in Quinan due to heavy rainfall has caused drinking water contamination concerns in the past. Drinking water contamination will continue to be a concern due to flooding caused by increased rainfall amounts. It is anticipated that drinking water contamination concerns will increase with the future changes in the weather because the municipality is experiencing more frequent flooding than in the past.

2. When there is heavy rainfall the Tusket wastewater treatment plant experiences an overflow of effluent into the treatment plant. The treatment plant is unable to handle the increase of water added to the system through the field beds during heavy rainfall. It is anticipated that this will be an increasing problem in the future with the changing weather and increased rainfall amounts.

3. The West Pubnico wastewater system experiences sewage back up and overflowing at pump station 5 and manhole 55 due to infiltration into the system during a heavy rainfall event. It is anticipated that this will be an increasing problem throughout the system in the future with the changing weather and increased rainfall amounts.

4. The Tusket Bridge was swept away by the Tusket River after heavy rainfall caused flooding. It is anticipated that there will be an increase of infrastructure and foreign materials being washed into our watercourses due to the changing weather and extreme weather events.

PROTECTED AREAS AND ENDANGERED SPECIES

A section of the Tobeatic Wilderness Area is located in the Municipality of Argyle. Wilderness Areas are provincially-significant protected areas which are designated under Nova Scotia's *Wilderness Areas Protection Act* (Environment, 2013). The Tobeatic Wilderness Area could be impacted by changes in the weather or by climate change. Drought could cause forest fires in this wilderness area, which would have a major impact on this area and the wildlife. Figure 1: Tobeatic Wilderness Area is a map from Nova Scotia Environment showing the location of the Tobeatic Wilderness Area (Environment, 2013).

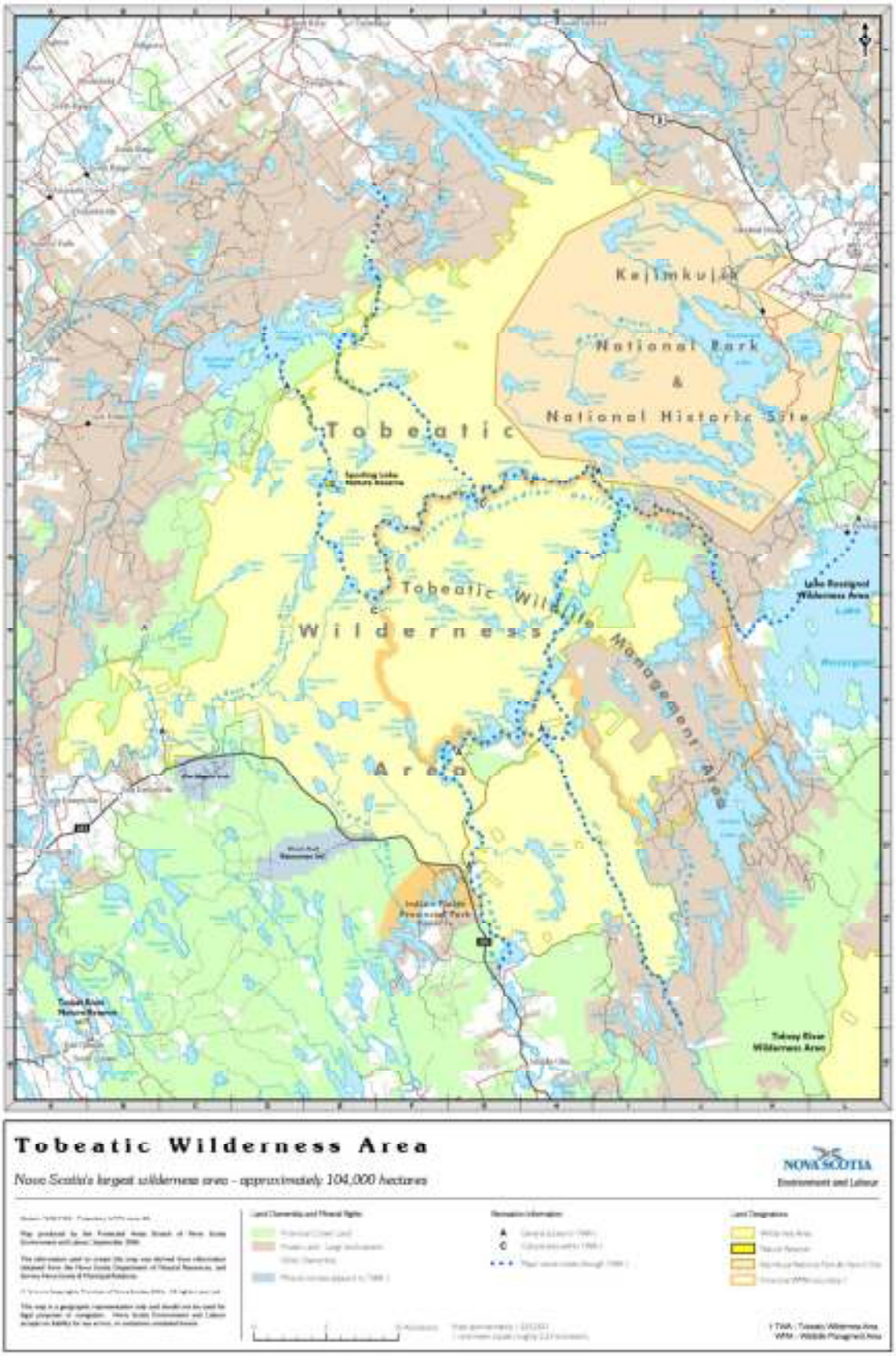


Figure 1: Tobeatic Wilderness Area (Environment, 2013).

There are three Nature Reserves located in the Municipality of Argyle: Great Barren & Quinan Lakes Nature Reserve (355 ha ±), Spinneys Heath Nature Reserve (640 ha ±) and the Tusket River Nature Reserve (21.9 ha ±). Figure 2: Great Barren & Quinan Lakes Nature Reserve is a map from Nova Scotia Environment showing the location of the Great Barren & Quinan Lakes Nature Reserve. Figure 3: Spinneys Heath Nature Reserve is a map from Nova Scotia Environment showing the location of the Spinneys Heath Nature Reserve. Nature Reserves are areas selected to preserve and protect, in perpetuity, representative (typical) and special natural ecosystems, plant and animal species, features and natural processes. Scientific research and education are the primary uses of Nature Reserves and recreation is generally restricted (Environment, 2013). Changes in the weather or climate change could potentially have an impact on these Nature Reserves.

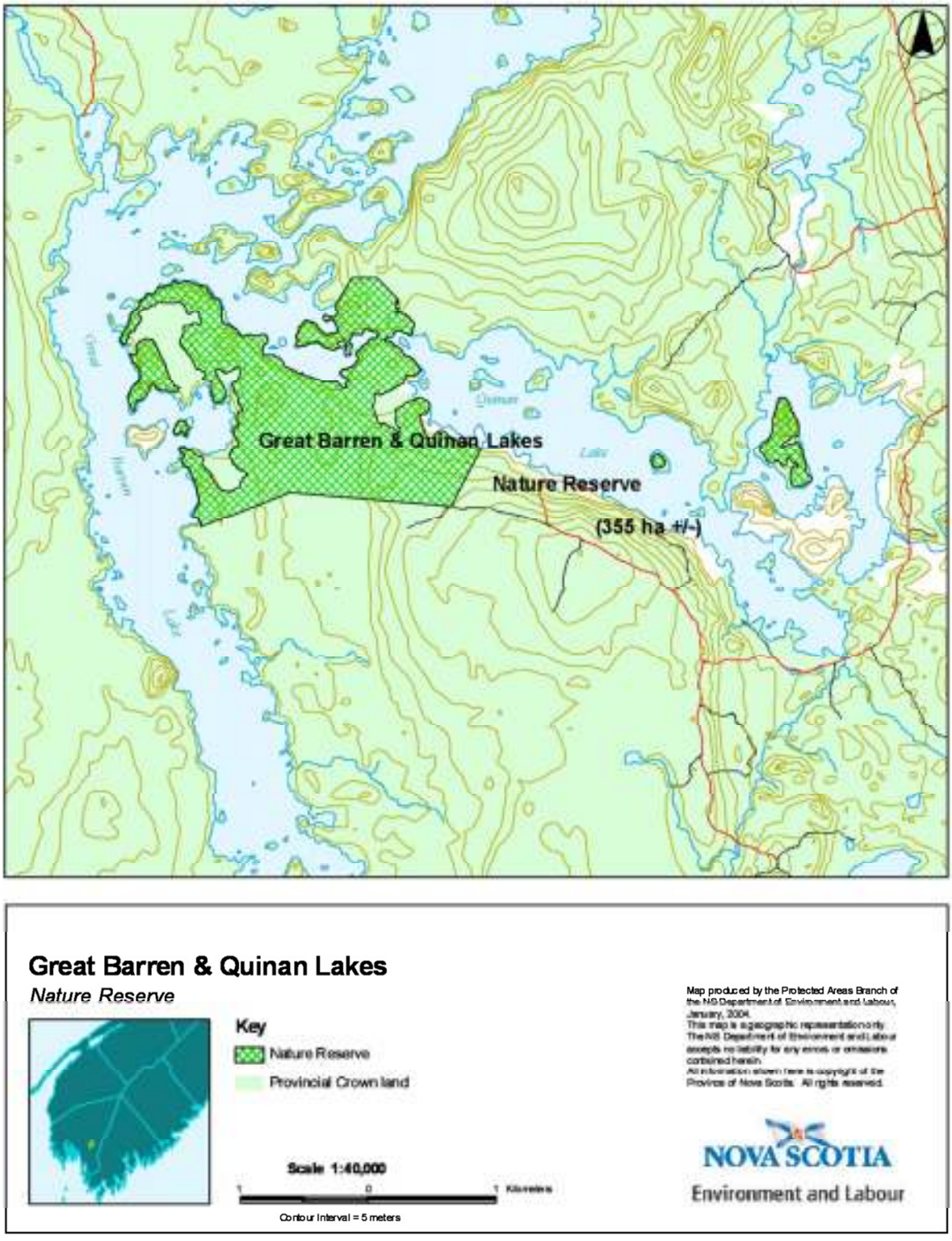


Figure 2: Great Barren & Quinan Lakes Nature Reserve (Environment, 2013).

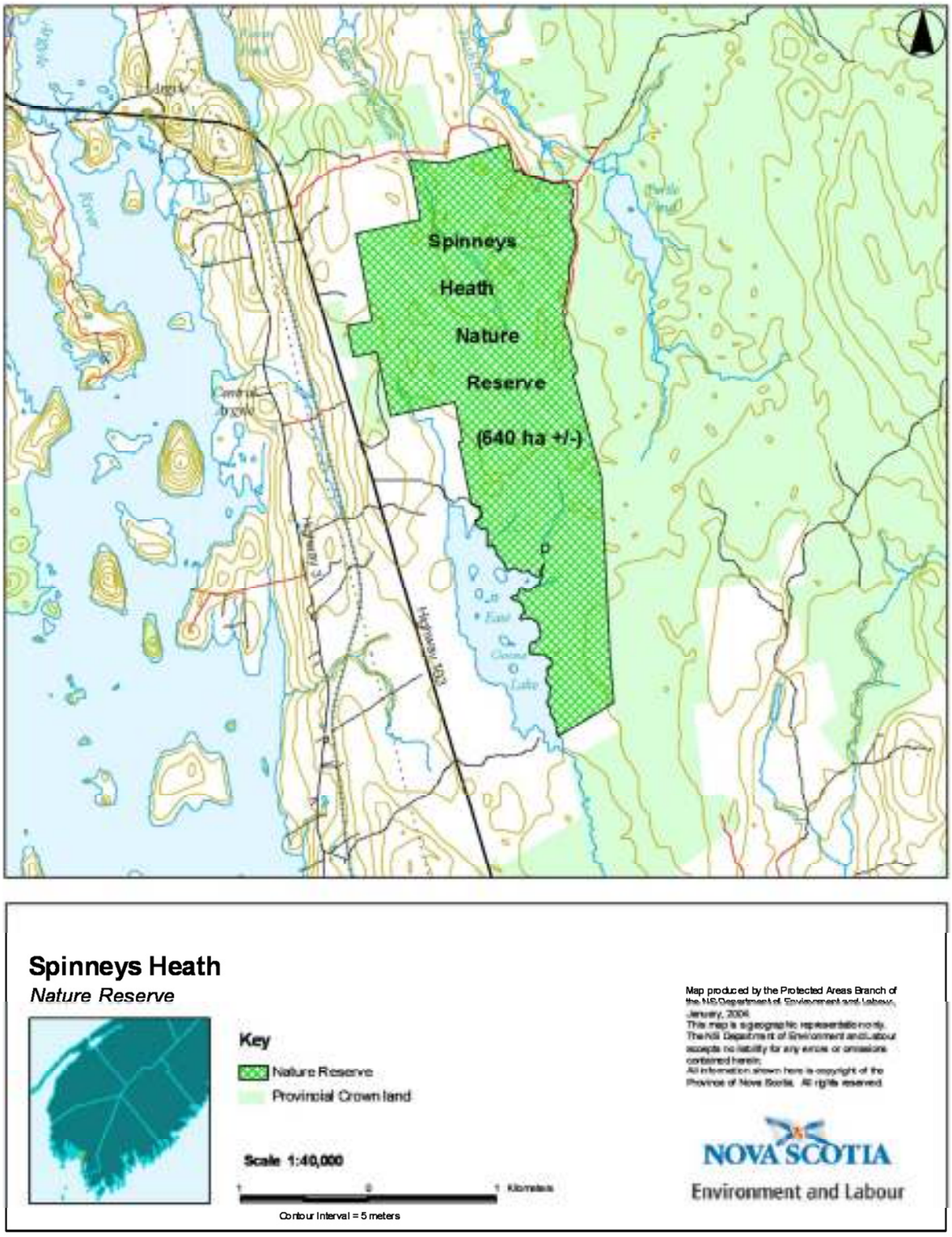


Figure 3: Spinneys Heath Nature Reserve (Environment, 2013).

There is one National Wildlife Area in the Municipality of Argyle known as Sand Pond National Wildlife Area (531 ha). Figure 4: Sand Pond National Wildlife Area is a map from Environment Canada showing the location of the Sand Pond National Wildlife Area. National Wildlife Areas are created and managed for the purposes of wildlife conservation, research, and interpretation. National Wildlife Areas can only be designated on lands owned by the federal government. (Environment Canada, 2013).

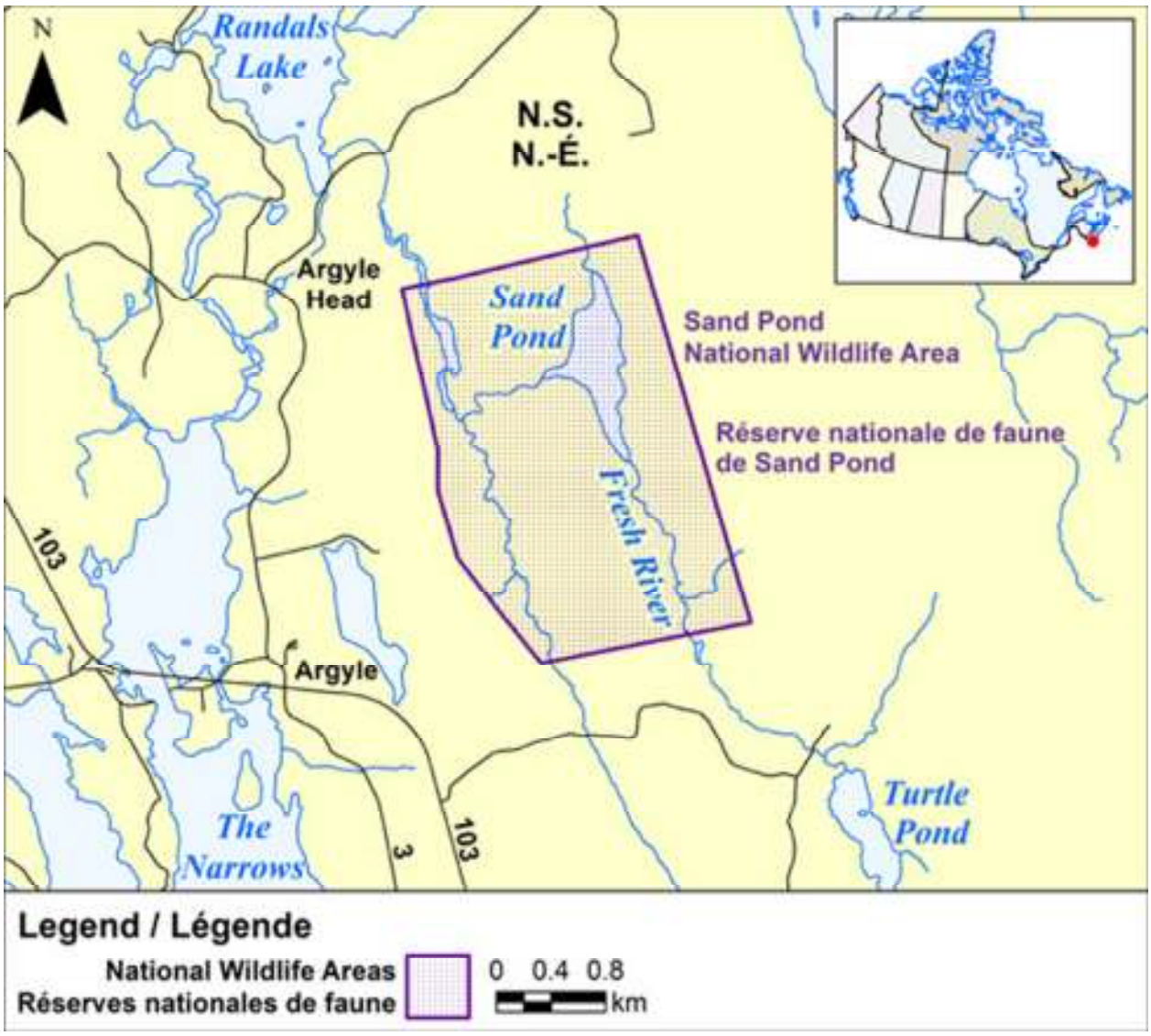
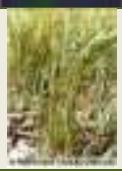
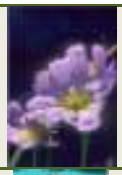


Figure 4: Sand Pond National Wildlife Area (Environment Canada, 2013).

There are 11 species at risk that are native to the Municipality of Argyle, including one bird, one mammal, one fish, one reptile, and seven plants as described in the table below (Nova Scotia's Species at Risk, 2005). The following species at risk may be impacted by the changes in the weather or by climate change.

Species at Risk		National Status	Provincial Status
Roseate Tern (Sterna dougallii)		Endangered	Endangered
Moose (Mainland Population) (Alces acles Americana)		Not Listed	Endangered
Atlantic Whitefish (Coregonus Canadensis)		Endangered	Endangered
Eastern Ribbonsnake (Thamnophis sauritus)		Threatened	Threatened
Pink Coreopsis (Coreopsis rosea)		Endangered	Endangered
Tubercled Spike-rush (Eleocharis tuberculosa)		Threatened	Threatened
Water-Pennywort (Hydrocotyle umbellate)		Threatened	Endangered
Eastern Lilaeopsis (Lilaeopsis chinensis)		Special Concern	Not Listed

Plymouth Gentian (Sabatia kennedyana)		Threatened	Endangered
Long's Bulrush (Scirpus longii)		Special Concern	Vulnerable
Sweet Pepperbush (Clethra alnifolia)		Special Concern	Vulnerable

HAZARDOUS MATERIALS

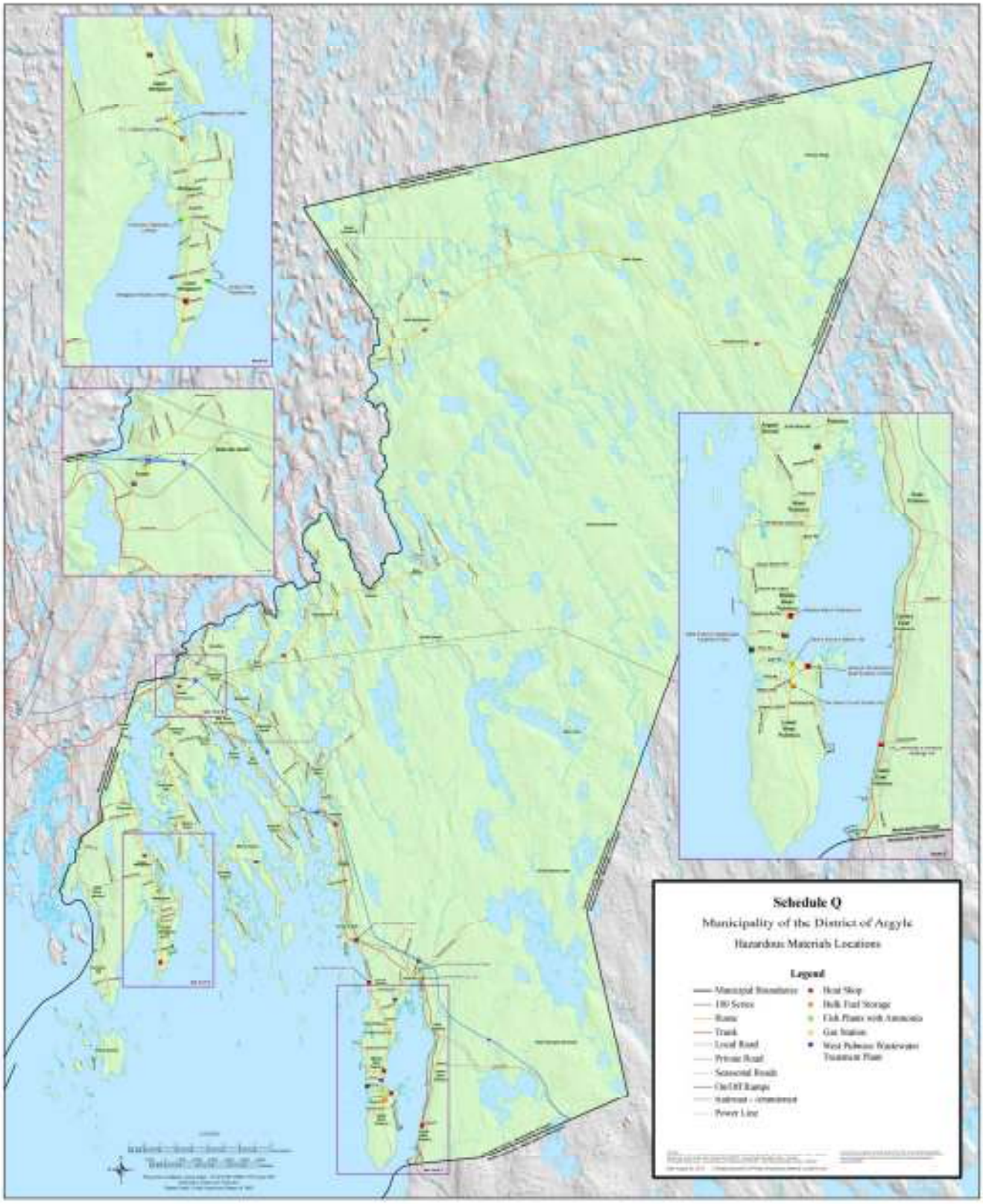
There are locations throughout the municipality where hazardous materials are stored. The Municipality of Argyle does not have any by-laws or policies which regulate the storage conditions of dangerous and/or hazardous materials. The storage conditions and overall safety standards of these locations are supposed to follow the *Workplace Hazardous Materials Information System (WHMIS) Regulations* and any other regulations that are required to be met in order to store the hazardous materials.

The Municipality of Argyle Emergency Plan does address dangerous and/or hazardous materials and who to contact in case of an environmental emergency.

The following are locations that the committee identified as having dangerous and/or hazardous materials stored on site:

- **Gas Stations** – Gas is stored underground at these locations.
- **Bulk Fuel Storage** - Fuel is stored above ground at these locations.
- **Boat Shops** – Acetone, fiberglass resin and harder is stored at these locations.
- **Fish Plants with ammonia on site** – These fish plants use ammonia for their refrigeration system.
- **West Pubnico Wastewater Treatment Plant** – The treatment plant has hazardous chemicals stored on site.

Schedule Q: Hazardous Material Locations shows the locations of dangerous and/or hazardous materials stored throughout the municipality.



Schedule Q can be seen at full scale in the list of schedules.

SECTION SIX: PRIORITIES FOR ADAPTATION

Section Six outlines issues requiring future action acknowledged by the committee to be important to the overall wellbeing of the municipality and potential actions for addressing the issues. This section also outlines how climate change concerns and adaptation will be integrated into the municipality's approach to the planning and regulation of development.

ADAPTATION ISSUES AND HAZARDS

The following table outlines the adaptation issues and hazards considered by the committee to warrant future action.

Table 6: Issues Requiring Future Action

Hazard	Effects on the Municipality	Issue	Action Priority Ranking*
Flooding	Social	Residential homes and properties located in the communities of Quinan and East Kemptville are vulnerable to flooding during extreme rainfall events.	High
Flooding	Infrastructure	After an extreme rainfall event the main roads leading through Quinan and East Kemptville are prone to flooding, which may result in road and bridge closures causing delays for emergency first responders and putting the safety of residents at risk.	High
Sea Level Rise	Infrastructure	Roads located in low lying areas along the coast are vulnerable to sea level rise and some routes may become impassable in the future restricting access to some communities.	High
Flooding	Environmental	Contaminated drinking water causing health issues for residents due to flooding.	Medium
Storm Surge	Social	Residential homes and properties located in the fishing communities along the coast are vulnerable to storm surge damage during severe storms.	Medium

Storm Surge	Economic	Fishing infrastructure, such as wharves, fishing vessels, and fish processing plants are vulnerable to storm surge damage during a severe storm.	Medium
Hurricanes & Wind	Economic & Social	Residential homes, businesses and community assets are vulnerable to damage caused by hurricanes and high wind storms.	Medium
Storm Surge	Infrastructure	There is a concern that salt water could enter the West Pubnico Wastewater System in an event of a severe storm surge through pump stations and manholes causing unknown issues in the treatment of the wastewater and operation of the treatment plant.	Low
Storm Surge	Infrastructure	There is a concern that salt water could enter the Tusket Wastewater System in an event of a severe storm surge through the tanks causing known issues in the treatment of wastewater and the operation of the treatment plant.	Low
Flooding	Environmental	An extreme rain event can overload the Tusket Wastewater Treatment Plant causing an overflow because of infiltration through the sand filters at the treatment plant.	Low

*Rank determined by committee members based on municipal circumstances

ADAPTIVE ACTIONS ALREADY UNDERTAKEN

The Municipality of Argyle and Emergency Management Organization (EMO) are working together to take adaptive action to help reduce the impacts of issues created from climate change. The following are actions that have already been undertaken by the Municipality and EMO:

1. EMO has created an emergency plan for flooding in Quinan called *Contingency Plan, EMO Quinan Flooding,* which can be seen in Appendix D. This plan was created after the community experienced flooding in November 2010.

2. A water level sign has been put up in Quinan to indicate to residents whether the water level of the rivers is low, moderate, high or extreme.

3. EMO is looking at options to set up measuring devices to monitor water levels along the Quinan and Tusket Rivers. Devices are being set up in the communities of Quinan and East Kemptville.

4. A boat has been purchased to be used as alternate transportation to transport residents and supplies in an event of bridge closures during flooding.

5. The EMO plan for the Municipality of Argyle has been recently updated and can be seen in Appendix C.

POTENTIAL ACTIONS

The following are potential actions for the Municipality to take into consideration for addressing the issues requiring future action listed in Table 6: Issues Requiring Future Action.

1. Find ways to improve communication with residents in case of an emergency. Set up a messaging system to contact residents in the Municipality of Argyle, such as "City Watch" or a similar program.

2. Find ways to improve communication with our neighbouring municipalities during climate hazard emergencies.

3. Complete a study on the West Pubnico Wastewater System to determine the possible effects that salt water intrusion may have on the treatment of wastewater and on the operations of the system.

4. Complete a study on the Tusket Wastewater System to determine the possible effects that salt water intrusion may have on the treatment of wastewater and on the operations of the system.

5. Complete upgrades to the Tusket Wastewater Treatment Plant to prevent the overflow of effluent that is occurring during an extreme rainfall event, which causing an overload of the system through infiltration through the sand filters at the treatment plant.

6. Identify roads that are vulnerable to sea level rise that may become impassable in the future resulting in restricted access to some communities.

7. Create a system for recording weather related events; such as the event, the area affected and what was done to deal with the situation.

8. Create a policy requiring new infrastructure projects or construction to have a climate change risk assessment completed by the consulting engineers.

MUNICIPAL PLANNING STRATEGY & LAND USE BYLAW

The Municipal Planning Strategy (MPS) and Land Use By-law (LUB) for the Municipality of the District of Argyle is presently under review. Climate change adaptation will be addressed in the MPS and LUB review process presently under way, such as to be reasonably consistent with the statements of Provincial interest outlined in Schedule B of the Municipal Government Act (MGA).The following are the five statements of Provincial interest and contain the following goals:

1) **Statement of Provincial Interest Regarding Drinking Water:** To protect the quality of drinking water within municipal water supply watersheds.

2) **Statement of Provincial Interest Regarding Flood Risk Areas:** To protect public safety and property and to reduce the requirement for flood control works and flood damage restoration in floodplains.

3) **Statement of Provincial Interest Regarding Agricultural Land:** To protect agricultural land for the development of a viable and sustainable agriculture and food industry.

4) **Statement of Provincial Interest Regarding Infrastructure:** To make efficient use of municipal water supply and municipal wastewater disposal systems.

5) **Statement of Provincial Interest Regarding Housing:** To provide housing opportunities to meet the needs of all Nova Scotians.

STATEMENTS OF PROVINCIAL INTEREST RELATED TO THE MCCAP

The MCCAP deals with three of the five Statements of Provincial Interest in the following ways:

1) **Statement of Provincial Interest Regarding Drinking Water:** The MPS and LUB review will discuss and recommend increased separation distances, riparian buffers and increase setbacks from watercourses for certain industries that could present potential environmental issues.

2) **Statement of Provincial Interest Regarding Flood Risk Areas:** EMO has developed for the Municipality of Argyle a contingency plan for the community of Quinan to address flooding concerns. Other communities within the Municipality of Argyle will be reviewed and flooding concerns will be addressed.

3) **Statement of Provincial Interest Regarding Infrastructure:** Policies will be developed by Council to minimize the effect of storm surge and sea level risk on existing and new wastewater infrastructure.

POTENTIAL PLANNING APPROACHES

For the MPS and LUB review the following are potential planning approaches which are under discussion at the Planning Advisory Committee (PAC) level, these items address climate change adaptation and are subject to approval from Council before implementing:

a) Increased separation distances from watercourses (riparian buffer), this includes residential, industrial and agricultural uses;

b) Discuss grade elevations for development located in at-risk areas;

c) Review of the Coastal Wetlands (CW) Zone. The definition of CW could be expanded to include a contour which takes into consideration sea level rise and storm surge and would be determined through a report acceptable to PAC and Council;

d) Denser development in serviced areas to mitigate urban creep;

e) Road design standards for future development of private roads and will deal with width and drainage issues to reduce the potential for flooding.

f) Address flooding issues in Quinan by restricting certain development in the area; such as multiple unit dwellings, commercial and industrial uses.

PART THREE
CLIMATE CHANGE MITIGATION

INTRODUCTION

A rise in average global temperature and the disruption of climate patterns are being blamed on the increase of greenhouse gases (GHGs) generated by human activity. The Municipality of Argyle intends to reduce the production of GHGs in everyday operations. The municipality is going to find ways to reduce energy consumption in three key areas: buildings, wastewater and vehicles emission categories.

ENERGY & EMISSIONS INFORMATION

The Municipality of Argyle completed the UNSM Corporate Energy and Emissions Spreadsheets and the summary can be seen in Appendix H. The complete UNSM Corporate Energy and Emissions Spreadsheet can be seen in electronic copy. Table 7: Energy & Emissions Inventory Summary Table is a summary of the municipality's energy consumption and the information was transferred from the Corporate Energy and Emissions spreadsheets.

Emission Category	Energy Type	Energy Consumption	Units	Cost ($)	Emission Factor (tCO2/units)	Emissions (tCO2e)
Buildings	Electricity	103,298	kWh	12,486.24	0.00084006	86.78
Water & Wastewater	Electricity	211,381	kWh	24,199.00	0.00084006	177.57
Streetlights	Electricity	3,202.88	kWh	1,133.98	0.00084006	2.69
Vehicles	Reg. Gasoline Diesel	2,808.94 21,276.00	L L	3,187.52 19,190.95	0.00234 0.00263	6.57 55.96
Solid Waste	Paper Food	0.63 0.50	tonnes	4,930.00	0.58 0.40	0.37 0.20

Table 7: Energy & Emissions Inventory Summary Table

EMISSION REDUCTION EFFORTS TO-DATE

ADI Limited/Enerplan performed an Energy Audit of the Municipal Administration Building, the Argyle Township Court House and the West Pubnico Wastewater Treatment Plant for the Municipality of Argyle. The *Municipal Energy Audit* was completed in January 2010 and can be seen in Appendix F. The energy audit describes the potential energy savings, and probable cost and estimated paybacks associated with the energy conservation measures identified for the Municipal Administration Building. The Municipality completed three out of the six energy saving measures

identified in the report. The following are the energy saving measures completed to the Municipal Administration Building:

1. **Air Sealing:** It was recommended that all main doors have new weather-stripping and door sweeps installed to reduce leakage. Install new roof hatch seal and apply insulation to the cover to prevent heat loss through the roof.

Energy Saving Measure	Electricity (kWh/yr)	Savings ($/yr)	Opinion of Probable Cost ($)	Payback (Years)
Air Sealing	3,064	275	1,100	4.0

2. **Lighting Retrofit:** It was recommended that the less efficient T8 and T12 lighting be replaced with the new high efficiency T8 lamps with electronic ballast, in order to reduce energy usage and increase lamp life. In addition, it was recommended that all remaining incandescent lamps be retrofitted with high efficiency compact fluorescent bulbs.

Energy Saving Measure	Electricity (kWh/yr)	Demand (kW/yr)	Savings ($/yr)	Opinion of Probable Cost ($)	Payback (Years)
Lighting Retrofit	7,327	62.4	1,050	5,700	5.4

3. **Additional Roof Insulation:** It was recommended that additional insulation should be provided within the roof envelope to increase the thermal performance to at least an R-32 rating.

Energy Saving Measure	Electricity (kWh/yr)	Savings ($/yr)	Opinion of Probable Cost ($)	Payback (Years)
Additional Roof Insulation	1,261	86	6,250	72.7

In addition, the existing A/C unit for the Municipal Administration Building was replaced with a new roof mounted A/C unit in May 2013, which is more efficient than the existing setup being used to cool the building.

SIGNIFICANT PROJECTS RELATED TO REDUCING EMISSIONS

The Municipality of Argyle has completed two significant projects related to reducing emissions at the West Pubnico Wastewater Treatment Plant.

1. **Heat Recovery System:** The Heat Recovery System recovers the heat naturally generated from the wastewater and is used to heat the two sewer treatment plant buildings. This is accomplished by the installation of a heat exchanger/heat pump system, heating coils installed within the concrete walls and concrete base slab of the sequential batch reactor (SBR) and sludge tanks, with building heating being delivered through an in-floor heat system. The Heat Recovery System has an estimated greenhouse gas (CO_2) reduction of 28.7 tonnes compared to the operation of a conventional electric baseboard heating system.

2. **Geotextile Bags for Dewatering:** It was known when the West Pubnico Sewer Treatment Plant upgraded to the Sequence Batch Reactor (SBR) system that it would require a more frequent schedule of sludge handling. Five different dewatering options were reviewed and the Geotextile Bags were chosen for dewatering because they require little electricity to operate, only requiring a pump and mixer during sludge transfer from the tank to the bag.

MEMORANDUM OF UNDERSTANDING ON CLIMATE CHANGE

The Municipality of Argyle progresses to meet the guiding principles outlined in the Memorandum of Understanding on Climate Change, made between the Union of Nova Scotia Municipalities (UNSM) and the Province of Nova Scotia. The Memorandum of Understanding on Climate Change, made between the Union of Nova Scotia Municipalities (UNSM) and the Province of Nova Scotia can be seen in Appendix G. The municipality has made progress towards reducing greenhouse gas emissions by completing energy saving measures outlined in the *Municipal Energy Audit*, which was completed on municipal infrastructure. The *Municipal Energy Audit* can be seen in Appendix F. Reduction of greenhouse gas emissions is taken into consideration when reviewing and updating municipal policies, such as buy local, travel, etc.

GOALS & ACTIONS

The following are goals and actions for each emission category listed in Table 7: Energy & Emissions Inventory Summary Table.

Buildings Goal

Municipal buildings have become more energy efficient, reducing greenhouse gas emissions and energy consumption.

Actions:

1. **New or Retrofitted Municipal Administration Building:** When determining to retrofit the existing administration building or build a new municipal administration building, Green Globes Certified Construction or other green incentives are taken into consideration.
   Time Frame: *Medium-Term (Year 3 and Year 4)*
   Accountability: *Property Inspection and Public Works*

Water & Wastewater Goal

Reduce greenhouse gas emissions and energy consumption throughout everyday operations of our Wastewater systems.

Actions:

1. **Renewable Energy:** Assess the viability of renewable energy alternatives to offset the production of greenhouse gas emissions at the West Pubnico Wastewater Treatment Plant.
   Time Frame: *Medium-Term (Year 3 and Year 4)*
   Accountability: *Property Inspection & Public Works*

2. **Dewatered Sludge Removal:** Assess the viability of combining dewatered sludge from our West Pubnico Wastewater Treatment Plant with our contaminated soil at our solid waste facility. The combined soil will be utilized as cover for our C & D landfill and would reduce the demand to import additional soil.
   Time Frame: *Short-Term*
   Accountability: *Property Inspection & Public Works*

Streetlights Goal

Reduce greenhouse gas emissions and energy consumption by using new technology.

Actions:

1. **Light Replacement:** Replace all street lighting with new LED light technology to reduced energy consumption and greenhouse gas emissions.
   Time Frame: *Medium-Term (Year 3 and Year 4)*
   Accountability: *Property Inspection & Public Works*

Vehicles Goal

Encourage the reduction of greenhouse gas emissions in the municipal vehicle fleet.

Actions:

1. **Garbage Pick-up Frequency:** For Council to discourage more frequent garbage pick-up schedules, garbage will not be picked up more than every two (2) weeks.
   Time Frame: *Short-Term (Year 1 and Year 2)*
   Accountability: *Office of the CAO*

2. **Travel Policy:** Create a travel policy that encourages the reduction of greenhouse gas emissions, with requirements such as carpooling or rewards for reducing greenhouse gas emissions.
   Time Frame: *Short-Term (Year 1 and Year 2)*
   Accountability: *Office of the CAO*

3. **Buy Local:** Incorporate buy local incentives in our Purchasing and Tendering Policy to encourage purchasing practices from our local businesses and to reduce our carbon footprint.
   Time Frame: *Short-Term (Year 1 and Year 2)*
   Accountability: *Office of the CAO*

Solid Waste Goal

Continue to reduce the volume of solid waste generated by the municipality's everyday operations.

Actions:

1. **Educational Sessions:** Have continued educational sessions to improve municipal operation waste separation and reduction.
   Time Frame: *Short-Term (Year 1 and Year 2)*
   Accountability: *Waste Check*

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