

# Municipal Climate Change Action Plan

## Town of Lockeport

As a requirement for the 2010 - 2014 Gas Tax Agreement and the Municipal Funding Agreements, municipalities will be **required** to prepare and submit to Service Nova Scotia and Municipal Relations a Municipal Climate Change Action Plan (MCCAP) by December 31, 2013.

Additional gas tax funding of more than \$223 million over four years, starting in 2010, will enable municipalities to continue to invest in environmentally sustainable infrastructure projects that contribute to reduced greenhouse gas emissions, cleaner water or cleaner air. The Gas Tax Fund promotes the economic, social, environmental and cultural sustainability of Nova Scotia municipalities.

The MCCAP will be an amendment to the Integrated Community Sustainability Plans (ICSP), which were prepared by municipalities and submitted to the Province in March, 2010. The MCCAP will focus on both climate change adaptation and mitigation and will describe how municipalities plan to respond to climate change.

## MCCAP Working Group & Mandate

MCCAP Adaptation Team (A Working group of The Town of Lockeport Economic Development / Planning Advisory Committee). **Working group members:** Howard Roszel (Councillor), Alan Stewart (Councillor), Dayle Eshelby (Councillor), Joyce Young (Town Clerk/Treasurer), Leo Williams (Fire Chief), Bevin Joudrie (Business Owner), Bil Atwood (MCCAP Coordinator). **Stakeholders:** Kevin Snow (Streets Foreman), Peter Partington (Harbour Authority), Doug Stephens (Surf Lodge Nursing Home), Local Property Owners, Local Businesses, Nova Scotia Power, Nova Scotia Transportation and Infrastructure Renewal (Hayden Lake Water System).

- This will be a temporary working group for the preparation of the MCCAP. Lockeport Town Council will appoint a permanent committee after the completion of the MCCAP to continue with the implementation.
- The MCCAP/ICSP Coordinator will take direction from the working group.
- The MCCAP working group will be accountable to Council through the Economic Development and Planning Advisory Committee, giving update reports when requested.
- The MCCAP coordinator will collaborate with The Municipality of the District of Shelburne and Town of Shelburne coordinators.
- The focus and goal of The MCCAP working group will be to complete and deliver an action plan that will serve as a realistic and functional guide for any future Council/staff or working group to implement.

## **Where Does Lockeport Stand**

Lockeport and other Towns and communities in Nova Scotia have experienced weather events as a result of climate change (natural hazards). Climate change poses risks to communities through extreme weather events such as sea level rise, water quality and changes to the performance of infrastructure systems. Lockeport will have to adapt to climate change as well as using an alternate approach when managing capital assets and operations.

The Town of Lockeport must focus on understanding how these changes will impact the Community. There is a combination of historical evidence and mounting scientific support that is increasing awareness among municipal administrators and Councillors about potential climate change impacts. Firsthand experience demonstrates that climate change will create financial burdens on the Town and will also put pressure on those officials in municipal Government who must now plan for an uncertain future. Strategies for adapting to climate change and mitigation against climate change is a must.

The geographic similarities between The Town of Lockeport and The Province of Nova Scotia can be compared by one extreme weather event attributed to climate change. This scenario has been studied with LiDAR Mapping. If the dykes at the Isthmus of Chignecto marsh located between New Brunswick and Nova Scotia are breached by storm surge, the only road into N.S., #104 Highway, would be flooded or completely washed away. Seventeen and a half billion dollars worth of trade travels on this highway yearly. What would be the cost to the N.S. economy and what would be the cost to repair? A similar scenario for Lockeport's beach /causeway could have devastating repercussions for the entire Town. The school board would move the students to Shelburne, maybe never to return. The Surf Lodge Nursing home would possibly have to relocate to the mainland, the local fishery could collapse and business would close due to the unavailability of a transportation route. Lockeport would lose the tax base and become a ghost Town from an extreme weather event resulting from climate change. Lockeport experienced the impact from Hurricane Bill in August 2009 and felt the effects of Hurricane Sandy 1200 km. away in Oct of 2012. Will Lockeport be prepared for something more extreme?

The purpose of this climate change action plan is for Lockeport to recognize and adapt to long term actual or expected climatic effects. Lockeport must be proactive in planning and management of the

Town's infrastructure and future projects. An energy management plan was prepared in 2009 for Lockeport and if followed will reduce Green House Gas Emissions (GHG) and in turn reduce Lockeport's dependency on fossil fuels.

There are two main responses to tackling the issues related to climate change: **Adaptation** and **Mitigation**.

**Adaptation** is built on the premise that appropriate actions are undertaken before major impacts occur or shortly after they take place, so that similar damage in the future is anticipated and minimized. Both of these types of adaptation responses can be planned in advance. In most cases, planned adaptation will incur lower long-term costs and is seen to be far more effective than simply reacting to climate change in an unplanned, ad-hoc manner. Adaptation at the municipal level also involves new ways of thinking about infrastructure design, renewal and maintenance. It involves adaptive land-use planning and neighbourhood design and also adaptive water and energy management, in addition to other adaptive measures that will help to ensure that the Community is prepared and will be resilient.

The MCCAP Working Group has determined vulnerable infrastructure issues and has compiled a list of priority locations and infrastructure that will have to be addressed by the present and any future Town Council and staff. A deeper understanding of the locations and infrastructure within the Town where climate change impacts could, or will happen are issues that **will** require informed management practices. An impact becomes an issue when it intersects with the management and operation of the Town, or where it affects people and property. The Town of Lockeport is one of the smallest municipal units in Nova Scotia. The geographic and population size does appear to make management and operation less overwhelming than larger municipal units; however, Lockeport has the same management issues as larger municipal units but must operate with a smaller tax base. Just as a severe weather event could devastate Lockeport, the cost of adaptation repairs could also ruin Lockeport economically and socially.

The Island portion of Lockeport is connected to the mainland by an isthmus known as Crescent Beach. Crescent beach being on the south side of the causeway and the paved road on the north is the only

transportation route to the mainland. The island portion and mainland (Brighton) complete the Town of Lockeport. Lockeport's population is 588 persons; there are 332 household dwellings and 487 parcels of land as of 2013. Lockeport has 8km. of shoreline in its jurisdiction excluding breakwaters and trestles. The shoreline owned by the Town is somewhat shorter at 3.14 km. this includes Calf Island Road, Roods Head the north side of Crescent Beach Causeway and Sam's Point (sewage treatment facility). One kilometer of former rail bed and trestles are also owned by the Town (X 2 sides= 2 km.). Past weather event issues and future climate change impacts for Lockeport do have one common benchmark that other municipal units may not have, Lockeport being surrounded by water cannot expand making impact locations and priorities past, present and future highly identifiable.

Where does the management of Lockeport begin in regards to adaptation and mitigation to climate change? A review of Lockeport's ICSP, adopted by Lockeport Town Council in March, 2010, shows priorities range from keeping the integrity of the causeway to maintaining a safe and healthy drinking water source. The four pillars of any ICSP are environmental, cultural, social and economic sustainability. A fifth and no doubt most important pillar to recognize for the safety and sustainability of any municipality is proactive governance. The priorities identified by past consultant studies for the Town range from repairing the beach dunes, to a second access to infrastructure assessment. Priorities identified by the MCCAP Working Group and stakeholders will show that Lockeport has initiated climate change adaptation decades ago and will now have a document to follow as climate change continues to impact Lockeport.

Current municipal agreements and jurisdictions have a negative effect on any urban (Town) Municipal Climate Change Action Plan. Rural Municipal infrastructures such as roads and bridges are maintained by Provincial tax dollars where as Town and City Municipal (urban) infrastructures have to be maintained by that municipal unit's rate payer. Therefore **rural** municipal Councils do not have the responsibility or tax burden that **urban** units have, creating a very uneven approach to climate change issues and priorities. Both rural and urban citizens share the use of any public infrastructures however **urban** infrastructures are not directly maintained by **rural** tax dollars. Rural Municipal Councils do not have to budget, design or tender to obtain Provincial and Federal permits or processes when Provincial roads and bridges are impacted by climate change. Urban Municipal Councils can exceed any budget and spend valuable time and resources on climate change adaptation issues without the ability to share the

costs by all those who utilize it. This is the single most threatening and costly issue facing Lockeport in its quest for climate change adaptation.

### **Impacts and Hazards**

The impact of *sea level rise* (SLR) coupled with the hazard of storm surge is the Town's greatest climate change vulnerability. Sea levels in Nova Scotia are expected to rise approximately 1+ meter by the year 2100 and will continue to impact numerous locations in the Town of Lockeport. Basically Lockeport is an island sitting in Allendale Bay, Shelburne County. At least 90% of Lockeport's infrastructure is located on the island portion. This infrastructure includes streets, sewage lines and pumping stations, Town owned buildings and recreational facilities. Most of Lockeport sits on solid bedrock with varying shoreline geologic features. The shoreline includes sandy beaches, cobblestone beaches, marsh lands, bedrock outcrops, grass and forested property, all sloping to the water's edge. Crest Street, John Street, Rood's Head and areas of Brighton Road are the most elevated areas of the Town. All other areas are low lying and are prone to sea level rise and storm surge. Currently (*during the preparation of the MCCAP*) Lockeport does not have LiDAR mapping but will have the mapping in the fall of 2013, so currently, exact locations and measurements for sea level rise are based on past observations and best estimates.

#### ***(Gradual High risk)***

*Storm surge* has and will continue to create immediate hazards for Lockeport. Storm surge is an extreme weather event that residents have become aware of during Lockeport's history. At the present time, Lockeport experiences two or three severe weather events each year. With hurricanes or strong winds comes storm surge. Should the wind blow on shore from an easterly or southerly direction, powerful waves combined with the storm surge, have damaged infrastructure around the perimeter of the island. High tides and the full moon cycle can add to the impending weather event. With all of the above listed components coming together, preparing for storm surge while coping with sea level rise (SLR) identifies this as the most vulnerable impact and hazard from climate change. (***High risk***)

*Erosion* is a lesser issue as most of the under lying geology of the Town consists of bedrock; however, shoreline areas that are not bedrock have been damaged by erosion. Evidence of a drowned or submerged forest [1] can be seen at low tide at Rood's Head Park Beach. Centuries ago Cranberry Island was connected to the island portion of Lockeport by a ravine. Observations

show the eastern end of Crescent Beach has a greater shoreline retreat due to erosion. (***Moderate Risk***)

[1] A ***submerged forest*** is the remains of trees (especially tree stumps) that have been submerged by marine transgression, i.e. sea level rise. These remains have usually been buried in mud, peat or sand for several thousand years before being uncovered by sea level change and erosion. In some places the remains are normally covered by sand and only rarely exposed.

***Flooding*** and runoff from increased rainfall, to date, has had little damage to the wastewater infrastructure. Unforeseen consequences could occur when an increase in water volume exceeds the design capacity of the facility. Most homes in Lockeport have an issue with basement or cellar flooding. Increased heavy rainfalls will put a greater volume of water into the wastewater treatment facility as a number of homes directly pump runoff water into the sewage lines. Overland flooding from continued sea level rise and storm surge is quite common for Lockeport and will impact infrastructure such as streets, pumping stations and public walkways. (***Moderate risk***)

***Hurricanes and high winds*** have always been an issue for Lockeport as its geographic location in Allendale Bay provides little protection from these weather events that travel from the open Atlantic Ocean. The damage to the shoreline from pounding surf and storm surge, as a result of hurricanes and high winds, are evident; however, Town owned buildings and structures could also be impacted. Hurricanes are isolated events but will become more severe and more often due to increased temperatures. Hurricanes follow warm water channels flowing from the leeward Caribbean Islands along the Atlantic coast. As the ocean and air temperatures increase, the greater and more frequent risks from these events will occur.

**Actions should include ongoing upgrades to infrastructure and aggressive (beyond building code) design for all future infrastructure projects. (*High risk*)**

***Drought*** will gradually impact Lockeport as the summer season has higher temperatures and less rain, while the winters have less snow, leaving less fresh water for private wells. It is not known how SLR will affect the fresh water table beneath the island portion of Lockeport; however, Lockeport is completely surrounded by salt water and as a result; this could influence the potable quality of any private well. This is a compound impact for the Town. Not only will climate change cause a shortage of fresh water but sea level rise and overland flooding could contaminate the fresh water supply with salt water. (***Moderate risk***) (*See NSTIR Hayden Lake Water System page 26*)

Lockeport is not overly vulnerable to **Forrest Fires** as there are only limited stands of trees on the island and small forested areas located on Brighton Road. Forrest fires are always a concern; hence the Volunteer fire department collaborates with other municipal fire departments for a proactive approach to the issue. It should be noted that any natural hazard currently deemed as a low priority could become a greater vulnerability as climate change impacts over time are experienced and a deeper understanding is acquired. **Action: Clearing of deadfalls at Rood's Head Park. (Low risk)**

## **Locations and infrastructure**

*The following locations are expected to be at greatest risk to the public due to SLR, storm surge and prolonged rainfall ranging from low to high risk (See Canada/ Nova Scotia Infrastructure Secretariat (CNSIS) spreadsheet, appendix c.). The term (low risk) is used until locations where SLR will breach the safety point. At that time the risk could go from low to high bypassing any moderate level. Implementation for any adaptation projects at these locations will require **engineered plans & designs** with the assistance of **LiDAR mapping**. The locations include roads, sewer lines, pumping stations, water lines, sidewalks, culverts and power lines. Keep in mind, these locations and impending climate change hazards will be gradual and ongoing. Any implementation and costs associated to adaptation plans should be reviewed and upgraded accordingly. **Council must integrate the adaptation projects into their regular Capital Investment planning process.***

**1\* Locke Street (Crescent Beach Causeway):** Although *Lockeport's greatest natural asset appears natural, the dunes for the most part are manmade and hold back tides that once flowed into the back harbour. The Beach and causeway are the economic, social, cultural and environmental lifeline for Lockeport.* Crescent Beach, locally known as the Big Beach, is approximately  $\frac{3}{4}$  of a kilometer (850m.) long. It is a white, fine grain sand beach with grassy dunes varying in height, and running its length. The dunes at the eastern end of the beach, for the most part, were cobblestone. In 1996, Hurricane Hortense breached the dunes at the western end of the beach. Revetment (rip rap) at that time was a total of **370m** extending eastward. More than a year after Hurricane Bill on August 23, 2009, **390m** of armor stone revetment repaired the dunes at the eastern end of Crescent Beach, extending westward. Due to sediment issues and a greater shoreline retreat at this location, the stone was not backfilled with sand, disallowing any vegetation to grow on this section of the former cobble stone dunes. The revetment towards the



middle of the beach has been covered with sand and now has vegetation cover allowing stabilization and gives the dunes a natural appearance. To date there are **90m** of dunes unprotected from storm surge erosion or wave action blow out.

*“Since this is the main transportation, power and communications corridor to the Town of Lockeport, human safety overrides environmental concerns when making decisions about restoration after major damage to the beach by storms”*

A draft report (2009) of Crescent Beach, Lockeport, NS. By **R.B. Taylor, Geological Survey of Canada.**



*Pictured from left to right: back harbour, salt marsh, boardwalk and lamps, Locke St, dunes, Crescent Beach and Atlantic Ocean*

This causeway is the only transportation access route on and off of the island. This narrow isthmus and infrastructure within, is only protected from the open Atlantic Ocean by the dunes of Crescent Beach. Town owned infrastructure includes Locke St., sewer line, two sewer pumping stations, a public boardwalk with lighting, sports fields, museum complex (2 buildings) and in ground phone lines. To the south is Crescent Beach, Provincially owned and protected under the Nova Scotia Beaches Act and administered by the Nova Scotia Department of Natural Resources. The north side of the causeway, above the ordinary high water mark, is under the jurisdiction of the Town of Lockeport. The boardwalk is less than 1m above the ordinary high water mark. The tidal marsh located here is the habitat to many species of shore birds. Although storm surge occasionally impacts this area (north side of Locke St.), sea level rise will gradually flood the marsh; submerge the boardwalk, the lighting infrastructure and endanger the

Elementary School. Hurricanes and storm surge have impacted the beach and dunes many times over Lockeport's 106 year incorporated history. The most recent was Hurricane Bill on August 23, 2009. The storm surge from this hurricane breached the dunes in several locations causing flooding to the Town's Museum complex, the sports fields and resulted in closing Locke St. access for 45 minutes. Although the Town had partial success in repairing the dunes in the breached areas, there remains 90 meters of weakened dunes that could fail at any time from any sizable storm or surge. Partial reactive success was achieved after 18 months and many meetings between the Town's Mayor, Council and Administrative staff with numerous Provincial Departments. The Town did gain valuable knowledge from the dune revetment process, as to what is the suitable method of repair with an engineer's guidance. Proactive management and wise budget planning should be the actions by the Town Council and staff to insure the continued integrity of this access; however the Town cannot *properly plan* or *accurately budget* for any infrastructure outside of its jurisdiction. The consequences of having to rely on a Provincial Government Department to maintain the integrity of the dunes for protection of the Town's infrastructure and sustainability creates an unnecessary challenge and develops a felt loss of control. Any damage and associated costs from natural hazards to the beach, dunes, causeway infrastructure or salt marsh areas are beyond Lockeport's sole responsibility. The eventual loss of the causeway to and from Lockeport is not just a Lockeport issue. The surrounding population in the Municipality of the District of Shelburne relies heavily on Lockeport's infrastructure for medical and fire protection. Lockeport is the location of hundreds of jobs in the fishing, tourism and electronics industries. Endangered Piping Plovers nest on Crescent Beach adding to the environmental complexity. Other essential services located in Lockeport are banking, post office, nursing home, pharmacy, grocery store, hardware and so on. Lockeport is also the immediate centre for social activity. Education, recreation and entertainment make up the social and cultural fabric supplied by or located on the island portion of Lockeport.

***Actions: 90m of armor stone revetment to be completed. Elevate the entire length of street/causeway. Second access a priority. Ongoing monitoring. (High risk from SLR and storm surge, High priority for adaptive action)***

***Stakeholders: Town of Lockeport, Department of Natural Resources, Department of Fisheries and Oceans, Nova Scotia Transportation and Infrastructure Renewal, Bell Alliant, NSPI.***

**2\* Locke Street (west):** This Street runs the length of Crescent Beach and as previously noted is the only access to and from Lockeport. Locke Street continues from the intersection of Brighton Rd. (the beach corner) towards West Head. This .6 km. length of street includes a 200 meter section of low laying surface less than one meter above the ordinary high water mark. Town infrastructure along this street includes The Crescent Beach Centre and sewer lines. The west side of Locke St. is in Lockeport's jurisdiction and a portion of the east side is in the Municipality of the District of Shelburne's jurisdiction. The sewer line crosses jurisdictions at this location and services tourist accommodations located in MDS jurisdiction. The 200 m. section of

*Locke Street West during storm surge Feb 2013*



*Locke Street West during Hurricane Bill 2009*



street in question is bordered on the east by what is known as the second beach. This smaller section of Crescent Beach is divided by an outcrop of bedrock. Storm surge and the debris carried with it, has stopped vehicle traffic between the outcrop (Lockeport) and Seaside Cottages (MDS) many times (*Hurricane Bill Aug. /09, Storm Surge Feb.9/13*). Heavy equipment has to be used to clear the stone and sand from the street causing delays at this vital access point for Lockeport. This vulnerable section of Locke Street is only protected by loosely placed armour stone between the beach and the shoulder. Although this section of street overlaps two municipal

jurisdictions, The Department of Natural Resources (DNR) has the jurisdiction of the beach allowing storm surge to breach it.

*Actions: armor stone banking on the east side (beach side) of this street is needed to prevent debris and erosion from altering traffic flow; however increased SLR and storm surge will prompt a decision to be made on street elevation. (High risk from impacts, High priority for adaptive action)*

*Stakeholders: Town of Lockeport, Municipality of the District of Shelburne, Department of Natural Resources, NSTIR.*

**3\* Chetwynd Lane:** This Street is located in the south end of Lockeport joining Church and John streets at their southern extensions. Chetwynd lane is one of two unpaved streets in Lockeport. Similar to Locke St. it faces the open Atlantic Ocean and will continue to be impacted by sea level rise and storm surge resulting in erosion and flooding. This street has been built across a natural ravine on the northern side of a pond and cobble stone beach. The ravine runs parallel with John and Church Streets. The ravine will possibly flood from storm surge and sea level rise, dividing the island once again as in the case of Cranberry Island being divided from Lockeport. There are currently two homes located on this street along with sewer lines and power lines. Chetwynd Lane, the intersection with John St. and approximately fifty meters of John St. towards the sewer treatment facility is vulnerable to storm surge flooding and erosion. Chetwynd Lane was impacted by storm surge during Hurricane Bill in 2009 and again on Feb.9/13. Overland flooding pushed debris onto the street and stopped vehicle traffic for several hours until it could be removed by machinery.

*Actions: elevation and armor stone banking is required at this location and should be considered before paving. Repairs to seawall (cobblestone beach). (High risk from impact, High priority for adaptive action)*

**4\* South Street:** This Street is vulnerable to storm surge and SLR at **three** locations. (*Currently moderate risk*) (*Action: ongoing monitoring of the locations*)

(I)The first location is at the corner of Hall and South Streets. Crescent Beach is within meters of this corner. Using historical information to date, this location has never been impacted by storm surge;

however, it should be noted that SLR and storm surge events will cause this area to become an issue for concern.

(II) The second location is at the corner of Lower Water Street and South Street. Wave action at this location should not be an issue as the inner harbour is protected by two breakwaters. Sea level rise will impact this intersection as it is low lying and is the only access link between the southern end of Lockeport to the remaining portion of the Town. The land shape of this area is somewhat of a basin. Infrastructure at this location consists of streets, sewage lines, surface water drains, a small boardwalk, homes and businesses. This location will be impacted by storm surge overland flooding coupled over time with sea level rise. Essential emergency services for the southern most portion of Town could be compromised should storm surge cause flooding at this location.

***Action: Elevation at this intersection will at the least allow access to the south end of Town as SLR impacts the area. (Currently, moderate risk)***

(III) The third location on South Street is from the intersection of John St. to the end of South St. where it joins to the South Government wharf. Including the street, infrastructure consists of a pumping station, sewage lines, surface water drains and the outflow line from the Town's sewer treatment facility. This length of South St. runs parallel to the inner harbour and is within one meter of the ordinary high water mark. The protective bank between the street and the water consists of loosely placed armour stone. The low lying intersection is next to a small sand beach, which doesn't provide protection from any heightened water level impacts. This section of South St. has significant social/cultural importance for Lockeport as it has been registered as Nova Scotia's First Historical Streetscape. This street is also the only link to the South Government wharf and nine residential properties. This section of South St. is for single lane vehicle traffic only.

***Actions: The Street could be widened as was done with the shoulder of Brighton Road and elevated allowing more aggressive armor stone to be installed protecting it from SLR. (Currently, moderate risk)***

**5\* South Water Street:** This street is located on the eastern side of the Town and runs through an industrial zone. Starting at the intersection of South and South Water Streets and ending at the entrance to Clearwater fish processing plant, its length is 325 meters. Currently there are seven businesses located on this street. Infrastructure located here consists of Town sewer, fresh water supply lines, salt water supply lines, street drainage, fire hydrants and a sewage pumping station.

This location is the Town's working waterfront with the infrastructure of the street behind the private business properties. The entire length of the street will be influenced by sea level rise as current ordinary high tides are within one and a half meters of the street elevation. Prolonged heavy rainfall should also be monitored at this location since large volumes of surface water runoff from Crest St. and Beech St. could impact the street and infrastructure.

**Action: ongoing monitoring. (Currently, moderate risk)**

**6\* Calf Island Road:** At one time, Calf Island Road was the access road onto Lockeport. Perpendicular to Brighton Road, it crosses the back harbour and connects to the island at Bridge Street. There was once a metal and wood bridge spanning 90 meters of the total 430 m of Calf Island Road. This road has been a dead end for more than fifty years due to the removal of the bridge. The road accesses two residential properties and sewer lines. Calf Island Road also carries a most important piece of infrastructure as it is the fresh water supply.



*Ordinary high tide*



*Feb. 2013, road submerged*

The water supply infrastructure is owned and maintained by the Department of Transportation and Infrastructure Renewal (NSTIR), Province of Nova Scotia. This fresh water supply infrastructure was installed in the mid 1970's for the commercial fishing industry (fish processing facilities). The water supply is also connected to the schools, Surf Lodge Nursing Home, tourist accommodations, numerous commercial businesses and fire hydrants excluding residential hook ups. Calf Island Road is located at the base of a hill from where the gravity feed reservoir tower is located. The supply line is buried and spans the length of the road then crosses a 90 m channel onto the island portion of Town. The only power transmission lines supplying Lockeport are located on NSPI poles at Calf Island Rd. The road is narrow and surrounded on both sides by water. The gravel surface is held stable by small to medium size stones (rip-rap) on both banks. Over the decades Calf Island Road has been submerged by high tides and storm surges numerous times. Current climate conditions make the road and its infrastructure vulnerable to impacts, only to increase over time. Although upgrade repair costs are presently out of reach in Lockeport's budget, a very strong case can be made for Calf Island Road being developed as Lockeport's second or main access.

***Actions: This road could be elevated and its banks stabilized with armor stone on both sides. Ongoing monitoring and collaboration with NSTIR on any actions. This location could possibly be developed into a second access route for Lockeport. (Currently, moderate risk priority for adaptive action)***

***Stakeholders: Town of Lockeport, Private Property Owners, Nova Scotia Transportation & Infrastructure Renewal, Nova Scotia Power Inc.***

**7\* Brighton Road:** This road is 2.45 km. with the most vulnerable section from SLR and storm surge being at the intersection of Calf Island and Brighton Road. The ordinary high water mark determined by the Department of Fisheries and Oceans (DFO) (2009), is within one meter of a 175m section of the road. This low laying portion of the Brighton Road will eventually be impacted by storm surge and sea level rise. Power lines, poles and trees along the Brighton Road could also block this access route if impacted by high winds and hurricanes. In 2010 the Town completed repairs to 460m of this road. The work done at that time consisted of new shouldering of 3m wide (top surface); the new grade and toe of the shouldering extends 7.5m into the water of the back harbour. The Town underwent a DFO Habitat Alteration, Disruption or Destruction of Fish Habitat (**HADD**) process. **DFO referral and authorization No. 09-HMAR-MA8-00173.** The length of the repair is armor stone. The road surface was not elevated. Again, costs associated with a project of this scope for Lockeport's budget was unaffordable.

*Action: The integrity of this section of road and pumping station will depend on an elevation correction. (Currently, low risk)*

**8\* North and Upper Water Street (intersection):** This intersection is vulnerable to prolonged rainfall flooding and storm surge. The infrastructure located here consists of sewage lines; drainage lines, a pumping station and a Nova Scotia Power (NSPI) substation. The intersection is a basin shaped land form. North Street, at a higher elevation, leads down to the intersection then continues on to Upper Water Street at a higher elevation. The area is basically at sea level but is somewhat buffered from the ocean by a former Canadian National Rail Line that acts as a sea wall. Between the intersection and seawall lies a tidal pond. This pond is gradually being back filled by private residents living opposite the street from the pond. At this time it is not understood if the back filling is legal or if it has a positive or negative impact on the scope of the issue as it could be displacing storm surge. The privately owned NSPI substation is an integral piece of infrastructure for the Town's sustainable operation. A loss of electrical power from this infrastructure would shut down operation of the Town wastewater and drainage system.



*Storm surge at intersection of North and Upper Water Streets, Feb. 2013, 16 inches of water and ice.*



*Actions: Elevation for this intersection and a portion of the street will have to be revisited as SLR possibly impacts the location. The Town and EMO should initiate discussion with Nova Scotia Power on the importance and vulnerability of the substation's location. An upgrade to drainage at this location should be investigated. Contact with the Department of Fisheries and Oceans over the backfilling of the tidal pond (DFO jurisdiction) would be due diligence on the Town's part and possibly lead to an informed solution. (Currently, moderate risk)*

*Stakeholders: Nova Scotia Power Inc.(NSPI), Department of Fisheries and Oceans (DFO)*

**9\* Trestles:** In 1923 a rail line and two trestles were built for shipping and transportation to Lockeport. In 1979 the Canadian National Railway discontinued service to Lockeport. The rail bed and two trestles became the assets of the Town of Lockeport in 1984. The rail bed and trestles are currently the secondary access to and from Lockeport, "by foot". The materials used for construction of the trestles are creosote treated wood posts and timbers. The trestle closest to the island is 45 metres in length and the second being 80 metres in length. A fenced boardwalk has been constructed at both locations for pedestrian safety only. In July 2013, ABLE Engineering completed a report for Council on the physical condition of the trestles. Repairs to

the trestles could run in the tens of thousands of dollars. The trestles, being quite visible and above ordinary high water levels, are a gauge, as the Community will comment on any extreme high tides or storm surges seen to impact the trestles. The trestles, to date, are approximately 90 years of age. The integrity and stability of the trestles have withstood many extreme weather events over the years and with upgrades, will for many more; however, the pedestrian boardwalk sections of both trestles are in a deteriorated state. Sea level rise will submerge the trestles in the coming years unless they can be elevated and possibly be upgraded for a safe second pedestrian or vehicular traffic access. *(Currently, high priority for action as this is the only other pedestrian access to and from Town)*

*Action: Major Reconstruction. Any upgrades should include an elevated traffic surface to compensate for sea level rise. LiDAR mapping will help determine proper elevation.*



*The Trestles, Calf Island Road and the Crescent Beach Causeway in the background.*

### **Buildings and Infrastructure**

*The Town of Lockeport currently is responsible for thirteen buildings, two sports fields, two public parks and one playground. Council and staff are accountable for the maintenance, insurance and safe use by the public for these buildings and infrastructure. As Lockeport acquires a deeper understanding of climate change and the results of impacts, an ongoing vulnerability assessment of these properties will be required. The risk levels described are associated to the structures from natural hazards not immediate public safety.*

**1\* The Crescent Beach Centre:** *157 Locke Street. Constructed in 1994, wood structure to code, partial concrete foundation/ basement, asphalt roof shingles. Town sewage connection, dug well. Heating source: forced air oil furnace and electric baseboard; two onsite storage buildings.* This structure was built in 1993/94 and opened in 1994. Its function is a Visitor Information Centre. The building was operated and maintained by an independent board of directors until 2010. The funding was put in place by the Federal Government of the day to compensate and move Lockeport towards tourism sustainability after the closure of the largest fish processing employer. The Lockeport Town Council, at that time, did not take on the responsibility of the building but did contribute to the location. It is assumed that consultants and architects hired for the project were not familiar with the vulnerable location on Crescent Beach. In **2010** the remaining board members of The Crescent Beach Centre legally turned ownership of the building over to The Town of Lockeport. During the past seventeen years since its construction, maintenance and operational costs have hampered the sustainability of this building. To say the least, average weather conditions in a less vulnerable location would incur maintenance costs for any structure; however, the design, building materials and location of the Centre, compounded by gradual impacts resulting from climate change, makes this a **high risk** structure. High winds and heavy rainfall have caused leaks in the roof and windows. Corrosive salt water and salt air have rusted metal doors and outside light fixtures. In 1996, Hurricane Hortense breached the dunes, flooded the basement and filled the well with salt water. The well water is tested yearly and is not safe for human consumption due to high levels of arsenic. Presently, the building is closed for the winter months because of high heating costs. Although there is a partial basement, most of the building is supported by large posts elevating the structure four feet above ground level. This design may have created the height needed for a view above the dunes on the first floor; however, the design compromises protection from exterior damage and energy loss from high winds. The roof shingles and outside light fixtures were replaced within the first fifteen years, far sooner than average wear from weather conditions. Sea level rise and more frequent storm surge, as a result of hurricanes and high winds combined with heavy rainfall, will continue to damage the Crescent Beach Centre. This building is high in value due to the design, location and construction costs. *(Seasonal use only), (High risk from natural hazards, storm surge, high winds, SLR, salt water/air corrosion).*

*Actions: A review by Council and public consultation should determine the appropriate action to be followed for the continued use and maintenance sustainability of the Beach Centre due to the high risk from natural hazards and premature weathering. (Priority action: a municipal plan for sustainable management or divest the building creating a new taxable property, private development will have greater success of sustaining this property than tax dollars).*

*Stakeholders: Lockeport Town Council, ratepayers, volunteer groups and any institutions associated with financial support for the property.*

**2\* The Little School Museum & Marine Room Complex: 29 Locke Street. Constructed 1845, Wood structures, 2x4 exterior walls, concrete foundation, asphalt roof shingles. Town sewage connection, dug well. Heating source: electric base board. A social and cultural landmark for Lockeport.** These two buildings are on the North side of the dunes of Crescent Beach. The Little School Museum was the first school house in Lockeport and it now holds historical artifacts for the Town. The Marine Room building is a newer building built in replica of the Little School. Both buildings and the well were flooded by salt water and exterior damage occurred as a result of storm surge from Hurricane Bill, in 2009. In 2011, the Little School was elevated by 24 inches and placed on a new concrete foundation. The Marine Room sits at a slightly lower elevation. Due to the age of the Little School Museum and advice from contractors and public consultation, the structure was not relocated. Both buildings sit in a basin bordered by Locke St., beach dunes and adjoining elevated properties. Hazards associated with this location are heavy rainfall flooding, storm surge/SLR flooding and damage from hurricanes and heavy winds. Currently, the buildings are protected from storm surge, as dune revetment in 2010, behind the buildings, has taken place. Since the Museum now sits at a higher elevation, the hazard of heavy rainfall can be managed providing a sump pump is installed at the Museum and the culvert kept clear of debris. Sea level rise will gradually factor into the safety of the buildings as this location is at sea level. Although these buildings are not high in property value; the Little School Museum is invaluable to the Community. *(Seasonal use), (Currently, moderate risk from natural hazards)*

*Below: Little School Museum & Marine Room flooded from Hurricane Bill storm surge 2009*



**3\* Wastewater treatment facility:** 94 John Street. Constructed 1978/79, Brick and mortar structure, concrete slab floor, flat asphalt roof. Town sewer connection, dug well. Heating source: electric. Salt storage building and equipment: wood structure, concrete slab floor, asphalt roof shingles. These buildings are constructed on an exposed outcrop of bedrock approximately two meters above ordinary high water level. Other than routine maintenance, these buildings should be capable of withstanding potential damage from harmful climate change effects for the remainder of their life span. There is a small area of erosion and washout at the southwestern corner of the facility compound. The staff responsible for this facility do not foresee any natural hazards affecting the structures. Any future construction at this location should be developed with engineered designs due to the vulnerable location. **(Currently, low risk from natural hazards)**

**4\* Storage building, Roods Head:** 19 Roods Head Lane, wooden structure, concrete slab floor, asphalt roof shingles. Heating source: electric. Town sewer connection, drilled well water supply. This building houses seasonal showers for campers as well as for storage purposes. The building could be prone to wind or fire damage as the location is surrounded by trees and directly exposed to hurricanes and high winds from the Atlantic Ocean. **(Low risk from natural hazards)**

**5\* Seacaps Marketplace:** 57 Hall Street, open wall post and beam structure, concrete slab floor, beam and decking cathedral ceilings, asphalt roof shingles. Electrical panel; non heated. This

structure is an open air market venue built in, 2005. It is used for many Town events and celebrations. The structure is an engineered mortise and tenon joint design with metal fabricated plates bolted at crucial joints. Although the building is built to code, hurricane winds could cause structural damage as the building could act as an umbrella, catching extreme wind for the lack of walls. The building is open to the public year round. (*Moderate risk from natural hazards*)

**6\* Lighthouse Stage/ Support Facility:** 61 Hall Street, constructed 2010, wooden structure, concrete slab floor, engineered roof truss system, asphalt shingles. Heating source: electric. Town sewer connection, Provincial water connection. Five onsite storage buildings. This building was built in 2010 and serves two purposes. It acts as a focal point for the Town and surrounding area as an entertainment stage facility. The building also houses the garage and office space for the Volunteer Medical First Response Unit. The building is to code and engineer designed. The metal stage door measuring 12'x 32' should not be used in winds exceeding 40 km per hour. The building is basically seasonal with the office space having minimal use throughout the year. (*Low risk from natural hazards*)

**7\* Lockeport Fire Hall:** 67 Hall Street, constructed 1986, engineer designed brick and wood structure, concrete slab floor, asphalt roof shingles. Heating source: electric. Town sewer connection, dug well. This building has two stories and is the Emergency Communications Centre and Emergency Operations Comfort Centre. There are two meeting rooms and office space on the second floor. The first level houses the Volunteer Fire Department vehicles and firefighting equipment. An auditorium, kitchen space and washrooms are located in the west half. The building is used as a Comfort Centre should any weather event or emergency develop and public shelter required. The building is used year round with minimal use of the auditorium. (*Low risk from natural hazards*)

**8\* Town Office:** 26 North Street, wood structure, concrete slab floor, asphalt roof shingles. Heating source: electric. Town sewer connection, Provincial water supply. This building is approximately 100 years of age. The structure was constructed as a theatre and has since been maintained and modified to accommodate the Town's offices and recreation facilities. The

recreation space at the back of the building consists of a large open room with walls extending over 30 ft. in height. Although the building is maintained for public use, the structure was built before National or Provincial Building Codes came into effect. This is a very public orientated building hosting social events, children's preschool and recreational activities. Due to the age and initial use, half of the building lacks any load bearing support and is susceptible to hurricanes and heavy winds. Immediate concern to public safety would be the lack of access to the eastern side of the building by the Fire Department. There is a fence at this location and the only access is through a locked gate owned by a private business. This building is used year round. (*Low risk from natural hazards*)

***Action: structural assessment. \*The Town should investigate having the fencing on the east side of the building setback to accommodate emergency vehicles accessibility.***



*Energy efficient windows being installed at the Town Office building winter 2013.*

***9\*Library: 35 North Street, constructed 1980, wood structure, concrete slab floor, asphalt roof shingles. Heating source: electric baseboard. Town sewer connection, dug well. This building houses the Town library. Proactive maintenance will sustain the longevity of the structure as it is not currently prone to any natural hazards. (Low risk from natural hazards)***

**10\* Lockeport Medical Clinic:** *44 Spruce Street, constructed 1950's, wood structure, concrete foundation, asphalt roof shingles. Heating source: electric baseboard. Town sewer connection, drilled well.* This building currently houses doctor's offices and blood clinic. Proactive maintenance will sustain the longevity of the structure as it is not currently prone to any natural hazards. (***Low risk from natural hazards***)

**11\* Sports fields:** *Locke Street, currently baseball field and soccer field, two cement block dug outs and one cement canteen with asphalt roof shingles. The sports fields are bordered by a wooden boardwalk with electrical LED street lamps. These sports facilities are a huge part of Lockeport's social and cultural identity. This entire area, infrastructure included, is vulnerable to sea level rise. Currently, high tide is within .5m of flooding portions of the playing surface. Inadequate drainage will contribute to flooding from continued heavy rainfall. The building structures will experience damage from hurricanes and heavy winds. (Moderate to high risk from SLR and storm surge)*

**Action:** *ongoing monitoring*

**12\* Crest Street Look-off:** *Crest Street, wooden platform, one LED street lamp.* This public rest and viewing area could incur damage from hurricanes and high winds due to its exposed elevated location; however because it is a non essential low cost structure it is not a high priority infrastructure issue. (***Low risk***)

**13\* Rood's Head Park:** Located in the South end of Lockeport this property is a public picnic area. Although there is minimal visitor tenting, the park does not have the infrastructure for Provincial camping regulations. The property has one storage building and parking area. Black spruce trees, for the most part, grow here and have a limited life span. The park has many dead fall trees and coupled with drought could be most vulnerable to fire. Although the park is small, accessibility to fight a fire would be challenging. Safe and easier access for firefighting equipment should be a priority for this location.



***Action: routine clearing of any deadfall and underbrush. (Low risk)***

**14\* Schools:** 10 Locke Street, brick structures, concrete slab floors, asphalt roof shingles. Heating source: electric and oil fired hot water boiler. Town sewer connection, Provincial water supply. The Lockeport High and Elementary Schools are owned by The Town of Lockeport and are leased by the South West Regional School Board (SWRSB). The SWRSB maintains, administers and is responsible for the buildings. In 2010 Lockeport Schools were recognized by The United Nations Educational, Scientific and Cultural Organization (UNESCO) for the “Associated Schools Project Network” a program aimed at human rights and freedoms and environmental sustainability. The program partners with eight thousand schools in 179 countries; Lockeport being the only school east of Quebec. The Town of Lockeport is one of few Municipal Units in the Province that owns school property and infrastructure. This unique arrangement has, for decades, allowed Lockeport to maintain its identity by keeping the school and students in the Community. The student population consists of Lockeport and MDS students. The elementary school’s location will make it vulnerable to sea level rise. The Elementary School is at ground level with the sports fields and will gradually face a flooding hazard. The High School sits at a higher elevation and will not experience the same threat. The greatest threat to the school’s sustainability due to climate change will be the integrity of the causeway. Should SLR and storm surge damage the causeway for even a short time, leaving the schools without a transportation access route, the only option would be to bus the students from the Municipality of the District of Shelburne to another location and determine a strategy for the on island students. Other than losing access to Lockeport, losing access to the schools would be a devastating blow to Lockeport’s economic, social and cultural sustainability. This is a residual effect of climate change.

***Action: The Town should initiate discussions with the SWRSB on a collaborative plan should the causeway be impacted. The UNESCO designation is a missed recognition opportunity for Lockeport and should be re established. (High priority)***

***Stakeholders: Town of Lockeport, Municipality of the District of Shelburne, South West Regional School Board, the Province of Nova Scotia, UNESCO, NSTIR (potable water)***

**15\* Boardwalk:** *Locke Street, back harbour salt marsh, wooden structure with concrete footings, electric street lamps.* This independent volunteer project was initiated in 1995 as a Waterfront Development Project with funding through the Nova Scotia Department of Economic Development and Federal program. The volunteer committee consisted of local businesses and public stakeholders. Public consultation and information sessions were held and received full support to proceed with the project. Lockeport Town Council did not take part in the initial project but did allow the use of Town land for the project. Since this project was funded by the Federal and Provincial Governments of the day, an environmental impact assessment was required and passed before the project could proceed. The impact assessment was conducted by Acadia University with the only environmental concern at the time being safe use of machinery and fluids in a coastal marsh zone. Over the years several Town led projects have extended the boardwalk, including LED street lamps, to a length of 750 metres (3/4 km). Each boardwalk extension project required an environmental impact assessment due to partial funding from Provincial and Federal programs. The Town, having done due diligence for every project, has proceeded with boardwalk extensions not fully understanding the scope and depth of sea level rise nor the impact of SLR being identified in the environmental assessment. It is evident that with any above normal high tides and the boardwalk's location, it will be vulnerable to sea level rise. The lighting will be vulnerable to SLR and extreme wind.

**Action:** *The boardwalk could be elevated however a newer boardwalk at a higher elevation should be considered when the lifespan of the existing boardwalk is over. (Moderate risk)*

**16\* Sanitary Sewer System:** *This system was installed in 1979 and is the Town's largest infrastructure asset. By law, every private, public and business building must be connected to the sewer system for the health and safety of the public and protection of the environment. The system has a treatment facility at the end of John Street including over 10km. of lines and 13 pumping stations. Included in this system are the storm sewer system pipes and catch basins.* Locations that have been identified as vulnerable to climate change impacts will also affect the sewer system infrastructure at these locations. Sea Level Rise is identified as the highest source of impact on the system followed by heavy rainfall and flooding. Erosion and low temperatures could play a part in the vulnerability to the system, due to the fact that the lines are buried in the

streets of Lockeport, as in any other Town, it is not possible to accurately measure the impacts of these hazards.

*Actions: Any adaptive actions to vulnerable street locations previously noted should take into account maintenance and protective upgrades of the sanitary sewer system infrastructure.*

*Ongoing awareness, monitoring and reviewing of potential impacts to the entire system should be forefront in adaptive actions.*

**17\* The Hayden Lake Water System:** The system is owned and operated by the Nova Scotia Department of Transportation and Infrastructure Renewal. The water system was initially constructed in 1980 for use by fish plants in the Town of Lockeport as a “non potable water supply”. It now supplies water to approximately a dozen industrial, institutional and commercial users. There are currently three residential users on the distribution system as well as the Town fire hydrants. As mentioned previously, drought will gradually impact Lockeport as the summer season has higher temperatures and less rain, while the winters have less snow, leaving less fresh water for private wells. It is not known how SLR will affect the fresh water table beneath the island portion of Lockeport. As a result, small amounts of salt water could influence the potable quality of any private well. This is a compound impact for the Town as not only will drought cause a shortage of fresh water, but sea level rise and overland flooding could contaminate the fresh water supply. Calf Island Road has been determined to be at the greatest risk from SLR, storm surge and salt water line corrosion in regard to the water supply; as it is buried in the road at this location. Any locations in Lockeport that are vulnerable to climate change and hold the water supply system infrastructure should be a focus for not only the Town but also NSTIR. The Lockeport ICSP, completed in 2010 points out the necessity of investigating the financial ramifications and responsibilities of acquiring the Hayden Lake Water Facility. In January, 2013, the Lockeport Town Council approved the following motion.

**02-11-13-03**

**It was moved by Councillor Williams and seconded by Deputy Mayor Townsend that as recommended by the Economic Development/Planning Advisory Committee, it be identified within the Municipal Climate Change Action Plan that it is Council’s intention to acquire the services of a consultant to further investigate the current and future status of the water supply within the Town of Lockeport and determine options available and recommendations to address the situation.**

**Motion Passed**

## Climate Change and Social Considerations

Lockeport, due to its geographic location and surroundings, has developed over its history, somewhat of a culture of independence. Social and cultural independence are perhaps Lockeport's greatest assets. Although Lockeport was settled because of its close proximity to lucrative fishing grounds, it is fairly distant from larger populated service areas and main transportation routes. In the mid 1970's the Canadian National Railway discontinued service to Lockeport and later on this service was dropped from the entire South Shore. During the 1980's, Lockeport experienced the effects of Provincial Government services downloading by having to take responsibility for roads, bridges and transportation infrastructure that was once maintained by Provincial tax dollars. These developments, over time, have forced Lockeport to adapt to independent thinking and actions in many ways. Lockeport has one of the oldest volunteer fire departments in the Province, as well as a volunteer medical first response unit. Lockeport also has a privately owned nursing home and various volunteer Community organizations. Lockeport's independent culture has developed a safeguard approach for the entire Community in the event of most emergency situations. The volunteer fire department and medical first responders are continually upgrading skills and have a regional collaboration with Shelburne County East Emergency Measures Organization (SCEEMO). Lockeport, being small enough in geographic size and population, can quickly pull resources together in times of need. Climate and weather conditions are factors in the day to day, and year to year focus of Lockeport's economic and social sustainability. Climate change has unwittingly long been an issue for concern in Lockeport. Adaptation to weather events and natural hazards have for decades played a large part in Lockeport's independent existence and longevity. A reactive or proactive approach to climate change will in fact determine correct adaptive actions. With the knowledge gained from Lockeport's history in relation to weather events and current climate change forecasts and tools for adaptation, sustainable management of infrastructure should protect the social pillar of this Town for decades to come. *\*(To be noted but not assumed) Emergency responders in Lockeport know the approximate age and number of people living in every dwelling regardless of where they reside in the Town. Neighbours are not just next door but on every street. Lockeport has a very strong sense of Community. Thirty three per cent of Lockeport's population is 65 years of age or older (2011 Census Canada)*

The island portion of Lockeport, where most of the population and infrastructure exists, is basically surrounded by the ocean. Age and income demographics are spread evenly in Lockeport. Age, income and housing standards are mixed on every street. Any vulnerable areas identified at risk from climate

change include all age groups and equally at-risk population. One at-risk location and privately owned piece of infrastructure is The Surf Lodge Nursing Home. The North Lockeport location on Howe Street is within two metres of the current ordinary high water levels. The nursing home does have a continuity plan and the emergency first responders do have a plan of action for the senior residents; however, these plans are for a single event and short term. Sea level rise will force the home to re-evaluate the sustainability of the location. The causeway access to Lockeport, being the highest at-risk infrastructure for Lockeport, stresses the importance of a second access. The following are stakeholder's answers to the questions concerning the possible loss of the causeway (long or short term) due to impacts from climate change and how it will affect Surf Lodge Nursing Home:

- 1) Reduced access for staff. Currently the largest portion of staff would be cut off from the island if the causeway were closed.
- 2) Reduced access to supplies such as food, medication, and fuel.
- 3) Would limit resident's access to emergency health services and services beyond what are offered at the Home. (Physiotherapist, Occupational therapist, Home Physicians, etc.)
- 4) May prevent resident's admission to their preferred facility, if discharge from Surf Lodge is not possible.
- 5) May prevent families and volunteers from visiting the facilities; both are vital in the care provided to residents.
- 6) Many of the issues identified above would have financial impact to the home. Although funded through the Department of Health and Welfare, in most cases no additional funding would be made available from the Province to assist the home.
- 7) Plan for long term closure with the possibility of relocating residents if necessary
- 8) Not served by the Lockeport Pharmachoice Pharmacy. Rx medications are delivered from outside of Lockeport.

*Action: ongoing collaboration of emergency plans.*

*Stakeholders: Lockeport Volunteer Fire Department (LVFD), Lockeport Medical First Responders (MFR), Emergency Health Services, Emergency Operations Centre Management, Barrington Ground Search and Rescue, SCEEMO, RCMP.*

**Beach View Apartments** on John Street in the South end of Lockeport houses senior residents. This Provincially owned infrastructure is located on a high elevation; safe from SLR impacts but like any structure, could be impacted from extreme winds. All residents on the island portion of Lockeport will be

affected when the causeway is impacted. The emergency responders fully understand the issues Lockeport has regarding the threat to streets being impacted by storm surge and local street flooding. The LVFD and MFR include this property and residents in their emergency plans and training scenarios.

*Action: ongoing collaboration of emergency plans*

*Stakeholders: LVFD, MFR, Emergency Health Services (EHS), SCEEMO, RCMP.*

**Atlantic Heights Rest Home** on Crest Street is a private company, categorized under extended care facility to adults with disabilities to enhance their development of interpersonal, Community oriented, and activities of daily living skills (13 residents). Trained staff is provided 24-hours / 7-days a week (15 staff on call). The LVFD and MFR incorporate emergency scenarios with the staff and residents yearly. Floor plans with emergency exits are part of a database for this facility. Not served by the Lockeport Pharmachoice pharmacy. Rx medications are delivered from outside of Lockeport.

*Action: ongoing collaboration of emergency plans*

*Stakeholders: Lockeport Volunteer Fire Department, Lockeport Medical First Responders, Emergency Health Services, SCEEMO, RCMP.*

**Roseway Hospital** is the nearest hospital to Lockeport. It is located in Shelburne as is the nearest EHS ambulance service. Again, the health and safety of Town residents relies on a distant and off island health and safety emergency resource.

**Lockeport Volunteer Fire Department and Medical First Responders** serve Lockeport and surrounding areas located on the island portion of Town. Although Lockeport does have an ambulance and volunteer staff for medical first response, by law they cannot transport to the hospital. The volunteer fire department serves Lockeport and is a member of the mutual aid association. Emergency first responders also continue to work and share vital information with SCEEMO and the RCMP. Without a second access to and from Lockeport for emergency services, the social stability of the surrounding areas, including Lockeport, will remain at risk. \* *A large portion of emergency responders live off island.*

*Action: Keep all emergency vehicles on the island during a severe weather event. First responders need current list of persons on oxygen for safety purposes. Town Council and the Province of NS could investigate an identity system for private households with oxygen in use. (Currently kept private)*

*Stakeholders: SCEEMO, RCMP, EHS, MDS volunteer fire departments (Jordan, Little Harbour, Sable River), District Health Authority, Barrington Ground Search and Rescue, Canadian Coast Guard (at Clark's Harbour)*

**Emergency Operations Centre (EOC):** The basis of the operations centre located at the fire station and management is a multi-service, multi-jurisdictional effort that stresses the need for decision making, communication, co-operation and co-ordination among various services and jurisdictions to respond effectively in an emergency. The team manages the emergency response for the overall Community. Up to twenty four persons for sleeping and comfort can be accommodated at the centre during an emergency.

**Doctors and Medical Clinic:** For many years, Lockeport has been without the services of a permanent doctor. Like so many small communities, the stresses associated with being the only practicing doctor is overwhelming. Smaller Municipal Units do not always have the services and social infrastructure to attract professionals and Lockeport is a prime example. Lockeport is prepared to accommodate a doctor by owning a medical centre; however, this position would be a 24/7 job and a structure means nothing if a doctor is over worked. This scenario has played out in the past and Lockeport has seen several doctors staying only for a short time. Mayor, Council and Staff have made acquiring a doctor a priority as part of Lockeport's social safety net. This issue will be a continuing threat to public health and safety for the residents of Lockeport. Since Lockeport's location and accessibility to medical services is threatened by climate change impacts to the only transportation access to the Town, the services of a local doctor will be vital for social stability.

*Action: High priority to acquire full time General Practitioner*

*Stakeholders: Provincial and Federal Governments, Town of Lockeport, Town of Shelburne and Municipality of the District of Shelburne*

### **Climate Change and Economic Considerations**

As mentioned previously and documented in the ICSP, Lockeport was founded on the fishery and today the fishery remains the backbone of the local economy, society and culture. Lockeport's fishing economy directly supplies food for world export, supporting numerous packaging, transportation and retail operations. Economic and social considerations overlap many of the identified climate change impacts for Lockeport. Tourism, retail and electronics manufacturing have become important industries in the diversification of the economic sustainability of the Town.

The **Lobster Fishery**, being the mainstay of Nova Scotia's fishing industry, is constantly monitored for any changes or variants in the climate. The delicate balance of water temperature for the sustainability of the lobster habitat is a concern for the entire industry. Ocean water temperature increases of only 2 degrees can cause lobsters to start shedding their hard shells earlier --- a process known as molting--- revealing a more vulnerable soft shell lobster that's susceptible to disease. Severe weather events which endanger fishing crews delay the fishing season and destroy fishing gear (boats, traps and lines). Changes are going to have to come from various sectors of the industry, from the fishermen to the buyers, to the processors. Members of the maritime seafood sector say they're looking at making adjustments in the lobster industry as the Atlantic Ocean continues to heat up. Some fishermen and harvesters in Nova Scotia are looking at putting in a request to the Department of Fisheries and Oceans to adjust the timing of the lobster season to avoid the hottest months. Warming also forces fishermen to change some of their practices. In some areas, lobster excess can no longer be kept in underwater pens because the water is too hot. Producers of seafood use refrigerated containers, which keep the lobsters at a temperature of three degrees Celsius.

\*Boris Worm, a professor of biology at Dalhousie University in Halifax, said global warming trends suggests Maritime water temperatures will continue to increase, but it varies from region to region.

*“It's most likely that this will continue to be a problem and a more important problem in the future, we're not in a stationary environment anymore.”*

**Clearwater Fine Foods** (a global lobster and fish exporter. 200 plus employees) operates one of its largest lobster processing plants on Lockeport's waterfront. The direct and indirect workforce maintained at this facility is the single most important economic generator for Lockeport. The inshore lobster and ground fish sector are included as an essential part of the local fishing industry.

**Cotter's Ocean Products Inc.** A sixteen year old local company located on the Lockeport's waterfront buys and exports lobsters to twenty eight countries; primarily China. Depending on the time of year, there are fifteen to twenty employees with fifty boats selling lobster to the company. This business exported over \$8 million worth of lobster for the 2012 season.

**R. Baker Fisheries** established in 1972 processes ground fish and live lobster with prime export market to the USA. This fish processing business has approximately fifteen employees with annual sales between one and five million dollars.



*The Canadian Press Published: Monday, March 11, 2013 The Federal Fisheries Department says \$4.1 billion worth of Canadian seafood landed on tables in more than 100 countries last year, with lobster remaining the most valuable export.*

**Tourism** in Lockeport has rebounded from its decline in the 1940's to the mid 1990's. In the late 1800's and the first two decades of the 1900's, Lockeport was known as a tourist destination for vacationers from New England and beyond. The picturesque beauty of the beaches and the quaintness of a fishing Community island Town made Lockeport a very unique destination for artist and writers. Lockeport has once again reinvented itself as a destination and because of technology, despite poor transportation access (Discontinued ferry at Yarmouth, incomplete 100 series highway on South Shore), tourists visit from all parts of the globe. It is well known and documented in Lockeport's ICSP that the beaches of Lockeport are its greatest natural tourism asset. Tourist accommodations are located on Crescent Beach/Locke Street, Beech Street and several locations in the Municipality of the District of Shelburne, served by Lockeport. Tourism and retail business also share a mutual economic partnership for the area. Tourism is a climate sensitive industry and combined with Lockeport's natural assets an increase in tourism should be realized. Warmer temperatures will increase visitor numbers for longer stays as cities and inland urban areas become less tolerable of climate change impacts. Warmer water temperatures will lead to an increase of recreational activities for visitors and economic benefits for the local economy.

**Retail business** in Lockeport, like any Community, serves the local population without them having to burn fuel and travel outside of the Town for groceries, hardware supplies, pharmaceuticals, restaurants and liquor. These businesses also add to the services needed for the tourism industry. Lockeport does rely on the Town of Shelburne for more substantial services; however, it is the local satellite communities that also depend on Lockeport's retail businesses for convenience and fuel savings. In local terms, the outlying communities of Green Harbour, Osborne Harbour, Pleasant Point, Little Harbour, Sable River and any populations of the points in between, usually refer to themselves as Lockeporters when they visit beyond local boundaries. There is a strong sense of Community with a heavy dependence on Lockeport's retail businesses, and likewise, the Town's economic sustainability depends on the tax base generated by those local businesses.

**The Lockeport PharmaChoice** is an essential health care business for Lockeport as it is the only pharmacy between Shelburne and Liverpool. RX prescriptions, clinics and health care equipment are provided at the pharmacy. There are ten staff employed at this business. The pharmacy relies on daily deliveries to keep it adequately supplied.

**The Town Market** is the only grocery store on the island portion of Town. The store supplies all food items including fresh/frozen and a bakery. This business depends on daily deliveries to support the local needs. There are eight employees at this business.

**Allendale Electronics**, Water Street, a circuit board manufacturing business started just outside of Lockeport 40 years ago and now located in Lockeport has a workforce of 15 plus employees.

**Surf Lodge Nursing Home**, Howe Street, mentioned under social considerations with 36 resident beds, has a full time staff of 18 and a total of 65 on call.

**Lockeport Regional High & Elementary Schools**, Locke Street, mentioned under social considerations have a teaching, administrative and operational staff of 35 plus employees.

**The Lockeport Harbour Authority** is responsible for maintenance and commerce of the harbour and its infrastructure. Well aware of the impacts from storm surge and through constant monitoring, the harbour authority proactively maintains the breakwaters and wharf infrastructure. The Harbour Authority's infrastructure is identified but independent from Town locations identified to be impacted by climate change. The Town Council will need to collaborate with the Harbour Authority to retain and sustain protection and commerce within the harbour. Thirty five boats, including 70 fishermen/Captains are members of the Lockeport Harbour Authority.

**The Hayden Lake Water System** (*page 26*) was initially constructed for use by fish plants in the Town of Lockeport as a "non potable water supply" in 1980. It now supplies water to approximately a dozen industrial, institutional and commercial users. The system is also the supply source for Town fire hydrants for the protection of homes and businesses. This system is the basis of any economic sustainability for the Town of Lockeport. High risk locations for the system, previously identified in this plan, are directly focused on businesses as they are the principal users of the water supply.

Impacts from climate change will have an ongoing effect to all sectors of Lockeport's *economy* and *social sustainability*. An impact to the fishing industry from an increase of ocean temperatures is a global economic weakness with local ramifications. Lockeport and the surrounding areas entire economy will be negatively impacted if the Crescent Beach causeway is impacted by sea level rise and storm surge. This infrastructure has been identified time and time again as high risk from climate impacts and top priority for adaptation. A consistent safe supply of potable water is another economic consideration associated with impacts from climate change. Vulnerable locations such as Calf Island Road, through which the water system and electric power transmission travels, should be considered a high priority for adaptation. Drought could impact the fresh water supply located at Hayden Lake, 10 km from Lockeport

in the Municipality of The District of Shelburne. Again the issue arises with the infrastructure and the local economy as NSTIR owns the system, businesses are privately owned and management of the system does not lie with the Town.

*Actions for economic considerations: The Lockeport Town Council will support in principal any efforts by the fishing industry, tourism and retail sectors to foster a sustainable economic future for Lockeport and area. Council should explore acquiring land for future development on the mainland; for example, land running along the ridge parallel to Brighton Road. Any adaptation plans for locations and infrastructure identified to be impacted by climate change will take into account business infrastructure and economic considerations. Proactive maintenance and upgrades at vulnerable locations will maintain a reliable infrastructure for business and should be a priority focus for the Town Council and staff. The Town must integrate adaptation projects into their regular Capital Investment Planning process.*

*Stakeholders: Town of Lockeport, all local Businesses and Fishermen, NSTIR, DFO, SWRSB, NS Department of Economic and Rural Development & Tourism and the Municipality of the District of Shelburne.*

Figuratively speaking, any municipality is actually a business. It operates on income from tax revenues. Likewise, managing a Municipal Unit to keep it sustainable is the basis of any business. Climate change will force Council and staff to make tough decisions in order to keep Lockeport sustainable. Some benefits from climate change should be attainable if proactive management is initiated. Any properly operated business or Town will always be looking at ways to become more efficient so the bottom line is for profit to be returned back to infrastructure. Good governance will do this without a loss of services. Fiscal strains and aging infrastructure are forcing Municipal Governments in Nova Scotia to rethink management approaches. Lockeport has in recent history been able to manage more for less, being one of the smallest Municipal Units in Nova Scotia, with a yearly operating budget of approximately \$1,200,000.00. There are a few Town management considerations that could have a positive economic effect from climate change and a few already in practice. Lockeport Town operates with only two utility trucks for snow plowing and street/property maintenance (both diesel fuelled). Lockeport has initiated energy efficient upgrades for lighting, windows, doors and insulation for Town owned buildings. Town staff has taken part in several energy efficiency educational programs. Milder winters equal savings on road salt budgets and plowing associated costs. Some Town buildings could be better utilized; such as the seldom used fire hall or energy draining recreation centre. The Town should possibly incorporate into

long term plans, relocating or building an energy efficient Town office, thus creating a new tax base with the present location. Efficient use of any Town building is an energy efficient management practice. Lockeport is a destination for tourists and with extended warmer seasons a greater marketing focus should be placed on this industry. As the climate becomes less bearable in other regions of Canada and the US, Lockeport should see an increase of summer residents supporting the local economy for longer durations. Climate change impacts have made the Crescent Beach causeway a transportation adaptive priority; however, the protection of the beach will secure Lockeport's greatest natural tourism asset. These climatic issues should lead to an increase of population which in turn will increase the tax base of the Town. A greater local population will boost the need for more services and retail opportunities. Well managed economic plans, incorporating possible positive climate change issues, can keep Lockeport sustainable when other less desirable locations become impacted.

### **Climate Change and Environmental Considerations**

Unlike an urban municipal unit surrounded by concrete and asphalt, Lockeport is completely surrounded by sensitive natural habitats. Lockeport, in so many ways, will be influenced by climate change impacts on nature and the environment. The salt marshes, beaches and forests provide the breeding ground and lungs for sustaining coastal ecosystems. Nature is very resilient and has the capacity to adapt over time; however, increased sea level rise will force salt marshes to retreat inland and as a result force development to retreat. Whether this retreat for Municipal infrastructure is managed by proactive or a reactive solution, Council will have to make that choice. Beaches are constantly moving with a seasonal shift of sand from onshore to offshore including dune migration. Sea level rise and storm surge will have an environmental impact on the beach in its natural setting but will also influence and impact the road located at the beach. Erosion is another impact to consider regarding local environmental status. Being surrounded by water, Lockeport is experiencing erosion from wave action and sea level rise. Most of the Town sits on bedrock and bedrock outcrops but the shoreline is in retreat; threatening sewer lines that could breach containment, causing health hazards for private wells and natural sensitive areas. The protection of the fishing boats in Lockeport's harbour from storms is always a main concern for the locals. The protection of oil and fuel for the boats should also be a concern relating to weather events. Sea level rise could impact any of the wharfs or fuel storage facilities. Located at the south Government wharf is a waste petrochemical container used by the fishing Community. The container is within inches of the current ordinary high water level and could actually float in a severe weather event.

Any buildings located on Lockeport's shoreline could house a number of hazardous chemicals, fuels or materials in danger of contaminating sensitive shorelines if they were impacted by storm surge, erosion or sea level rise. Town owned buildings are in fairly safe weather protected locations. A couple of buildings to monitor for sewer line mishaps would be the Marine Room, located on Locke Street, and the Crescent Beach Centre. The Beach Centre has an outside furnace oil tank located in a possible impact area. The Town could supply safety information for private properties relating to impacts from natural hazards for proper storage of chemicals, fuels and dangerous materials. Lockeport does not own a landfill; therefore, being a small inland area, all solid waste is collected and transported to a proper facility. Toxic and hazardous chemicals can be taken to a shared Municipal hazardous waste depot. There are no side roads or hidden sites in Lockeport's jurisdiction identified as illegal dumping areas. Lockeport may be one of only a few Municipalities in the Province that does not have this environmental problem. According to the Waste Diversion Co-ordinator, Lockeport does an excellent job in sorting and managing solid waste and recycling.

The Town of Lockeport underwent a DFO Habitat Alteration, Disruption or Destruction of Fish Habitat (**HADD**) process in 2010. The compensation site for the HADD was a salt marsh located on the west side of Brighton Road known as the beach corner. The site was chosen for the HADD as the tidal flow was reduced due to a deteriorated culvert. The dying salt marsh was six times the size of the road shoulder infill that initiated the compensation process. The repairs were made by the Town along with a commitment of three years monitoring and reports required by the Department of Fisheries and Oceans. The Town and High School Ocean's Class acquired a wealth of knowledge from the success of the HADD process and have acquired a deeper understanding to include any salt marsh protection into adaptive actions when necessary.

Lockeport and the surrounding areas are known as great bird watching locations and attract a large number of local and visiting birding enthusiasts. There are a large amount of native and migratory species to the area. It has been documented that the protected Piping Plover that have nested at Crescent Beach over the past several decades are losing their natural nesting habitat at the beach due to higher than usual storm surges. The foredunes at Crescent Beach have disappeared because of storm surge and wind erosion, depleting the vegetative areas where the plovers nest. A few other oddities locals have noticed for the past few years are a couple of non native species of seaweed on the beach. An invasive species of crab, known as Green Rock Crab, are now present on the shorelines. House flies and fruit flies are now present year round, instead of seasonal, and mosquitoes are in greater abundance than ever before. Whether these changes to nature are related to climate change or not they need to be mentioned for future reference as to when and how these changes occurred.

*Actions: The Town could supply safety information for private properties relating to impacts from natural hazards for proper storage of chemicals, fuels and dangerous materials. Possibly create an inventory of potential hazardous materials at privately owned locations with the help from LVFD and Emergency response management and the possibility of creating regulations or by-laws regarding safe storage.*

*Stakeholders: Town of Lockeport, DFO, DNR, NSTIR, LVFD, Lockeport Harbour Authority, Occupational Health and safety Division NS (OH&S)*



*Brighton Road shouldering (2010)*

## **Priorities for Action**

*Public safety is the top priority.*

The Town of Lockeport has been adapting to natural hazards for as long as any of the residents can remember. The term “adaptation” may not be thought of when action on a weather related issue is implemented but for decades adaptation is what has taken place. Daily, the sea has a way of reminding Lockeporters of its presence and force. Social and economic activity revolves around the day to day conditions of the local weather and sea temperament. The sea is so much a part of local culture and lifestyle that locals use the term “She” when talking about the ocean. Without hesitation or a documented action plan Town Council, staff, residents and stakeholders know the Crescent Beach Causeway is the most vulnerable piece of Town infrastructure relating to natural hazards. It is the lifeline and link for all public safety, social, economic, and environmental concerns; be it from storm surge, hurricanes, sea level rise or erosion. The beach is the first place locals and emergency responders monitor during an extreme weather event to

gauge how severe any storm may become. If there is concern for impact or damage at the beach causeway then safety and infrastructure could be jeopardized elsewhere. If there is minimal wave action (storm surge) and strong but average winds then the Community will determine the level of safety, personally or to the Town. This weather conscious way of life is very typical for Lockeporters. Any *single or all* vulnerable locations identified could be impacted from *one* extreme weather event due to Lockeport's size and location near the ocean. During a storm on February 9<sup>th</sup> 2013, six of Lockeport's vulnerable locations were flooded or submerged by storm surge.

Adaptive options are based on the geographic location and what proactive or reactive solutions have been used in the past for protective measures. *Dune revetment*, designed by engineers, has proven effective and environmentally safe at the Beach Causeway location. A *second access* is a high priority. *Armour stone* placement along Town owned and private shorelines has been used in the past (permits required from DNR and DFO). Property *infill elevation* above ordinary high water levels is another method used. The Town may have to look at *street elevation* and *new drainage* in some locations. *Ongoing monitoring* is necessary for any vulnerable location or low risk locations as they could become higher risk over the long term (awareness). Any contracted or request for proposal (RFP) adaptive options should be addressed by an engineer as part of implementation. Lockeport, for the most part, is an island and will always be impacted by sea level rise and storm surge. Although reviewing *setbacks* for newer development will be investigated there is not a great deal of undeveloped land available on the island. A *managed retreat* to the mainland for some infrastructure projects or newer development is eminent as adaptation options for this very reason; lack of available land. As for the protection of public drinking water supplies, the Town has never been responsible. All residents have private wells and industry is connected to a Provincially owned water system; however, the water system could be impacted by drought and unable to supply residents and businesses, no matter what jurisdiction owns and manages it. Residents may have to rely on *fresh water deliveries* from elsewhere or *\*cisterns*. There is the possibility of a Town owned *drilled well* for public use or a small scale *\*desalination system* that could supply private homes and businesses.

\* (*Cisterns are often built to catch and store rainwater. Cisterns are distinguished from wells by their waterproof linings. Modern cisterns range in capacity from a few liters to thousands of cubic metres, effectively forming covered reservoirs*).

\*(Salt water is **desalinated** to produce fresh water suitable for human consumption or irrigation. One potential by-product of desalination is salt. Desalination is used on many seagoing ships and submarines. Most of the modern interest in desalination is focused on developing cost-effective ways of providing fresh water for human use. Along with recycled wastewater, this is one of the few rainfall-independent water sources).

The Town of Lockeport is currently, in the spring of 2013, collaborating with The Town of Shelburne and The Municipality of the District of Shelburne (MDS) on the possibility of a land use by-law (LUB) including development setbacks. Lockeport has a Land Use By-law and Municipal Planning Strategy and will incorporate any new by-laws into these documents. The Town of Lockeport, The Town of Shelburne and MDS share the same Building Inspection Department and Sub Division Officer. If this project proceeds, it is anticipated that these Councils will be making adjustments to the LUB so a uniform fit for local climate change issues relating to development will be incorporated. In the short term the Town can legally formulate a **waiver** for the development officer to use as a transitional tool as part of a development permit. This waiver would release the Town from legal obligations arising from risk zone development. The Town, through the development officer using the waiver, could educate and warn any future development prospects of risks from natural hazards identified at any locations.\* **LIDAR** mapping will be a valuable tool for the development and building process. Another possible development agreement requirement would be for **property owners to supply written confirmation, with the assistance of the Development Officer, stating that they are aware their property is prone to erosion, or at risk from sea level rise and storm surge, and that they understand the risks associated with development.**

\***LIDAR** (*Light Detection and Ranging or Laser Imaging Detection and Ranging*) Digital air photography for orthophoto imaging of bare earth digital elevation model and topographic vectors (contours, enhanced drainage and annotation).



The following list of vulnerable locations and infrastructure have been identified for adaptation options including priority ranking respecting public safety, social, economic and environmental considerations.

Location & Infrastructure	Risk Ranking & Issues	Priority Ranking & Issues
The Crescent Beach Causeway p. 8	<b>High</b> (SLR, storm surge, heavy winds, washout, undermining)	<b>High</b> (only access for public safety, economy, environment, sewer infrastructure, phone & power lines)
Calf Island Road p. 14	<b>High</b> (SLR, storm surge, heavy winds, corrosion from salt water intrusion, washout, undermining)	<b>High</b> (water, power & public safety, economy, sewer lines)
North & Upper Water Street intersection p. 16	<b>High</b> (SLR, storm surge, flooding)	<b>High</b> (only power substation, access, economy, sewer lines, public safety)
Chetwynds Lane p. 12	<b>High</b> (SLR, storm surge, washout, undermining)	<b>High</b> (access, power & sewer lines, public safety)
Locke Street West p. 11	<b>Medium</b> (SLR, storm surge, washout, undermining)	<b>Medium</b> (access, public safety & sewer lines)
South Water Street p. 13	<b>Medium</b> (SLR, storm surge, flooding)	<b>Medium</b> (access, safety, economy, sewer lines)
South Street (Historic Streetscape) p. 12	<b>Medium</b> (SLR, storm surge, flooding)	<b>Medium</b> (public access safety & sewer lines)
Brighton Road (Perpendicular to Calf Island Rd.) p. 15	<b>Low</b> (SLR, storm surge, flooding)	<b>Low</b> (access)
Crescent Beach Centre p. 18	<b>High</b> (SLR, storm surge, salt water intrusion & arsenic the in well, heavy winds, premature ageing) <i>possible threat to public safety</i>	<b>High</b> (infrastructure repair costs, energy inefficient, high operational costs) <i>The purpose/ use/ necessity of the building could be housed elsewhere.</i>
Trestles p. 17	<b>Medium</b> (SLR, storm surge, flooding, materials age)	<b>High</b> (access, public safety, repair costs, current physical condition, liability) *See Engineers Report, July/13
Museum Complex p. 19	<b>High</b> (SLR, storm surge, flooding, heavy winds) <i>No threat to public safety</i>	<b>Medium</b> ( cultural property and artifacts impacted)
Town Hall Building p. 22	<b>Low</b> (Heavy winds, age, built before building code, energy inefficient)	<b>Low</b> (energy saving renovations ongoing, windows, lighting, roof replacement)
Pavilion: Seacaps Marketplace p. 21	<b>Medium</b> (Heavy winds, wind catch design)	<b>Low</b>

Vulnerable Locations for: SLR, Storm Surge, Erosion & Overland flooding



Infrastructure at these locations: Streets, Storm drains, Culverts, Sewer lines, Pumping stations, Power lines, Power sub-station, Phone lines, Sidewalks, Street lights, Fire hydrants, Private properties, Businesses.

## **MCCAP: Mitigation**

Mitigation is defined as a human intervention to reduce the sources or enhance the sinks of greenhouse gases. Examples include using fossil fuels more efficiently for industrial processes or electricity generation, switching to renewable energy (solar energy or wind power), improving the insulation of buildings, and expanding forests and other “sinks” to remove greater amounts of carbon dioxide from the atmosphere. The objective of mitigation efforts is to reduce greenhouse gas emissions, with the result of lowering the volume of carbon that enters the atmosphere on an annual basis. Mitigation actions over the long-term will reduce GHG levels in the atmosphere and help to reduce the heating trends that are behind many of the climate changes we are currently experiencing. Mitigation is an extremely important aspect of dealing with climate change, and many of the Province’s municipalities have already undertaken actions, through their ICSP that fall into the category of climate change mitigation. The starting point for most of these actions involves an energy use and greenhouse gas emissions inventory. The inventory allows municipalities to determine where they consume energy and the amount of GHG they emit. This baseline information is critical for implementing policies to reduce greenhouse gas emissions and develop energy conservation programs.

*“Nova Scotia aims to reduce its GHG production to 10 per cent below 1990 levels by 2020. That's a reduction of more than 20 per cent compared to our current levels, and even more compared to where we would be in 2020 if we continued with our current habits”.* Province of Nova Scotia.

In March of 2010 the Town of Lockeport adopted the *Integrated Community Sustainability Plan* (ICSP). Since the inception of the **ICSP** two other documents have been completed for the Town. ***The Municipal Operations Energy Audit (appendix A)*** completed in June of 2009 is for identifying Energy Management Opportunities. The report focuses on improvement in terms of energy savings, alternate energy sourcing or distribution and reductions in costs and greenhouse gas emissions for Municipal operations. There are three major components to energy costs: Buildings and Operations, Vehicle Fleet including the TOL portion of the Joint Services Board and Streetlights. EMO’s are described in terms of costs and savings for three types of activities: Short Term, Medium Term and Long Term; all with impact on costs and savings.

The second of the two documents is ***The Eastern Shelburne County Energy Strategy (appendix B)*** completed in December 2010. The Energy Strategy is an important first step in achieving energy efficiency and renewable energy goals of the municipalities. The Energy Strategy provides a road map for Lockeport to follow to increase the efficient use of energy across all sectors and to identify renewable energy opportunities that can benefit local economic development.

### **The Energy Strategy provides:**

- Practical and achievable energy efficiency or alternate energy opportunities.
- Measures to reduce overall greenhouse gas emissions.
- A strategy for the education of residents and businesses on the economic and environmental benefits of energy efficiency and renewable and alternative energy development.
- An action plan for municipal Governments to pursue the opportunities that is relevant to the Eastern Shelburne County economic development and investment opportunities.

Without duplicating the findings in these two documents into this action plan, both are included with the MCCAP as the whole mitigation component requirement. The documents include energy and emissions information, energy and emissions inventory tables and setting goals and actions for mitigation.

### **Adaptation & Mitigation Progress**

#### ***May 2010***

Lockeport installs LED lighting on the newest section of the waterfront boardwalk. The sodium lights on the older section of the boardwalk will be replaced at the end of their lifespan.

#### ***April 21, 2011***

Legislation introduced by the Nova Scotia Government will make LED lighting mandatory on Nova Scotia's roads and highways. Nova Scotia will become the only Province or State in North America to enact such a law.

#### ***April 2013***

Lockeport Council investigated the costs and resources associated in the purchase and installation of a 50kw wind turbine. A site visit by Seaforth Energy was conducted and decided the Town owned property at Sam's Point near the sewage treatment facility was the best location for the turbine. This project would qualify for the Nova Scotia Community Feed-In Tarriff (COMFIT) program. Although this project would be a revenue generator for the Town and move Lockeport towards the mitigation process, the estimated cost of \$400,000.00 is one third of Lockeport's yearly budget of \$1.2 million. Council felt at this time, the scope of this project and loan of this amount would strain the Town's borrowing capacity or resources for any future projects. This project is on hold.

***May 2013***

Nova Scotia Power begins installation of LED street lights for the Town of Lockeport. LED lights described by the Province of Nova Scotia use less than half the energy of current high pressure sodium lights. This energy savings will also mean a reduction in maintenance costs, greenhouse gas and mercury emissions.

***May 2013***

The Town of Lockeport was contacted by The Ecology Action Centre in Halifax and will take part in a unique study on climate change adaptation relating to tourism and the fisheries.

The Ecology Action Centre is a partner in a project led by the University of Waterloo called ParCA (Partnership for Canadian Caribbean Climate Change Adaptation). The project is looking at climate change adaptation in four study areas - two in the Caribbean (Jamaica and Tobago) and two in Canada (South Shore of NS and PEI). All four areas are of a similar size and their main industries are tourism and fisheries. The project is hoping to understand how climate change is impacting these industries and how the areas are adapting to the changes. The main goal is to inform climate adaptation planning by understanding best practices that have worked in all four areas. This project is ongoing for the summer of 2013. Lockeport will gain valuable information from this exercise and has greatly increased its resource base and once again added to its distinctive recognition.

***July 2013***

A structural assessment report was completed by ABLE Engineering for both trestle bridges. The report covers above and below water suggested repairs to the structures.

## Final Observations

Lockeport and all coastal communities are the backbone of the Province. These communities are the origins of where the Province gained its wealth, social characteristics, cultural identity and basis of Government. The challenges of climate change have put strains on Communities that will only add to the present challenges of Community sustainability. Lockeport has identified impacts and hazards, vulnerable locations and infrastructure relating to climate change impacts. Adaptation to these issues is not a task for Lockeport to undertake on its own. Climate change and the issues associated with it have developed over time by over indulgence from a global population that takes from nature “*what it wants not what it needs*”. Lockeport, and most Communities in Nova Scotia, contributes to the global economy using best practices developed by each fishing, farming and forestry Community. The Province and Canada have gained knowledge from the centuries of trial, error and sustainable management these Communities have developed. Knowing everything is relative and that Lockeport produces its share of greenhouse gases, lesson learned; however, the amount of GHG Lockeport has produced over its history and what it will mitigate over its future will never equal the costs associated with adaptation for Lockeport’s climate change impacts to come. Lockeport does not have an option to climate change adaptation, impacts are evident. The will and means by how to approach these issues create the challenge. Lockeport will do its part to initiate The Municipal Climate Change Action Plan. Hopefully, this plan will instill a deeper understanding to the Provincial and Federal Governments the assistance and support needed by all Communities to fulfill adaptation priorities and mitigation practices through their invaluable contributions they have made towards the sustainability of Nova Scotia.

## Acronyms

CNSIS .....	Canada/ Nova Scotia Infrastructure Secretariat
COMFIT .....	Community Feed -In Tariff
CC .....	Climate Change
DFO .....	Department of Fisheries & Oceans
DNR .....	Department of Natural Resources
EHS .....	Emergency Health Services
EMO .....	Emergency Measures Organization
EOC .....	Emergency Operations Centre
GHG .....	Greenhouse Gas
HADD .....	Habitat Alteration, Disruption or Destruction
ICSP.....	Integrated Community Sustainability Plan
LIDAR.....	Light Detection and Ranging, Laser Imaging for mapping
LED .....	Light Emitting Diodes
LUB .....	Land Use by-law
LVFD .....	Lockeport Volunteer Fire Department
MFR .....	Medical First Responders
MDS .....	Municipality of The District of Shelburne
MCCAP.....	Municipal Climate Change Action Plan
NSPI .....	Nova Scotia Power Incorporated
NSTIR .....	Nova Scotia Transportation & Infrastructure Renewal
OH&S .....	Occupational Health & Safety
ParCA .....	Partnership for Canadian Caribbean Climate Change Adaptation
RFP.....	Request for Proposal
RCMP .....	Royal Canadian Mounted Police
SLR .....	Sea Level Rise
SCEEMO .....	Shelburne County East Emergency Measures Organization
SWRSB .....	South West Regional School Board

**UNESCO .....United Nations Educational, Scientific and Cultural Organization**