Town of Mahone Bay
INCORPORATED MARCH 31, 1919
MAHONE BAY, N.S.

MUNICIPAL
C L I M A T E C H A N G E
ACTION PLAN

Adopted:
Version: 5

Council of the
Town of Mahone Bay
2013

C. Joseph Feeney, Mayor

David Devenne, Deputy Mayor

Councillor Kelly Wilson

Councillor Penny Carver

Councillor John Bain

Councillor Karl Nauss

Councillor Lynn Hennigar

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1.0 INTRODUCTION TO THE PLAN

The Municipal Climate Change Action Plan for the Town of Mahone Bay was developed using the *Municipal Climate Change Action Plan Guidebook* issued in 2011 by Service Nova Scotia and Municipal Relations, a Department of the Government of Nova Scotia. The Guidebook sets out the mandatory content of Municipal Climate Change Action Plans, developed by all municipal units, as a series of steps:

STEP ONE: Assemble an Adaptation Team/Committee
STEP TWO: Identify climate change issues and hazards
STEP THREE: Identify affected locations
STEP FOUR: Indentify affected facilities and infrastructure
STEP FIVE: Indentify affected populations, economic sectors, and environmental issues
STEP SIX: Set priorities for action

Part 2 of this Plan identifies the Adaptation Committee and its mandate. Part 3 lists references, and describes basic climate change assumptions and the planning process. Part 4 contains a review of Steps Two, Three, Four, and Five in the form of an overview of the climate change hazards and impacts. A detailed analysis is found in the series of tables that follows. Part 5 describes priorities for action, while Part 6 addresses climate change mitigation. Maps and Appendices form Parts 7 and 8.

2.0 ADAPTATION COMMITTEE (Step One)

2.1 Members and stakeholders

MEMBER	ROLE
David Devenne, Deputy Mayor	Chair & Planning Advisory Committee Member
Lynn Hennigar	Town Councillor
Kelly Wilson	Town Councillor
John Bain	Town Councillor
John Biebesheimer	Planning Advisory Committee member
Allan O'Brien	Planning Advisory Committee member
Kristen Martell	Planning Advisory Committee bMember
James Wentzell	C.A.O. and Town Clerk
Derrick Mackenzie	Town Operations Manager
Tara Maguire	Director of Community Development

STAKEHOLDER	ROLE
Geoff MacDonald	Planning Staff
Bill DeGrace	Planning Staff
Bruce Blackwood	Assistant Emergency Co-ordinator

2.2 Committee Mandate

On 14 February, 2012, the Town of Mahone Bay Town Council appointed a Municipal Climate Change Adaptation Team consisting of the Planning Advisory Committee with the addition of the CAO, Planner, and Director of Operations.

The purpose of the Climate Change Action Plan Team is:

- To prepare the Steps Two through Six of the Climate Change Action Plan;
- To complete the greenhouse gas emissions template for the municipal operations;
- To work together with Council to identify the priorities for adaptation, which is step 6 of the required Adaptation Plan Process;
- To submit a complete draft of the Climate Change Action Plan to Council for public consultation and approval.

2.3 Accountability

The Climate Change Adaptation Committee is accountable to Council for the completion of the draft Municipal Climate Change Action Plan.

3.0 REFERENCES, ASSUMPTIONS AND PROCESS

3.1 References

The Adaptation Committee and Stakeholders referred to the following resources:

Intergovernmental Panel on Climate Change (IPCC) 2007, *Climate Change 2007, The Physical Science Basis.* Retrieved December 2012 from http://www.ipcc.ch/publications_and_data/ar4/wg1/en/contents.html

Integrated Community Sustainability Plan, Municipality of the District of Chester (June 2009, Institute for Planning and Design).

Modelled Potential Species Distribution for Current and Projected Future Climates for the Acadian Forest Region of Nova Scotia, 2010, Bourque, C. P.A., Hassan, Q.K., and Swift, D.E. Retrieved December 2012 from http://novascotia.ca/natr/forestry/

Scenarios and Guidance for Adaptation to Climate Change and Sea Level Rise – N.S. and P.E.I. Municipalities, 2011, William Richards and Real Daigle, retrieved December 2012 from http://atlanticadaptation.ca/

Municipal Climate Change Action Plan Guidebook, 2011, Canada-Nova Scotia Infrastructure Secretariat, Service Nova Scotia and Municipal Relations.

The Municipal Climate Change Action Plan Assistant, 2011, Elemental Sustainability Consulting Ltd. for the Canada-Nova Scotia Infrastructure Secretariat, Service Nova Scotia and Municipal Relations.

Mahone Bay Sea Level Rise Final Report. December 2011 Dalhousie University Environmental Planning Studio

Municipality of the District of Lunenburg: a Case Study in Climate Change Adaptation. Part 2 – Section 1, Future Sea Level Rise and Extreme Water Level Scenarios for the Municipality of the District of Lunenburg, Nova Scotia. May 2012, J. Critchely, J. Muise, E. Rapaport, and P. Manuel, retrieved December 2012 from http://atlanticadaptation.ca/

Climate Change in Atlantic Canada Multi-media Project, Mount Allison University, retrieved February 2013 from www.climatechangeatlantic.com.

Implications of sea level rise and extreme flooding impacts in rural coastal communities with aging populations: Case studies from Nova Scotia. Prepared for Public Health Agency of Canada, Climate Change Directorate, Nova Scotia Environment, and Nova Scotia Department of Seniors, Rapaport, Dr. Eric, Manuel, Dr. Patricia, Keefe, Dr. Janice, 30 April 2013

3.2 Assumptions

From the references above, the Adaptation Committee extracted some basic assumptions which are used in developing this Climate Change Action Plan:

a) Sea Level Rise at the Mean High Water Level might approach 1.85 metres by year 2100.

b) We have no estimates on the *rate* of sea level rise, only on the possible *amounts* of sea level rise.

c) When combined with extreme high tides which recur regularly and with the storm surge expected from more intense storms, the plausible water level achieved during an emergency event in the year 2100 is about five metres above the current Mean High Water Mark. The mapping which accompanies this report shows the 2, 4, and 6 metre contours above the current high water mark for guidance in assessing the current and future hazards resulting from sea level rise and storm surges.

d) Intense rainfall events are expected to give up to 16% more rain in each event and these events are expected to recur more often.

e) Summer weather is expected to be drier and hotter.

3.3 Process

Throughout the late Winter and Spring of 2012, the Lunenburg County Regional Emergency Measures Co-ordinator met with planning and engineering staff from the Town of Bridgewater, the Town of Mahone Bay, the Municipality of Chester and the Municipality of Lunenburg to develop a united identification of the hazards and risks of climate change that are likely to affect Lunenburg County. That analysis led the Regional Emergency Measures Organization to develop a Hazard, Risk and Vulnerability Assessment for each of the identified hazards, which was completed in July 2012. The complete text of the final document is attached as Appendix B.

The Hazard, Risk and Vulnerability Assessment proved invaluable as a tool in assessing the impacts of the various identified Climate Change hazards. The Adaptation Committee then reviewed the information in the Municipal Climate Change Action Plan Guidebook in the context of the Town of Mahone Bay to identify the hazards, affected locations, facilities, infrastructure populations, economic sectors and environmental issues.

4.0 CLIMATE CHANGE HAZARDS, AFFECTED PEOPLE, AREAS, AND INFRASTRUCTURE (Steps Two, Three, Four, and Five)

4.1 Identified Hazards: an Overview

In this Climate Change Action Plan, thirteen identified hazards are introduced here, and are detailed in the series of tables that follow in Section 4.3.

Coastal Flooding

Sea levels that are predicted to rise are exacerbated when storms affected by low atmospheric pressure strike the coast, creating storm surge and resulting coastal flooding. This can affect much of the town's population and livelihood, given the concentration of housing, retail trade and services, and churches, along the shoreline.

Inland Flooding

Inland flooding is caused by overflowing rivers, streams, lakes, etc. as a result of intense precipitation (predicted to increase in frequency) and/or snow melt and ice jams. Flooding can intensify if combined with storm surge on the coast. Residents of the town who live inland are especially vulnerable.

Hurricane

A hurricane is a cyclonic tropical storm with exceptionally strong winds and rain. They affect the Caribbean, the coastal United States and, with increasing frequency, Canada's Atlantic region. These storms worsen coastal flooding and cause extensive damage to woodlands and infrastructure, resulting in devastation that affects natural habitat, and impacts such as power outages that affect all townspeople.

Extreme Weather Event

Hurricanes can be predicted; not so with sudden extreme weather events such as severe rain storms, thunderstorms, tornadoes and hailstorms. He frequency and intensity of these vents is expected to increase in the coming years, potentially causing major damage to houses, boats and infrastructure and placing extra demands on sewage treatment plants, pumping stations and affecting local trade and tourism.

Winter Storm/Blizzard

Severe winter storms can take the form of snow, freezing rain, rain or any combination of these. They are expected to occur more often in the future. Streets, bridges, the electrical system and Town operations, among others, can all be affected, while emergency response can be impaired, placing the elderly and infirm at risk.

Hot Days/Heat Wave

At least three consecutive days where temperatures have exceeded thirty degrees constitutes a heat wave. Temperature extremes can be expected to occur more frequently and for longer periods in the future. Periods of extreme heat can affect the water supply, the maintenance of parks and trees, and can pose extra demands on emergency response, especially as the elderly and infirm are most impacted.

Forest Fire/Wildfire

Although naturally occurring forest fires are a reality, about 97% of all forest fires and wildfires in Nova Scotia are caused by human activity. These events are likely to increase in frequency with drier and hotter summers. Residential areas in the Town, especially in proximity to its hinterland, are most at risk, while the electrical distribution system, the Oakland Lake water supply, the Fire Hall, and the sewage treatment plant are all potentially affected.

Drought

Water resources are essential for irrigation and domestic use. Just as more frequent and heavy rain can be expected, so too can we expect to see prolonged periods of abnormally dry weather. The greatest impact on the Town could be in its Oakland Lake water supply and its water treatment and distribution system. People on dug wells are especially vulnerable.

Animal Disease and Pests

Changes in mean temperature and precipitation create favourable conditions for diseases that have been historically rare or unknown in Atlantic Canada. In these conditions, certain pests can thrive where they could not before. Diseases can affect animals and humans alike. The black-legged tick is but one example. Presence of disease in any region can affect retail trade and tourism in that region.

Plant Disease and Pests

Just as changes in mean temperature and precipitation can bring animal diseases and pests, they can also bring new plant diseases and pests, and new invasive species. This can affect the Town's tree cover, area parks and landscaping, and the Oakland Lake water supply. Town residents with backyard produce gardens, as well as workers in agriculture and forestry in the hinterland, can be affected.

Forest Cover Changes

Forests naturally evolve with changes in mean temperature and other weather-related phenomena. But when the pace of climate change is more rapid, forest plant populations cannot adapt as quickly, causing some species to die out over the next one hundred years and beyond. The Town's forest cover can be easily stressed by hotter, direr summers, while forestry and related industries in outlying areas can be affected.

Changes in Agricultural Crops

As with changes affecting forest cover, the pace of change on our local climate will affect the survivability of certain crops in our hinterland that we have traditionally depended on to thrive. In addition these changes can affect horticultural and landscaping plantings in the town's parks,

as well as backyard kitchen gardens.

Sea Temperature Rise, Acidification, and Invasive Species

Climate change results in warmer and more acidified waters along Nova Scotia's Atlantic coast. This can affect the health of native species, while other species traditionally foreign to our waters may thrive. This fundamental ecological change can impact the local fishery.

4.2 Other Hazards

Other hazards were discussed by the Adaptation Team, which felt they were better addressed by being included in the thirteen major categories listed above. Those secondary categories included erosion, landslides, public water supply contamination, and raw sewage releases.

4.3 Climate Change Hazards: Detailed Analysis

Tables beginning on Page 11.

4.3 CLIMATE CHANGE HAZARDS: DETAILED ANALYSIS

4.3.1 Coastal Flooding

Step Two CLIMATE CHANGE ISSUES & HAZARDS	**Hazard** Flooding of coastal lands by sea water. (Includes Storm Surge – elevated sea level caused by atmospheric low pressure area associated with a large storm). This does not include wave run-up, which depends on the details of wind direction and speed both before and during the flood event.	**Climate Issues** Sea level rise resulting from the increase in ocean volume. The increase in the frequency of intense storms.	**Anticipated Future Effects** When combined with the on-going land subsidence, these effects will significantly increase the number of significant flooding events.	**Level of Preparedness** Low	**Maps** Map 1, Coastal Flooding, shows areas vulnerable to coastal flooding.	**Information Gaps** Estimates of the rate of sea level rise due to increase in ocean volumes vary widely, introducing uncertainty about the urgency of adaptation measures	**Climate Change Benefits** None
Step Three AFFECTED LOCATIONS		**Places Affected, Historical** Town Wharf, land adjacent Town wharf. Moorings Condominium parking area (580 Main Street). Main Street in front of 866 Main (Zwicker Property)	**Expected Places Affected** Immediate concern is all places within 2 Metres of High Water, based on storm surges experienced in Halifax and on the predicted sea level rise. However, areas within 4 metres are vulnerable in the longer term, based on estimates of sea level rise and plausible storm surges, such as the storm surge experienced by New York in 2012. The total sea level rise and storm surge effects by the year 2100 are expected to be in the range of 5 to 6 metres above the current high water mark.	**Degree of Impact** High	**Maps of Affected Locations** Map 1, Coastal Flooding shows the areas vulnerable to the likely existing storm surge threat, which is also the expected total sea level rise by the year 2100 (2 metres) and areas vulnerable to the existing, but less likely, storm surge threat , which becomes more likely as sea level rises(4 metes). The map also shows the expected total combined threat of sea level rise, extreme high tide, and extreme storm surge by the year 2100 (6 metres).	**Information Gaps** There has been no systematic record of storm damage locations or repair costs. There is no tide gauge in Lunenburg County to record actual storm surge heights. The nearest tide gauges are in Halifax and Yarmouth. Storm sewers not mapped.	
Step Four FACILITIES & INFRASTRUCTURE	**Key Municipal Facilities & Infrastructure** Main Street (Provincial Route 3) Three Sewage Pumping stations Fire Hydrants Power lines, communications lines, and street lights along Main Street. The 4 metre level affects Town Hall, Mush-a-mush River Bridge, and the Ernst Brook bridge on Route 3. Town wharf, with floats and boat launch.	**Municipal F & I Affected** Sewage pumping stations at the Town Wharf, the Town Bandstand and at 866 Main Street. Main Street at the Town Wharf and 866 Main. Street lighting, power lines, and sidewalks, are also vulnerable in those three locations. Bandstand vulnerable at 2 metre level. The 4 metre level affects large areas of the Town, including Town Hall and the EHS ambulance station.	**Specific Issues Anticipated** Disabling the control systems on pumping stations, whether from submergence, or from concentrated salt water spray. Shorting of electrical supply to decorative street lighting. Damage to underground electrical distribution and communications lines on Edgewater Street. Damage to Town Wharf, floats and boat launch. The 4 metre level affects: the Irving gas station on Edgewater Street, the Bell Aliant telephone exchange building on Clairmont Street, as well as most downtown businesses.	**F & I Important to Emergencies** Key retail facilities such as the grocery store, gas station, and pharmacy. Key streets and intersections. Electric distribution system. Communications infrastructure.	**Maps of Affected Municipal Infrastructure** Map 1, Coastal Flooding. Map 2, Storm Drainage Map 3, Sewer and Water System	**Information Spreadsheets** Analysis of the efficiency of existing infrastructure is shown in the spreadsheets attached as Appendix A	

Coastal Flooding

Step 5(a) **WHO WILL BE AFFECTED**	**Who is Vulnerable?** Short-term – Residents and businesses near the 2 metre elevation at the seacoast Medium -term – residents and businesses between the 2 metre and the 4 metre elevation. Long-term - residents and businesses between the 4 metre and 6 metre elevations. The 4 metre elevation affects all of the commercial downtown.	**EMO Integration** REMO has done a Hazard, Risk and Vulnerability Assessment.	**Maps** Map 1 Coastal Flooding Map 3, Sewer and Water Systems	**Hazards which Affect Health and Safety** Flooding on storm surges will damage or destroy homes and businesses, and block roads, restricting emergency response. Failure of sewage pumping stations will release raw sewage into the harbour. Failure of Electric and communications lines will affect all services. Flooding of the Irving Gas Station may release gas and diesel fuel into the flood water.	**Emergency Resources** REMO plans list resources, including REMO, police, fire, Red Cross, local contractors.
Step 5(b) **ECONOMIC IMPLICATIONS**	**Vulnerable Economic Areas** 2 metre elevation: homes and businesses from the Ernst Brook to the pipe plant may sustain damage. Main Street and the Ernst Brook Bridge may be damaged, restricting access on Route 3. Tourism – from damage to shoreline infrastructure such as the Town wharf and the marina, retail shops and restaurants. Public sector – repair and recovery costs for Municipal and Provincial infrastructure, as well as loss of assessment value, and sales tax form economic activity. The RPS plant (major employer) is vulnerable at the 4 metre elevation. Vulnerable businesses include: Save-Easy Grocery Store, Kinburn PharmaSave drug store, Irving Gas Station, The Mahone Bay Nursing Home, and RPS Plastics.	**Options for dealing with threats** Short-term: Raise or strengthen key facilities. Include these requirements in the Land Use By-law and the Building Code By-law. Medium-term: re-route key infrastructure. Long-term: abandon some locations, retreat to higher ground or more adaptable locations (possible out-migration)	**Beneficial Effects** None		**Economic Effects of Emergencies** Sea Level rise will increase the frequency of coastal flooding events, which are expensive to recover from. Modifying public sector infrastructure to prepare for increased emergencies is expensive.
Step 5(c) **ENVIRONMENTAL ISSUES**	**Historical Environmental Problems related to weather or climate change.** Release of raw sewage from pumping stations. Some coastal erosion, particularly on Main Street south of Fauxburg Road and on Edgewater Street east of the Visitors Information Centre.	**Expected Change in Environmental Problems** Increased frequency and gradually increasing severity of coastal flood events.	**Sensitive Habitats, Ecosystems, Wildlife, Endangered species** None	**Dangerous or Hazardous Materials** Home heating oil. Raw sewage from flooded pumping stations. Gas and Diesel from Irving Station Plastics, hardeners and solvents from the RPS plant.	**Emergency Preparedness Plan** REMO is developing specific hazard preparedness plans from the HRVA document attached.

4.3.2 Inland Flooding

Step Two CLIMATE CHANGE ISSUES & HAZARDS	**Hazard** Flooding caused by overflow of river, stream, lake or similar water body. Usually caused by intense precipitation events, but may be combined with snow melt and ice jams in the spring. May combine at the coast with storm surge.	**Climate Issues** Intense storms are predicted to increase in frequency	**Anticipated Future Effects** Increase in the number of flood events	**Level of Preparedness** Low	**Maps** Map 2 – Storm Drainage	**Information Gaps** No central record of flooding issues although anecdotal evidence indicates properties near the Ernst Brook are the most vulnerable. No analysis of Ernst Brook or Mush-a-mush River to identify likely future flood areas.	**Climate Change Benefits** Less harbour ice to block stream outlets and create winter flooding.
Step Three AFFECTED LOCATIONS		**Places Affected, Historical** Ernst Brook at the trail bridge, at the Kinburn Street Bridge, and at the Main Street Bridge Historical major flooding at Ernst Brook bridge on Main Street was associated with ice jams. Culvert from Clearway/Main intersection to 394 Main is undersized and prone to flooding Main Street. Properties backing on the drainage channel from Clearland Road to the culvert under Edgewater Street by the Anglican Church.	**Expected Places Affected** All historical places. Mush-mush River at Edgewater Street bridge. Two dams on Oakland Lake which regulate the water level for the Town's water supply.	**Degree of Impact** high	**Maps of Affected Locations** Map 1, Coastal Flooding Map 2, Storm Drainage	**Information Gaps** No analysis of rivers to identify likely future flood areas. No mapping of heritage, cultural and archeological resources.	
Step Four FACILITIES & INFRASTRUCTURE	**Key Municipal Facilities & Infrastructure** Streets and bridges. Oakland Lake Water Supply	**Municipal F & I Affected** Two bridges on provincial Route 3. Two dams on Oakland Lake Storm Sewers Combined storm/sanitary sewers can overload the pumping stations or the sewage treatment plant.	**Specific Issues Anticipated** Lowering of Oakland Lake water level, if either dam is eroded by flooding.	**F & I Important to Emergencies** Fire Department. Public Works Department.	**Maps of Affected Municipal Infrastructure** Map 2, Storm Drainage	**Information Spreadsheets** Attached as Appendix A	

Inland Flooding

Step 5(a) **WHO WILL BE AFFECTED**	**Who is Vulnerable?** Small numbers of residents along Ernst Brook and in the drainage swale from the Anglican Church north to Bayview School. Possibly residents along the Ernst Brook, including the Quinlan apartment condominium building at 476 Main Street.	**EMO Integration** Included in REMO all hazards plan.	**Maps** Map 2, Storm Drainage	**Hazards which Affect Health and Safety** Closure of Ernst Brook or Mush-a-mush River Bridges on Highway 3. Closure of Edgewater Street near the Anglican Church.	**Emergency Resources** REMO plans list resources, including REMO, police, fire, Red Cross, local contractors
Step 5(b) **ECONOMIC IMPLICATIONS**	**Vulnerable Economic Areas** Local transportation and community connections if the two bridges on Route 3 are affected. Tourism and recreation potential if the Ernst Brook bridge on the Bay-to-Bay Trail is affected.	**Options for dealing with threats** Upgrade Town Specifications to require higher capacity in future storm drainage systems.	**Beneficial Effects** None		**Economic Effects of Emergencies** Temporary or long-term disruption of transportation, large costs to the NS Dept of Transportation.
Step 5(c) **ENVIRONMENTAL ISSUES**	**Historical Environmental Problems related to weather or climate change.** Erosion of stream banks	**Expected Change in Environmental Problems** Increased erosion of stream banks, greater chance of dam failure at Oakland Lake.	**Sensitive Habitats, Ecosystems, Wildlife, Endangered species** Oakland Lake.	**Dangerous or Hazardous Materials** Home heating oil from private houses.	**Emergency Preparedness Plan** Done in Conjunction with REMO

4.3.3 Hurricane

Step Two CLIMATE CHANGE ISSUES & HAZARDS	**Hazard** Hurricane – a tropical storm with strong winds and heavy rain. Coastal and inland flooding are both likely, and may combine at the mouths of rivers. Large waves may intensify the effects of coastal flooding. Strong winds cause damage to forest land, electricity infrastructure, and other structures.	**Climate Issues** Rise in sea temperatures in temperate latitudes. Increase in the frequency of Intense storms	**Anticipated Future Effects** As sea temperatures increase at temperate latitudes, more tropical storms are expected to arrive as hurricanes in Nova Scotia waters.	**Level of Preparedness** Medium	**Maps** Map 1 Storm Surge Analysis Map 2 Storm Drainage.	**Information Gaps** Areas subject to inland flooding are not well identified.	**Climate Change Benefits** None
Step Three AFFECTED LOCATIONS		**Places Affected, Historical** Town Wharf. Moorings Condominium parking area (580 Main Street). Main Street in front of 866 Main (Zwicker Property) Ernst Brook at the trail bridge and at the Main Street Bridge Culvert from Clearway/Main intersection to 394 Main is undersized and prone to flooding Main Street. Properties backing on the drainage channel from Clearland Road to the culvert under Edgewater Street by the Anglican Church	**Expected Places Affected** Immediate concern is all places within 2 Metres of High Water, However, areas within 4 metres are vulnerable in the longer term. The total sea level rise and storm surge effects by the year 2100 are expected to be in the range of 5 to 6 metres above the current high water mark Mush-mush River at Edgewater Street bridge. Two dams on Oakland Lake which regulate the water level for the Town's water supply. Overhead power and communications lines are vulnerable to wind damage.	**Degree of Impact** High	**Maps of Affected Locations** Map 1Storm Surge Analysis Map 2 Storm Drainage.	**Information Gaps** There has been no systematic record of storm damage locations or repair costs. There is no tide gauge in Mahone Bay to record actual storm surge heights. No analysis of rivers to identify likely future flood areas.	
Step Four FACILITIES & INFRASTRUCTURE	**Key Municipal Facilities & Infrastructure** Three Sewage Pumping stations Fire Hydrants Power lines, communications lines, and street lights along Main Street (Provincial Route 3). The 4 metre level affects Town Hall, Mush-a-mush River Bridge, and the Ernst Brook bridge on Route 3. Town wharf, with floats and boat launch Streets and bridges. Oakland Lake Water Supply	**Municipal F & I Affected** Sewage pumping stations, sewage treatment plant, water treatment plant. Main Street at the Town Wharf and 866 Main. Street lighting, power lines, and sidewalks. The Bandstand is vulnerable at the 2 metre level. The 4 metre level affects large areas of the Town, including Town Hall and the EHS ambulance station.	**Specific Issues Anticipated** Disabling the control systems on pumping stations. Wide-spread wind damage to all structures. Damage to underground electrical distribution and communications lines on Edgewater Street. Damage to Town Wharf, floats and boat launch, moored boats. Interruptions in water and sewage treatment. Interruption of communications systems. Lowering of Oakland Lake water level, if either dam is eroded by flooding.	**F & I Important to Emergencies** Key retail facilities such as the grocery store, gas station, and pharmacy. Key streets and intersections. Electric distribution system. Communications infrastructure Fire Department Public Works Department Street trees and nearby trees.	**Maps of Affected Municipal Infrastructure** Map 3, Sewer and Water Systems.	**Information Spreadsheets** Attached as Appendix A	

Hurricane

Step 5(a) **WHO WILL BE AFFECTED**	**Who is Vulnerable?** Short-term – Residents and businesses near the 2 metre elevation at the seacoast Medium -term – residents and businesses between the 2 metre and the 4 metre elevation, which includes all of the commercial downtown. Long-term - residents and businesses between the 4 metre and 6 metre elevations. Small numbers of residents along Ernst Brook and in the drainage swale from the Anglican Church north to Bayview School. Residents along the Ernst Brook, including the Quinlan apartment condominium building at 476 Main Street. Elderly and infirm are particularly vulnerable to power outages caused by wind. Mahone Nursing Home residents.	**EMO Integration** REMO has a plan for hurricanes, including evacuation.	**Maps** Map 1 Storm Surge Map 2 Storm Drainage Map 3Sewer System Map 4 Water Distribution Map 5 Oakland Lake	**Hazards which Affect Health and Safety** Closure of key highway bridges Flooding on Main Street (Highway 3) Tree damage due to wind. Blowing debris may damage buildings. Power outage Communications Outage. Contamination of Oakland Lake due to highway spills. Loss of power at the main pump at Oakland Lake.	**Emergency Resources** REMO plans list resources, including REMO, police, fire, Red Cross, local contractors
Step 5(b) **ECONOMIC IMPLICATIONS**	**Vulnerable Economic Areas** Tourism – from damage to shoreline infrastructure such as the Town wharf and the marina, retail shops and restaurants. Public sector – repair and recovery costs for Municipal and Provincial infrastructure, as well as loss of assessment value, and sales tax form economic activity. The RPS plant (major employer) is vulnerable at the 4 metre elevation. Vulnerable businesses include: Save-Easy Grocery Store, Kinburn PharmaSave drug store, Irving Gas Station, The Mahone Bay Nursing Home, and RPS Plastics. Local transportation and community connections if the two bridges or low-lying sections on Route 3 are affected. Tourism and recreation potential if the Ernst Brook bridge on the Bay-to-Bay Trail is affected.	**Options for dealing with threats** Work with the businesses which provide essential services in order to develop emergency preparedness plans.	**Beneficial Effects** Post-storm repair may provide work for local contractors.		**Economic Effects of Emergencies** Damage to shore facilities can cripple the recreational use of the harbour. Damage to accommodations such as hotels and retail stores can affect Tourism. Other related damage to private and public facilities can have very high cost for recovery.
Step 5(c) **ENVIRONMENTAL ISSUES**	**Historical Environmental Problems related to weather or climate change.** Overloaded sewage pumping stations discharge to the harbour. Shoreline erosion threatening Edgewater Street near Clearland Road.	**Expected Change in Environmental Problems** More frequent sewage dumping events. More rapid shoreline erosion threatening Edgewater Street (Route 3) near Clearland Road.	**Sensitive Habitats, Ecosystems, Wildlife, Endangered species** Oakland Lake and the water supply infrastructure in it.	**Dangerous or Hazardous Materials** Irving gas station. Reinforced Plastics Systems – both the main working plant and the dump /storage area.	**Emergency Preparedness Plan** In co-operation with REMO. Town Council is discussing the establishment of an emergency shelter in the Town.

4.3.4 Extreme Sudden Weather Event

Step Two **CLIMATE CHANGE ISSUES & HAZARDS**	**Hazard** Extreme sudden weather events such as thunderstorms, tornadoes, hail storms, freezing rain storms.	**Climate Issues** Frequency and intensity of severe storms are expected to increase.	**Anticipated Future Effects** As the frequency of severe storms increases, the frequency of damage from extreme sudden weather events will increase. More possibility of tornados	**Level of Preparedness** Low	**Maps** None	**Information Gaps** Rate of change in frequency and intensity of storms	**Climate Change Benefits** None
Step Three **AFFECTED LOCATIONS**		**Places Affected, Historical** Entire Town	**Expected Places Affected** More extensive local flooding, possible stream flooding (see: inland flooding). More frequent lightning strikes on electrical substation and distribution system. Possibility of damage from hail and freezing rain, particularly to the electrical transmission (NS Power) and distribution (Mahone Bay) systems. Damage to moored boats from extreme squalls.	**Degree of Impact** Medium	**Maps of Affected Locations** Map 2, Storm Drainage	**Information Gaps** None identified.	
Step Four **FACILITIES & INFRASTRUCTURE**	**Key Municipal Facilities & Infrastructure** Fire Hall, Town Hall, Streets and Bridges	**Municipal F & I Affected** Streets and Bridges Electrical System Public Works response for repairs may be impaired. Emergency response may be impaired dues to freezing rain or hail.	**Specific Issues Anticipated** Electrical system damage Telephone and cable service damaged. Fallen trees and tree limbs.	**F & I Important to Emergencies** Streets and Bridges, Electrical system.	**Maps of Affected Municipal Infrastructure** None	**Information Spreadsheets** Attached as Appendix A	

Extreme Sudden Weather Event

Step 5(a) **WHO WILL BE AFFECTED**	**Who is Vulnerable?** Small numbers of residents along Ernst Brook and in the drainage swale from the Anglican Church north to Bayview School. Possibly residents along the Ernst Brook, including the Quinlan apartment condominium building at 476 Main Street. Mahone Nursing Home.	**EMO Integration** REMO all hazards plan.	**Maps** None	**Hazards which Affect Health and Safety** Power outages due to lightning strikes, wind damage, hail, or freezing rain. Possible tornados.	**Emergency Resources** REMO plans list resources, including REMO, police, fire, Red Cross, local contractors
Step 5(b) **ECONOMIC IMPLICATIONS**	**Vulnerable Economic Areas** All areas of the Town are vulnerable.	**Options for dealing with threats** None identified.	**Beneficial Effects**		**Economic Effects of Emergencies** Potentially high, depending on the track of the storm.
Step 5(c) **ENVIRONMENTAL ISSUES**	**Historical Environmental Problems related to weather or climate change.** Erosion of stream banks	**Expected Change in Environmental Problems** Increased steam bank erosion at Ernst Brook and Mush-a-mush River. Possibility of dam failure at Oakland Lake water supply.	**Sensitive Habitats, Ecosystems, Wildlife, Endangered species** Street trees. Oakland Lake water supply.	**Dangerous or Hazardous Materials** None affected by this hazard.	**Emergency Preparedness Plan** Under review in co-operation with REMO

4.3.5 Winter Storm/Blizzard

Step Two CLIMATE CHANGE ISSUES & HAZARDS	**Hazard** Severe winter storm with strong winds and heavy precipitation which may be in form of snow, freezing rain, rain, or any combination of these.	**Climate Issues** Predicted increase in the frequency of severe storms.	**Anticipated Future Effects** Severe winter storms will occur more often. In addition to blizzards, more rain on snow events are expected, leading to more inland flooding events in the winter.	**Level of Preparedness** High	**Maps** Map 1 – Storm Surge Map 2 – Storm Drainage	**Information Gaps** Rate of change in frequency and intensity of storms	**Climate Change Benefits** None
Step Three AFFECTED LOCATIONS		**Places Affected, Historical** All Streets. Low-lying areas Electric distribution system	**Expected Places Affected** All streets. Low-lying areas. Electrical distribution system.	**Degree of Impact** High	**Maps of Affected Locations** Map 2, Storm Drainage	**Information Gaps** None identified	
Step Four FACILITIES & INFRASTRUCTURE	**Key Municipal Facilities & Infrastructure** Town Operations Garage Electric distribution system.	**Municipal F & I Affected** Electric distribution system. Two major bridges. Town Streets	**Specific Issues Anticipated** May need private sector equipment to assist with snow plowing or snow removal.	**F & I Important to Emergencies** Fire Hall, Town Operations Garage Provincial roads giving access to the Town. Snow storage areas.	**Maps of Affected Municipal Infrastructure** Map 2, Storm Drainage	**Information Spreadsheets** Attached as Appendix A	

Winter Storm/Blizzard

Step Five(a) **WHO WILL BE AFFECTED**	**Who is Vulnerable?** Elderly and infirm are particularly vulnerable to power outages and to isolation by blocked roads.	**EMO Integration** REMO all hazards plan.	**Maps** None	**Hazards which Affect Health and Safety** Road blockage due to snow, power outage due to wet snow, ice, and wind. Contamination of Oakland Lake due to highway spills.	**Emergency Resources** REMO plans list resources, including REMO, police, fire, Red Cross, local contractors
Step Five(b) **ECONOMIC IMPLICATIONS**	**Vulnerable Economic Areas** All sectors of the economy.	**Options for dealing with threats** None identified.	**Beneficial Effects** None		**Economic Effects of Emergencies** High
Step Five(c) **ENVIRONMENTAL ISSUES**	**Historical Environmental Problems related to weather or climate change.** Storage of large amounts of snow is a problem, and dumping into the harbour is not permitted. Lands available include those behind the Mahone Bay Centre, the Edgewater Street parking lots.	**Expected Change in Environmental Problems** More large snow events are predicted.	**Sensitive Habitats, Ecosystems, Wildlife, Endangered species** None identified	**Dangerous or Hazardous Materials** Salt is used to clear ice and snow.	**Emergency Preparedness Plan** Under review in co-operation with REMO

4.3.6 Hot Days/Heat Wave

Step Two CLIMATE CHANGE ISSUES & HAZARDS	**Hazard** Heat wave: three consecutive days with temperatures over 30 degrees Celsius	**Climate Issues** Climate projections indicate drier, hotter summers with an increase in mean temperatures	**Anticipated Future Effects** Increase in the number of hot days and the likelihood of heat waves. Increased electricity use, need for medical help. Mean temperature increase may lead to outdoor work inefficiencies.	**Level of Preparedness** Low	**Maps** None	**Information Gaps** Rate of increase in mean temperatures is unknown.	**Climate Change Benefits** Increase in summer temperatures will favour heat-loving crops.
Step Three AFFECTED LOCATIONS		**Places Affected, Historical** Entire Town	**Expected Places Affected** Entire Town	**Degree of Impact** High	**Maps of Affected Locations** None	**Information Gaps** As above	
Step Four FACILITIES & INFRASTRUCTURE	**Key Municipal Facilities & Infrastructure** Water supply	**Municipal F & I Affected** Outside maintenance of parks, streets, electric, sewer and water systems becomes more difficult in extended heat wave.	**Specific Issues Anticipated** None	**F & I Important to Emergencies** Town is in discussion with community groups to establish a comfort station.	**Maps of Affected Municipal Infrastructure** None	**Information Spreadsheets** Attached as Appendix A	

Hot Days/Heat Wave

Step Five(a) **WHO WILL BE AFFECTED**	**Who is Vulnerable?** Elderly and sick people are particularly vulnerable.	**EMO Integration** REMO all hazards plan	**Maps** None	**Hazards which Affect Health and Safety** Extended hot days are a health hazard.	**Emergency Resources** REMO plans list resources, including REMO, police, fire, Red Cross, local contractors
Step Five(b) **ECONOMIC IMPLICATIONS**	**Vulnerable Economic Areas** All sectors Forestry is particularly vulnerable to woods travel closures.	**Options for dealing with threats to the economy** None identified.	**Beneficial Effects** None		**Economic Effects of Emergencies** Increased hot weather increase interest in recreations such as boating.
Step Five(c) **ENVIRONMENTAL ISSUES**	**Historical Environmental Problems related to weather or climate change.** Relatively small number of occurrences.	**Expected Change in Environmental Problems** Increase in the number of occurrences.	**Sensitive Habitats, Ecosystems, Wildlife, Endangered species** None identified	**Dangerous or Hazardous Materials** None identified	**Emergency Preparedness Plan** Under review in co-operation with REMO

4.3.7 Forest Fire/ Wildfire

Step Two **CLIMATE CHANGE ISSUES & HAZARDS**	**Hazard** Uncontrolled fire in forest land. May threaten residential areas. About 97% of wildfires in Nova Scotia are caused by human activities.	**Climate Issues** Drier hotter summers are predicted	**Anticipated Future Effects** Increased difficulty in controlling wildfires	**Level of Preparedness** High	**Maps** None	**Information Gaps** None identified	**Climate Change Benefits** None
Step Three **AFFECTED LOCATIONS**		**Places Affected, Historical** No large wildfires in Town. Much of what is now wooded land in the Town was pasture within living memory.	**Expected Places Affected** All woodlands. Most residential areas. Oakland Lake Water Supply Watershed.	**Degree of Impact** High	**Maps of Affected Locations** Map 5, Oakland Lake Water Supply Watershed	**Information Gaps** None identified	
Step Four **FACILITIES & INFRASTRUCTURE**	**Key Municipal Facilities & Infrastructure** Fire Hall. Water Reservoir and treatment plant Oakland Lake Pumping station. Oakland Lake Water Supply Watershed.	**Municipal F & I Affected** Electrical distribution system Oakland Lake Water Supply Fire Hall Oakland Lake Water Supply Watershed. Sewage treatment plant.	**Specific Issues Anticipated** Destruction of Victoria Park woodland, other private wooded lands. Destruction of residential areas adjacent to wooded lands. Air quality degradation. Damage to water supply quality and quantity.	**F & I Important to Emergencies** Fire Department Fire Hydrants Town Wharf dry hydrant. Street network for evacuation.	**Maps of Affected Municipal Infrastructure** None	**Information Spreadsheets** Attached as Appendix A	

Forest Fire/Wildfire

Step Five(a) **WHO WILL BE AFFECTED**	**Who is Vulnerable?** Most of the population lives in or near forested land.	**EMO Integration** Included in REMO all hazards plan	**Maps** **None**	**Hazards which Affect Health and Safety** Fire Smoke inhalation	**Emergency Resources** REMO plans list resources, including REMO, police, fire, Red Cross, local contractors
Step Five(b) **ECONOMIC IMPLICATIONS**	**Vulnerable Economic Areas** Forestry, housing.	**Options for dealing with threats** Maintain fire-fighting capacity, links with NSDNR Review the Burning By-law to better control open burning in the Town	**Beneficial Effects** None		**Economic Effects of Emergencies** Potential devastating effect on all businesses.
Step Five(c) **ENVIRONMENTAL ISSUES**	**Historical Environmental Problems related to weather or climate change.** No major wildfire outbreak within Town or within the Oakland Lake Water Supply.	**Expected Change in Environmental Problems** More hot dry summers will likely increase the risk of forest fire.	**Sensitive Habitats, Ecosystems, Wildlife, Endangered species** Oakland Lake Water Supply Watershed.	**Dangerous or Hazardous Materials** Fuel at Irving station Resins and plasticizers at Reinforced Plastic Systems.	**Emergency Preparedness Plan** Under review in co-operation with REMO

4.3.8 Drought

Step Two CLIMATE CHANGE ISSUES & HAZARDS	**Hazard** Prolonged period of abnormally dry weather that depletes water resources.	**Climate Issues** Higher temperatures and decreased precipitation during summer months	**Anticipated Future Effects** Increased risk of drought.	**Level of Preparedness** Low	**Maps** None	**Information Gaps** Global Climate models leave some uncertainty about the effects in Atlantic Canada, although summers are expected to be generally hotter and dryer, increasing the risk of drought.	**Climate Change Benefits** None
Step Three AFFECTED LOCATIONS		**Places Affected, Historical** Entire Town	**Expected Places Affected** Entire Town Oakland Lake Water Supply. Reduction of private water supply from wells. Potential for salt water intrusion into private wells along the coast.	**Degree of Impact** Medium to high	**Maps of Affected Locations** None	**Information Gaps** Long-term capacity of Oakland Lake in prolonged drought conditions is not known, since the existing calculations of capacity are based on long-term historical weather records.	
Step Four FACILITIES & INFRASTRUCTURE	**Key Municipal Facilities & Infrastructure** Oakland Lake Water Supply Water treatment and distribution system.	**Municipal F & I Affected** Oakland Lake Water Supply. Parks and grounds Depth of water intake at Oakland Lake may be insufficient in prolonged drought.	**Specific Issues Anticipated** Potential for rationing water.	**F & I Important to Emergencies** Fire Department expects to draft salt water from Town Wharf dry hydrant for fire fighting.	**Maps of Affected Municipal Infrastructure** None	**Information Spreadsheets** Attached as Appendix A	

Drought

Step Five(a) **WHO WILL BE AFFECTED**	**Who is Vulnerable?** People on dug wells are especially vulnerable. Areas of Town not served by the central water supply are particularly vulnerable.	**EMO Integration** REMO all hazards plan	**Maps** None	**Hazards which Affect Health and Safety** Increased risk of forest fire or wildland fire in drought conditions. Fire and smoke ar hazards resulting from forest fire. Series of heat waves may accompany drought.	**Emergency Resources** REMO plans list resources, including REMO, police, fire, Red Cross, local contractors
Step Five(b) **ECONOMIC IMPLICATIONS**	**Vulnerable Economic Areas** Agriculture, forestry	**Options for dealing with threats** Reduce water transmission losses from Oakland Lake. Ban non-essential water uses.	**Beneficial Effects** None		**Economic Effects of Emergencies** Threats to farms, farmers, farmers markets
Step Five(c) **ENVIRONMENTAL ISSUES**	**Historical Environmental Problems related to weather or climate change.** Drought has been infrequent in Lunenburg County.	**Expected Change in Environmental Problems** Drier, hotter summers will produce more frequent drought conditions.	**Sensitive Habitats, Ecosystems, Wildlife, Endangered species** Oakland Lake Water Supply Watershed.	**Dangerous or Hazardous Materials** None identified	**Emergency Preparedness Plan** Under review in co-operation with REMO

4.3.9 Animal Disease and Pests

Step Two **CLIMATE CHANGE ISSUES & HAZARDS**	**Hazard** 1. Diseases affecting agricultural animals 2. Diseases affecting wildlife 3. Animal diseases affecting humans	**Climate Issues** Changes in mean temperature and precipitation create favourable conditions for diseases which have been historically rare or unknown in the Atlantic Region	**Anticipated Future Effects** Diseases and pests adapted to warmer climates will be introduced and thrive in Atlantic Canada. Recent examples include the black-legged tick which carries Lyme Disease and white nose syndrome which affects bats.	**Level of Preparedness** 1. High for agricultural animals 2. Medium for Wildlife 3. High for humans	**Maps** None	**Information Gaps** The identity of likely diseases	**Climate Change Benefits** None
Step Three **AFFECTED LOCATIONS**		**Places Affected, Historical** Wooded areas and fields (black-legged tick)	**Expected Places Affected** Entire Town	**Degree of Impact** Medium	**Maps of Affected Locations** None	**Information Gaps** None identified	
Step Four **FACILITIES & INFRASTRUCTURE**	**Key Municipal Facilities & Infrastructure** None	**Municipal F & I Affected** None	**Specific Issues Anticipated** None	**F & I Important to Emergencies** None	**Maps of Affected Municipal Infrastructure** None	**Information Spreadsheets** Appendix A	

Animal Disease and Pests

Step Five(a) **WHO WILL BE AFFECTED**	**Who is Vulnerable?** Agricultural workers are vulnerable to any animal/human cross-over. All people in Town are vulnerable to some disease vectors such as ticks.	**EMO Integration** REMO all hazards plan	**Maps** None	**Hazards which Affect Health and Safety** Diseases transferred to humans by animal vectors. Examples include Lyme disease, West Nile virus, Influenza viruses, and Dengue fever.	**Emergency Resources** REMO plans list resources, including REMO, police, fire, Red Cross, local contractors
Step Five(b) **ECONOMIC IMPLICATIONS**	**Vulnerable Economic Areas** Agricultural Sector in areas outside Town limits, but economically tied to the Town.	**Options for dealing with threats** Agriculture Canada maintains a surveillance and reporting system.	**Beneficial Effects** Increased demand for veterinary services		**Economic Effects of Emergencies** Disease scares affect tourism and retail sales.
Step Five(c) **ENVIRONMENTAL ISSUES**	**Historical Environmental Problems related to weather or climate change.** Increased range of disease vectors.	**Expected Change in Environmental Problems** Continued change in the range of disease vectors such as dog ticks and black-legged ticks, resulting in the importation of new diseases	**Sensitive Habitats, Ecosystems, Wildlife, Endangered species** None	**Dangerous or Hazardous Materials** None	**Emergency Preparedness Plan** In co-operation with REMO

4.3.10 Plant Disease and Pests

Step Two CLIMATE CHANGE ISSUES & HAZARDS	**Hazard** 1. Diseases affecting agricultural plants. 2. Diseases affecting forest plants.	**Climate Issues** Changes in mean temperature and precipitation create favourable conditions for diseases which have been historically rare or unknown in the Atlantic Region.	**Anticipated Future Effects** Diseases and pests adapted to warmer climates will be introduced and thrive in Atlantic Canada. Heat and drought stress will make some plants more susceptible to disease.	**Level of Preparedness** 1.High for agricultural plants 2. Medium for forest plants.	**Maps** None	**Information Gaps** Identity of likely diseases and pests.	**Climate Change Benefits** None
Step Three AFFECTED LOCATIONS		**Places Affected, Historical** Entire Town	**Expected Places Affected** Entire Town	**Degree of Impact** 1.High for agricultural plants 2. Medium for forest plants.	**Maps of Affected Locations** None	**Information Gaps**	
Step Four FACILITIES & INFRASTRUCTURE	**Key Municipal Facilities & Infrastructure** Oakland Lake Water Supply Watershed.	**Municipal F & I Affected** Victoria Park Landscaping (horticultural) plantings throughout the Town. Street trees. Oakland Lake Water Supply	**Specific Issues Anticipated** Loss of street trees and other shade trees. Damage to wooded areas. Increased risk of forest fire in dead or damaged wooded areas. Increased need for tree control by the Town Electric Utility	**F & I Important to Emergencies** Fire Department and Provincial DNR fire service, in case of forest fire.	**Maps of Affected Municipal Infrastructure** None	**Information Spreadsheets** Appendix A	

Plant Disease and Pests

Step Five(a) **WHO WILL BE AFFECTED**	**Who is Vulnerable?** Agricultural and forestry workers. All Town residents who have kitchen gardens.	**EMO Integration** REMO all hazards plan	**Maps** None	**Hazards which Affect on Health and Safety** Increased use of pesticides and herbicides.	**Emergency Resources** REMO plans list resources, including REMO, police, fire, Red Cross, local contractors
Step Five(b) **ECONOMIC IMPLICATIONS**	**Vulnerable Economic Areas** Agriculture and Forestry	**Options for dealing with threats** None	**Beneficial Effects** None		**Economic Effects of Emergencies** Changes in forestry practices Increased food costs
Step Five(c) **ENVIRONMENTAL ISSUES**	**Historical Environmental Problems related to weather or climate change.** Unknown whether introduced pests such as the spruce longhorn bark beetle are helped by warmer summers and milder winters.	**Expected Change in Environmental Problems** Continued change in the range of disease vectors, resulting in the importation of new diseases	**Sensitive Habitats, Ecosystems, Wildlife, Endangered species** Oakland Lake Water Supply Watershed.	**Dangerous or Hazardous Materials** Pesticides and herbicides	**Emergency Preparedness Plan** In co-operation with REMO

4.3.11 Forest Cover Changes

Step Two CLIMATE CHANGE ISSUES & HAZARDS	**Hazard** The pace of climate change is expected to be more rapid than any previous change shown in the geological record, and is expected to be proceed more quickly than forest plant populations can move	**Climate Issues** Rapid changes in mean temperature and precipitation	**Anticipated Future Effects** Changes in forest composition, with susceptible species dying out relatively quickly over the next 100 years.	**Level of Preparedness** Low	**Maps** None	**Information Gaps** The pace of climate change is yet unknown. Whether plant species from more southern areas can successfully colonise Nova Scotia is unknown	**Climate Change Benefits** Some native species may grow more rapidly in some parts of the Province in warmer conditions.
Step Three AFFECTED LOCATIONS		**Places Affected, Historical** Unprecedented change	**Expected Places Affected** Entire Town	**Degree of Impact** Medium	**Maps of Affected Locations** None	**Information Gaps** The pace of climate change is yet unknown.	
Step Four FACILITIES & INFRASTRUCTURE	**Key Municipal Facilities & Infrastructure** Oakland Lake Water Supply Watershed	**Municipal F & I Affected** Victoria Park Street trees. Deteriorating trees threaten power and communications lines. Oakland Lake Water Supply Watershed.	**Specific Issues Anticipated** Many tree species may be stressed by increasingly warm and dry summer, or shorter winter, becoming more susceptible to disease. Risk of forest fire is higher in stands of dead or diseased trees.	**F & I Important to Emergencies** Town fire department and Provincial DNR fire services, in case of forest fire.	**Maps of Affected Municipal Infrastructure** None	**Information Spreadsheets** Appendix A	

Forest Cover Changes

Step Five(a) **WHO WILL BE AFFECTED**	**Who is Vulnerable?** Forestry workers, all residents.	**EMO Integration** REMO all hazards plan	**Maps** None	**Hazards which Affect on Health and Safety** Increased use of pesticides and herbicides in stressed stands of trees.	**Emergency Resources** REMO plans list resources, including REMO, police, fire, Red Cross, local contractors
Step Five(b) **ECONOMIC IMPLICATIONS**	**Vulnerable Economic Areas** Forestry and related industries.	**Options for dealing with threats** When planting new trees, use species adapted to warmer conditions.	**Beneficial Effects** None		**Economic Effects of Emergencies** No emergencies foreseen.
Step Five(c) **ENVIRONMENTAL ISSUES**	**Historical Environmental Problems related to weather or climate change.** Forest damage caused by high winds in intense storms.	**Expected Change in Environmental Problems** As climate changes to warmer winters and hotter, drier summers, the mix of forest species will change. As intense storms increase, wooded areas are likely to sustain more wind damage.	**Sensitive Habitats, Ecosystems, Wildlife, Endangered species** All forested lands, all species. Oakland Lake Water Supply.	**Dangerous or Hazardous Materials** Pesticides and herbicides.	**Emergency Preparedness Plan** None

4.3.12 Agricultural Crop Changes

Step Two CLIMATE CHANGE ISSUES & HAZARDS	**Hazard** The pace of climate change is expected to be more rapid than any previous change shown in the geological record.	**Climate Issues** Rapid changes in mean temperature and precipitation	**Anticipated Future Effects** Some current crops may not thrive in the new conditions, but there is an opportunity to introduce new crops.	**Level of Preparedness** None	**Maps** Low	**Information Gaps** The pace of climate change is yet unknown.	**Climate Change Benefits** There may be an opportunity for new crops.
Step Three AFFECTED LOCATIONS		**Places Affected, Historical** Unprecedented change	**Expected Places Affected** Agricultural operations, including market gardens and kitchen gardens.	**Degree of Impact** Medium	**Maps of Affected Locations** None	**Information Gaps** The pace of climate change is yet unknown.	
Step Four FACILITIES & INFRASTRUCTURE	**Key Municipal Facilities & Infrastructure** None	**Municipal F & I Affected** Horticultural and landscaping plantings sin Town parks	**Specific Issues Anticipated** None	**F & I Important to Emergencies** None	**Maps of Affected Municipal Infrastructure** None	**Information Spreadsheets** Appendix A	

Agricultural Crop Changes

Step Five(a) **WHO WILL BE AFFECTED**	**Who is Vulnerable?** Agricultural workers and all gardeners.	**EMO Integration** REMO all hazards plan	**Maps** None	**Hazards which Affect on Health and Safety** Increased use of pesticides and herbicides is possible. Food shortages are possible	**Emergency Resources** N/A
Step Five(b) **ECONOMIC IMPLICATIONS**	**Vulnerable Economic Areas** Agriculture	**Options for dealing with threats** Gradual adaptation of commercial crops to changing growing conditions.	**Beneficial Effects** None		**Economic Effects of Emergencies** Food shortages. Increased incentive for private kitchen gardens.
Step Five(c) **ENVIRONMENTAL ISSUES**	**Historical Environmental Problems related to weather or climate change.** Drier summers have increased the need for irrigation.	**Expected Change in Environmental Problems** More dry summers.	**Sensitive Habitats, Ecosystems, Wildlife, Endangered species** None	**Dangerous or Hazardous Materials** Pesticides and herbicides	**Emergency Preparedness Plan** In co-operation with REMO

4.3.13 Sea Temperature Rise, Acidification, and Invasive Species

Step Two CLIMATE CHANGE ISSUES & HAZARDS	**Hazard** Climate change results in warmer waters along the Atlantic coast of Nova Scotia, changing the mix of plant and animal species in our waters. Traditional fisheries may collapse. Unfamiliar diseases and pests may thrive. Invasive species from further south may thrive	**Climate Issues** Sea temperatures in this area may continue to warm, changing local climate and changing the plant and animal populations in the sea. Increased input of carbon acidifies sea water, interfering with the growth of shells by a great many organisms, from plankton to coral, shellfish, crabs and lobsters. Invasive species supplant native species and change the local ecology.	**Anticipated Future Effects** Warmer sea temperatures also allow storms such as hurricanes to retain greater strength as they enter Nova Scotia waters. Changes in animal and plant populations will increase. Increased general warming may change the course of the Gulf Stream, which could lead a sudden cooling of the waters off Nova Scotia.	**Level of Preparedness** Low	**Maps** None	**Information Gaps** The future pace of sea temperature rise and acidification are unknown	**Climate Change Benefits** None
Step Three AFFECTED LOCATIONS		**Places Affected, Historical** Entire coast has been affected by invasive species such as tunicates and green crabs.	**Expected Places Affected** Entire coastline	**Degree of Impact** High	**Maps of Affected Locations** None	**Information Gaps** The future pace of sea temperature rise and acidification are unknown	
Step Four FACILITIES & INFRASTRUCTURE	**Key Municipal Facilities & Infrastructure** Town wharf and dinghy harbour Fire Dept. dry hydrant on Town wharf.	**Municipal F & I Affected** Town wharf, dry hydrant	**Specific Issues Anticipated** Increased fouling of in-water structures, including boats, wharves, water intakes. .	**F & I Important to Emergencies** Dry hydrant is important to all fire emergencies in or near the Town.	**Maps of Affected Municipal Infrastructure** None	**Information Spreadsheets** Appendix A	

Sea Temperature Rise, Acidification, Invasive Species

Step Five(a) **WHO WILL BE AFFECTED**	**Who is Vulnerable?** Aquaculture and fisheries, tourism.	**EMO Integration** No emergency foreseen	**Maps** None	**Hazards which Affect on Health and Safety** Warmer temperatures encourage more algal blooms such as 'red tide' which make shellfish poisonous and make the water unsafe for swimming.	**Emergency Resources** N/A
Step Five(b) **ECONOMIC IMPLICATIONS**	**Vulnerable Economic Areas** Aquaculture and fisheries, including fishing tourism. Lobster and crab fisheries.	**Options for dealing with threats to the economy** Reduce greenhouse gas emissions.	**Beneficial Effects** None identified		**Economic Effects of Emergencies** Algal blooms discourage swimming and boating.
Step Five(c) **ENVIRONMENTAL ISSUES**	**Historical Environmental Problems related to weather or climate change.** Green crabs are having a serious effect on sea urchins and thus on seaweeds. Tunicates are smothering mussel farms	**Expected Change in Environmental Problems** Pace of change is expected to increase	**Sensitive Habitats, Ecosystems, Wildlife, Endangered species** All salt water populations of fish and plants.	**Dangerous or Hazardous Materials** None identified	**Emergency Preparedness Plan** None

5.0 PRIORITIES FOR ADAPTATION (Step Five)

The Town of Mahone Bay has established priorities for adaptation over the short term (0-5 years), medium term (5 to 20 years) and long term (over 20 years). They include priorities for managing our infrastructure, our outreach requirements (that is, how we will engage the community in the coming years), and policy and planning – how we will update our planning documents to meet the climate change challenge. Essential to priority-setting at the Town level is the need to work with Provincial and Federal levels of government to ensure coherence in planning/policy direction, and to clarify cost-sharing for the implementation of climate change mitigation and adaptation.

	SHORT – TERM: 0 TO 5 YEARS	RESPONSIBILITY	MEDIUM-TERM: 5 TO 20 YEARS	LONG-TERM: OVER 20 YEARS.
INFRASTRUCTURE	Use GPS unit to map all storm sewer and combined sewer locations. Review mapping of street lighting, water system, sidewalks for accuracy. Increase tree pruning, removal and re-planting program to protect the health of the street trees and to protect the overhead electrical and communications systems. SEWAGE TREATMENT PLANT - Review inflow and infiltration effects on capacity and develop mitigation plans - review emergency power options and develop mitigation plans - review vulnerability to coastal flooding and inland flooding and develop mitigation plans SEWAGE LIFT STATIONS -Review flooding and power outage options and develop mitigation plans FORCE MAINS -review installation standards for those vulnerable to tide and coastal flooding. PARKS -review all park land for vulnerability and long-term adaptation plans WHARF, SLIPWAY, DINGHY HARBOUR -inspect, repair, maintain against increasing storm damage, develop long-term plan for upgrading STORM DRAINAGE -Update capacity of storm drain across Edgewater near Lutheran Church. -Update capacity of storm drain from Clearway/ Main intersection to 394 Main Street. WATER SUPPLY -Maintain and upgrade two small earthen dams on Oakland Lake. -Install emergency generator for the main raw water pump at Oakland Lake.	CAO/Operations	Keep asset mapping up to date. Keep tree control up to date Implement mitigation plans incrementally as opportunity arises Implement mitigation plans incrementally as opportunity arises Upgrade installation whenever force mains are replaced. Develop mitigation or abandonment plans Develop mitigation or abandonment plans Implement updating plans as opportunity arises Include upgrades in the five-year capital improvement plan.	Re-evaluate the Municipal Climate Change Action Plan

…/continued

Priorities for Adaptation (continued)

		RESPONSIBILITY		
OUTREACH	Publish this climate Change Action Plan within the Town, including website, presentations to community groups and youth in schools. Include and publicize legible maps showing vulnerable areas. Share emergency plans with other vital service providers such as NSDOTIR, NSDNR, NSDOE, Bell Aliant, NS Power, Eastlink and Rogers, as well as social and health service agencies.	CAO/Operations	Continue to promote Climate Change Action Plan and its review processes	Re-evaluate the Municipal Climate Change Action Plan
	Work with REMO to refine action plans such as evacuation plans.	CAO/Council		
	Assist a community group in establishing a comfort station in the Town, which may include feeding, warming or cooling, and basic personal care. Promote the value of volunteerism in emergency planning, and encourage and assist seniors program at Mahone Bay Centre to provide community support to seniors and their pets during emergencies. Assist the Chamber of Commerce and its members in planning for emergencies, including the continuation of vital services, such as the sales of fuel, food and drugs.	Council		
POLICY AND PLANNING	Review and update Town specifications.	Operations	Monitor Town Specifications and all planning documents for accommodation to Climate Change	Re-evaluate the Municipal Climate Change Action Plan
	Review Municipal Planning Strategy and the suite of By-Laws: Land Use By-law, Building Code By-law and Subdivision By-law for development policies near vulnerable areas, and Burning By-law for fire bans in dry weather.	Planning Service, in co-operation with CAO and Operations		
	Include climate change issues in Town infrastructure investment and planning, including shoreline treatments and sea control.	CAO/Operations with gov't/private sector		
	Examine the findings of the Intergovernmental Panel on Climate Change Fifth Assessment Report (September 2013) and review this Plan accordingly.	Planning	Review Climate Change Action Plan periodically and update as required in light of observed changes and updated predictions	
	Continue to monitor and protect the watershed of Oakland Lake, including dialogue with both the Municipality of Lunenburg and the NS Dept. of Transportation and Infrastructure Renewal. Clarify with NSDOTIR the cost-sharing arrangements for maintenance and repair of the Ernst Brook and Mushamush River bridges.	CAO/Operations		
	Clarify with Provincial and Federal levels of government the cost-sharing arrangements for the implementation of climate change mitigation and adaptation.	Mayor and Council	Continue to work with Provincial and Federal Levels of government on policy, planning and cost-sharing with regard to climate change mitigation and adaptation.	

6.0 CLIMATE CHANGE MITIGATION

The Town completed an inventory of all its corporate energy use using the base year of 2006, in order to determine its corporate greenhouse gas emissions (see Appendix C). This showed that the largest total energy consumer for the Town is the water and sewer system operation, the second largest consumer is the Town's building assets. The third largest consumer is the vehicle fleet. The fourth largest consumer of energy is the street lighting system.

Following this inventory the Town completed in 2009 a Municipal Energy Audit Report (see Appendix D), which provided an analysis of the corporate energy consumption of the various assets of the Town. This audit also provided a list of measures and opportunities to reduce energy consumption and the corresponding greenhouse gas emissions for each of these assets. Note that reducing greenhouse gas emissions is not always the same as reducing energy costs, which is traditionally the focus of the Town's reduction strategies.

The Town has been working at implementing the recommendations of the report. Work done to date includes:

- Insulated Town Hall attic
- Installed lighting controls in Town Hall and Fire Hall
- Downsized the hot water heater in the Town Hall
- Insulated tanks at the water treatment plant
- Installed L.E.D. lighting at the Fire Hall
- Installed L.E.D. street lighting on Main Street
- Renovated, re-insulated, and installed new light fixtures and heating fixtures in the Town Hall main office.

The Town intends to continue to implement the recommendations of the report year by year.

7.0 MAPS

Map 1 Coastal Flooding
Map 2 Storm Drainage
Map 3 Sewer and Water Systems

(Included with this plan under separate cover)

8.0 APPENDICES

Appendix A: Infrastructure Risk Assessment Table
Appendix B: Hazard, Risk Vulnerability Assessment by REMO
Appendix C: Energy Inventory
Appendix D: Town of Mahone Bay ecoNovaScotia Energy Audit

(Included with this plan under separate cover)